

UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF INDIANA
INDIANAPOLIS DIVISION

UNITED STATES OF AMERICA,)	
Plaintiff,)	
)	
STATE OF NEW YORK, STATE OF NEW)	
JERSEY, STATE OF CONNECTICUT,)	
HOOSIER ENVIRONMENTAL COUNCIL,)	
and OHIO ENVIRONMENTAL COUNCIL,)	
Plaintiff-Intervenors,)	
)	
vs.)	1:99-cv-1693-LJM-JMS
)	
CINERGY CORP., PSI ENERGY, INC., and)	
THE CINCINNATI GAS & ELECTRIC)	
COMPANY,)	
Defendants.)	

MEMORANDUM OPINION & ORDER

On September 28, 2007, this Court granted partial summary judgment in favor of plaintiff, the United States of America (the "Government"), and certain plaintiff-intervenors, the Hoosier Environmental Council and the Ohio Environmental Council, on their claims that defendants, Cinergy Corp., PSI Energy, Inc., and the Cincinnati Gas & Electric Company (collectively, "Cinergy"), violated the terms of a 1998 Administrative Order and the provisions of an Ohio State Implementation Plan ("SIP") that established limits on particulate matter ("PM") emissions at Cinergy's plant in Beckjord, Ohio. Docket No. 984.

On May 5, through May 22, 2008, this Court presided over a Jury Trial in this matter with respect to the Government's, and plaintiff-intervenors', the States of New York, New Jersey and Connecticut, and the Hoosier Environmental Council and the Ohio Environmental Council (all plaintiffs, collectively, "Plaintiffs"), claims that Cinergy violated

the New Source Review (“NSR”) provisions of the Clean Air Act (“CAA”) when it performed certain work on its coal-fired boiler units at several of its facilities in Indiana and Ohio without first obtaining a permit. On May 22, 2008, the Jury returned a verdict in favor of Plaintiffs on the following projects: (1) the front wall radiant superheater replacement project at Wabash River, Indiana, unit 2 from June 1989 to July 1989; (2) the high temperature finishing superheater tubes and upper reheater tubing assemblies replacement project at Wabash River, Indiana, unit 2 from May 1992 to September 1992; (3) the finishing, intermediate, and radiant superheater tubes and upper reheat tube bundles replacement project at Wabash River, Indiana, unit 3 from June 1989 to October 1989; and (4) the boiler pass and heat recovery actions replacement project at Wabash River, Indiana, unit 5 from February 1990 to May 1990. Docket Nos. 1338 & 1339.

On February 2, through February 6, 2009, this Court presided over a Bench Trial on the appropriate remedy for the violations found by the Court as a matter of law at Beckjord, and by the Jury after a trial on the merits at Wabash River. Docket Nos. 1581-85. This Memorandum Opinion & Order is intended to serve as the Court’s findings of fact and conclusions of law after said Bench Trial as contemplated by Rule 52(a) of the Federal Rules of Civil Procedure. Any factual statement or finding more appropriately considered a conclusion of law shall be so deemed, and vice versa.

I. FACTUAL BACKGROUND

A. WABASH RIVER PLANT

Cinergy's Wabash River plant is located in Vigo County, Indiana, near the City of Terre Haute. (Docket No. 1499, at No. 8.) The Wabash River plant has five coal-fired boiler generating units: Wabash River units 2, 3, and 4, are 90 megawatt ("MW") gross units that went online in 1953, 1954, and 1955, respectively; unit 5 is a 103 MW gross unit that went online in 1968; and unit 6 is a 342 MW gross unit that went online in 1968. (Remedy Tr. at 2-330 to 331; Docket No. 1499, at Nos. 11, 13, 14, 16, 17, 19; Pls.' Ex. 1955, at PSI-0083210.) All of the Wabash River units vent their emissions through a common smokestack. (Remedy Tr. at 1-31, 2-330 to 331; Pls.' Ex. 2133; Secret, Nov. 13, 2008, Dep., at 49-64.) Together, Wabash units 2 through 6 burn approximately 2 million tons of coal in a typical year. (Remedy Tr. at 22-331.) Cinergy tends to view units 2 through 5, the smaller units, collectively. (*Id.* 4-659.)

By the mid-1980s Cinergy, through its predecessor in interest, Public Service of Indiana ("PSI"), knew that the forced outage rate of a unit increases and availability decreases with age. (Pls.' Ex. 1955, at PSI 0083177.) Moreover, Cinergy knew that the forced outage rate typically begins rising quickly at about 30 years of operation. (*Id.* at PSI-0083177, 0083212.)

In the mid-1980s, Cinergy began a program to evaluate whether it was more economic to "refurbish" the units at Wabash River or to replace them with new units. (*Id.* at PSI-0083187.) In or around February 1985, during hearings before the Public Service Commission of Indiana, James E. Benning ("Benning"), then Executive Director–Fossil

Power Operations Support at PSI, testified that the company's "refurbishment plan", also referred to as a "renovation plan" or a "plant life extension plan," had the "ultimate goal . . . to extend the life of existing generating plants so as to defer the need to build new, costly generating units." (*Id.* at PSI-0083172.) Benning stated that the company's program was "designed to allow operation of its existing generating plants at the same, or possibly even greater, levels of reliability and efficiency through the year 2003." (*Id.*) The Wabash River projects at issue in this case were part of this refurbishment plan. (Liability Tr. at 2-271 to 272, 2-300 to 302, 2-306, 2-315 to 317.) The company's goal with respect to the Wabash River units was to extend their life fifteen years beyond their current life expectancy date of 1993. (Pls.' Ex. 1319, at CINWA002121-22.)

On May 22, 2008, the Jury in this matter found that a reasonable power plant owner or operator would have expected a net increase of 40 tons or more in SO₂ and/or NO_x emissions as a proximate result of the refurbishment projects at Wabash River units 2, 3, and 5. Docket No. 1338. Specifically, the Jury found that Cinergy violated the CAA when it failed to obtain an NSR permit for the following projects: (1) the front wall radiant superheater replacement project at Wabash River, Indiana, unit 2 from June 1989 to July 1989, because of increased emissions of SO₂; (2) the high temperature finishing superheater tubes and upper reheater tubing assemblies replacement project at Wabash River, Indiana, unit 2 from May 1992 to September 1992, because of increased emissions of SO₂; (3) the finishing, intermediate, and radiant superheater tubes and upper reheat tube bundles replacement project at Wabash River, Indiana, unit 3 from June 1989 to October 1989, because of increased emissions of both SO₂ and NO_x; and (4) the boiler pass and heat recovery actions replacement project at Wabash River, Indiana, unit 5 from

February 1990 to May 1990, because of increase emissions of both SO₂ and NO_x. Docket Nos. 1335, 1338 & 1339.

B. EMISSIONS AT WABASH RIVER

During the first liability phase trial in May 2008, Plaintiff's expert, Dr. Richard Rosen ("Dr. Rosen"), presented the annual baseline emission levels of SO₂ and/or NO_x before the earliest project was performed at each unit ("Rosen baseline"). (Liability Tr. at 6-951 to 953; Pls.' Ex. 1549.) Specifically, for the 1989 project at Wabash River unit 2, the SO₂ baseline emission level was 5,641 tons per year; for the 1989 project at Wabash River unit 3, the SO₂ baseline emission level was 4,484 tons per year; and for the 1990 project at Wabash River unit 5, the SO₂ baseline emission level was 4,245 tons per year. (Pls.' Ex. 1549.)

With respect to NO_x, the annual baseline emissions level for the 1989 project at Wabash River unit 3, was 1,201 tons per year, and the annual baseline emissions level for the 1990 project at Wabash River unit 5, was 1,156 tons per year. (Liability Tr. at 6-952 to 953; Pls.' Ex. 1549.)

Wabash River units 2, 3, and 5, are still in service as of the date of this Order. (Remedy Tr. at 2-309.) In January 2009, Cinergy began running Wabash River units 2, 3, and 5, at the annual Rosen baseline emissions levels described above. (*Id.* at 4-731 to 732.)

Since the modifications were performed, Cinergy has emitted approximately 378,000 tons of SO₂ from Wabash River units 2, 3, and 5, through the end of 2007. (*Id.* at 2-208 to 209, 2-320; Pls.' Ex. 2112B.) Since the modifications were performed, Cinergy

has emitted approximately 49,000 tons of NO_x from Wabash River units 3 and 5, through the end of 2007. (Remedy Tr. at 2-308 to 309; Pls.' Ex. 2112B.)

For purposes of this Memorandum Opinion and Order, the term "excess emissions" means "actual emissions that would have exceeded levels of emissions that would have been allowed had permits been issued at the time the modification took place, looking back." (Remedy Tr. at 4-881.) Calculations for excess emissions were performed by party experts for various types permits for which Cinergy might have applied and for various types of pollution control systems that might have been installed if Cinergy had applied for permits under NSR. The type of pollution control equipment that was required at the time of the projects depended upon the designation of the area in which the Wabash River plant was located. (*Id.* 2-307.)

At the time of the projects, the Wabash River plant was located in a nonattainment area with respect to SO₂ emissions. (*Id.* at 2-312.) Dr. Phyllis Fox ("Dr. Fox"), Plaintiffs' expert, testified that if Cinergy had applied for a permit under NSR for each of the Wabash River projects with respect to SO₂, it would have been required to install lowest achievable emissions rate ("LAER") technology. (*Id.* at 2-307.) There is no dispute between the parties that LAER for SO₂ at the time of the projects would have been a wet scrubber or wet flue gas desulfurization ("FGD") unit. (*Id.* at 2-307; *id.* at 3-588.) There is a dispute, however, over the removal efficiency of the FGD's available at the time of the projects.

Dr. Fox opined that an FGD at the time could remove 95% of the SO₂ from the flue gas. (*Id.* at 2-314.) Dr. Fox came to her conclusion based on the installation of an FGD on a unit at a Pennsylvania plant, known as Mitchell unit 3, in 1982, pursuant to a consent

decreed. (*Id.* at 2-318.) In that case, Dr. Fox testified that the consent decree required 95% removal efficiency and that the data from the installed unit showed that the unit removed 99% of the SO₂ from the flue gas. (*Id.* at 2-318 to 319.) In addition, the vendor that constructed the Mitchell unit 3 FGD applied for a patent on the process at a 99% removal efficiency rate. (*Id.* at 2-319.) One other plant, Harry Allen in Nevada, had been issued a permit for an FGD with a 95% removal efficiency; but that plant had never been built. (*Id.*) Prior to 1999, Dr. Fox was also aware of papers being presented in San Francisco and in other parts of the United States reporting on FGD efficiencies of 95% to 96% in the United States. (*Id.* at 2-319 to 320.) Assuming Cinergy had installed an FGD with a 95% removal rate, the excess emissions of SO₂ from Cinergy's Wabash River units 2, 3, and 5, collectively, was a total of 359,000 tons, in the time period from the date of the projects through 2007. (*Id.* 2-230 to 231.)

Cinergy's expert, William DePriest ("DePriest"), testified that LAER at the time of the projects was an FGD that removed 90% of the SO₂ from the flue gas. (*Id.* at 3-588.) DePriest opined that the Mitchell unit 33 FGD was of a unique design, which would not have been the most economical choice for FGDs at the time. (*Id.* at 3-589.) Assuming Cinergy had installed an FGD with a 90% removal rate, the excess emissions of SO₂ from Cinergy's Wabash River units 2, 3, and 5, collectively, was a total of 340,000 tons, in the time period from the date of the projects through 2007. (*Id.* at 2-321 to 322.)

Another Cinergy expert, Thomas Rarick ("Rarick"), testified that instead of installing LAER at the time of the projects, Cinergy would have sought a synthetic minor permit cap on SO₂ emissions at its Wabash River plant. (*Id.* at 2-322, 4-883, 4-897, 5-937.) The

synthetic minor permit cap would have capped SO₂ emissions at the Wabash River plant at pre-project baseline levels. (*Id.* at 4-883.) With such a permit, Cinergy would have had to limit future production capacity. (Pearl Oct. 30, 2008, Rule 30(b)(6) Dep. at 51; Defs.' Ex. DR142, at GAL-096179.)

Cinergy has never obtained a synthetic minor permit for a coal-fired unit. (Pearl Oct. 30, 2008, Rule 30(b)(6) Dep. at 60.) In fact, Cinergy representative Steven L. Pearl ("Pearl") testified that synthetic minor permits are more conducive to combustion turbine units, which are "peaking units," operating only at times of peak demand. (*Id.* at 60-61.) Pearl testified that, typically, coal-fired units are "base-load units" that Cinergy would "want . . . available to operate at all times, so [it is] much more hesitant to restrict their operation." (*Id.* at 61.) Pearl and Rarick agree that whether a synthetic minor permit would have been compatible with any of the projects at issue in this case would require an economic evaluation. (*Id.* at 60; Remedy Tr. at 5-935 to 936.) Cinergy never made such an evaluation. (Remedy Tr. at 5-936.)

Hypothetically, even if Cinergy would have applied for and obtained a synthetic minor permit that would have capped SO₂ emissions at the Wabash River plant to the Rosen baseline emissions level, Cinergy has emitted approximately 120,000 tons of excess SO₂ through December 2007. (*Id.* at 2-323 to 324, 5-939 to 941.)

With respect to NO_x, at the time of the projects, the Wabash River plant was in an area that was designated attainment for NO_x. As a result of this status, Cinergy would have been required to install best available control technology ("BACT") if it had applied

for and obtained an NSR permit. (*Id.* at 2-306 to 307, 2-311 to 312.) The parties disagree over what would have been considered BACT at the time of the Wabash River projects.

Plaintiffs' expert, Dr. Fox, testified that BACT for NO_x in the late 1980s was selective catalytic reduction ("SCR") technology. (*Id.* at 2-325.) Dr. Fox explained that SCR had not been installed on a coal-fired power plant in the United States in the late 1980s, but the time was ripe because SCR had been installed on such units overseas, particularly in Germany, Austria, and Japan. (*Id.* at 2-325 to 326.) Furthermore, SCR had widespread use on gas- and oil-fired plants in the United States. (*Id.* at 2-326.) The first SCR in the United States for a coal-fired boiler was permitted in late 1990. (*Id.* at 2-326 to 327.) Dr. Fox concluded that any problems associated with high-sulfur coals used in the United States had been resolved in foreign countries and would not impede application of SCR to coal-fired plants in the United States. (*Id.* at 2-327 to 328.)

Dr. Fox calculated the NO_x excess emissions for the Wabash River plant if SCR had been installed at the time of the projects to be 30,000 tons through the year 2007. (*Id.* at 2-328.)

In contrast, Cinergy's experts, Rarick and DePriest, testified that BACT for NO_x emissions control at the time of the Wabash River projects on units 3 and 5 was a low-NO_x burner with an emission limitation of 0.6 pounds per million BTUs. (*Id.* at 4-889, 3-561 to 562.) Rarick testified that in his review of the RACT/BACT/LAER Clearinghouse, which is a database of technology decisions that have been made under NSR programs and is managed by the EPA, and state and local environmental protection agencies, BACT at the time of the Wabash River projects was not SCR. (*Id.* at 4-885 to 886.) Rarick stated that

the RACT/BACT/LAER Clearinghouse data supported a conclusion that low-NO_x burners were BACT at the time of the Wabash River projects because there were numerous entries that identified low-NO_x burners as the required BACT for a number of coal-fired projects preceeding and up to the date of the Wabash River modifications. (*Id.* at 4-889.)

In forming his conclusion that SCR was not BACT at the time of the Wabash River projects, Rarick also considered a statement made by the EPA in June 1991 in public rule-making documents regarding proposed revisions to the PSD regulations. (*Id.* at 4-887.) At 56 Federal Register 27638, the EPA stated that “[SCR] and SNCR are not in use in this country as retrofit technologies for coal-fired boilers and the DOE, or Department of Energy sponsored projects, have not yet been demonstrated.” (*Id.* at 4-887 to 888.) In addition, at the same citation under a section entitled “Utility BACT Presumption for NO_x,” the EPA stated, “In general, this will call for the use of combustion modification and/or low-NOX [sic] burners.” (*Id.* at 4-890.) Although the EPA did not adopt this particular rule-making initiative, Rarick finds it persuasive evidence of what the EPA considered BACT at the time it was written. (*Id.* at 4-888.)

At the time of the modification to unit 5, Cinergy installed a low-NO_x burner that would have met an emissions limitation of 0.6 pounds per million BTU. (*Id.* at 4-889.) Such a limitation would have been measured on a 30-day rolling average. (*Id.* at 5-944.) Although Cinergy did not install a low-NO_x burner on unit 3 at the time it made the modification to that unit, it did install such a burner on unit 3 a few years later. (*Id.* at 4-889.) Even with these installations, Cinergy’s excess emissions of NO_x would have totaled 4,865 tons, through 2009. (*Id.* at 5-946 to 947.)

Rarick opined that at the time of projects, installation of BACT for NO_x emissions would have been the most reasonable presumption for how Cinergy would have applied for a permit. (*Id.* at 5-947 to 948.)

C. HARM CAUSED BY EXCESS EMISSION AT WABASH RIVER

1. PM2.5

With respect to SO₂ emissions, Dr. Fox testified that the annual excess emissions of SO₂ is approximately 23,000 tons. (*Id.* at 2-321, 2-328.) Putting this into perspective, this rate is approximately equivalent to the amount of SO₂ emitted by 324,000 heavy-duty diesel trucks, which is the total number of trucks registered in Indiana, Ohio, and Kentucky. (*Id.* at 1-178 to 179.) According to Plaintiffs' expert, Lyle Chinkin ("Chinkin"), the annual excess emissions alone would rank among the top 5% of sources of SO₂ pollution in the Eastern United States. (*Id.* at 1-212.) Cinergy's expert, Stanley Hayes ("Hayes"), testified that the annual excess emissions of SO₂ is equivalent to 2% of SO₂ emissions from all sources of the gas in the State of Indiana. (*Id.* at 3-641.) And, the Wabash River annual excess SO₂ emissions is approximately two times that of the total annual SO₂ emissions from all point sources in all six counties of the Dayton Regional Air Pollution Control Agency. (*Compare id.* at 2-242 with *id.* at 2-321.)

There is no dispute that SO₂ and NO_x emissions contribute to the formation in the atmosphere of secondary particulate matter that is 2.5 microns in diameter or smaller ("PM2.5"), which is called secondary PM2.5. (*Id.* at 1-62 to 64, 1-118, 1-121; Pls.' Ex. 1907, at CINERGY 1005860; Remedy Tr. at 2-234.) Specifically, once emitted, SO₂ can

form sulfates, which is a constituent of secondary PM_{2.5}. (Remedy Tr. at 1-64, 1-118, 1-121.) Once emitted, NO_x can form nitrates, which is another constituent of secondary PM_{2.5}. (*Id.*)

In the air, PM_{2.5} is measured in micrograms per cubic meter (“µg/m³” or “µg”). (*Id.* at 1-122 to 123.) Secondary PM_{2.5} represents the majority of PM_{2.5} in the United States. (*Id.* at 1-64.) Secondary PM_{2.5} can form over hundreds of miles, and it can travel thousands of miles downwind from where it forms. (*Id.* at 1-77 to 78, 1-141.) Because of its size, PM_{2.5} is “considered respirable.” Pls.’ Ex. 1939, at CINERGY 1343912. Once inhaled, PM_{2.5} lodges deep in the human lung. (Remedy Tr. at 1-63.) Because the sulfate particles tend to combine with metals in the atmosphere, the PM_{2.5} that contains sulfates are particularly toxic. (*Id.* at 1-80.)

According to Plaintiffs’ expert, Dr. Joel Schwartz (“Dr. Schwartz”), the scientific consensus is that PM_{2.5} is harmful to human health. (*Id.* at 1-63 to 65.) Particulate matter, like PM_{2.5}, cause the following health impacts: decreased lung function, increased prevalence of respiratory symptoms, worsened respiratory infections, heart attacks, and the risk of early death. (*Id.* at 1-49.) The effect on life expectancy and heart attack rates is both acute and chronic. (*Id.* at 1-65 to 70.) These views are held by the following groups in the scientific community: the American Medical Association; EPA’s Clean Air Science Advisory Committee (“CASAC”); the American Academy of Pediatrics; the American College of Cardiology; the American Heart Association; the American Thoracic Society; the American Cancer Society; the American Public Health Association; and the

National Association of Local Boards of Health (collectively, the “relevant public health advisory groups”). (*Id.* at 1-50 to 54.)

According to the relevant public health advisory groups there is clear and convincing scientific evidence that significant adverse human-health effects occur in response to short-term and chronic particulate matter exposures at and below 15 $\mu\text{g}/\text{m}^3$, the level of the current annual PM_{2.5} standard. (*Id.* at 1-50 to 54; Pls.’ Ex. 1911.) Dr. Schwartz testified that the dose-response curve for PM_{2.5} and mortality is linear, at least in the range between 8 $\mu\text{g}/\text{m}^3$ and 25 $\mu\text{g}/\text{m}^3$, the range of ambient PM_{2.5} in the United States. (Remedy Tr. at 1-85 to 87.) Dr. Schwartz’ statistical evidence was acknowledged by a National Academy of Sciences panel, which, after reviewing epidemiology data, stated “For pollutants such as . . . PM_{2.5} there is no evidence for any departure of linearity in the observed range of exposure.” (*Id.* at 4-873 to 877.)

There are some human chamber studies and toxicology studies that argue against a connection between PM_{2.5} and health effects. (*Id.* at 1-60 to 62, 4-809 to 811, 4-849 to 850.) And, the EPA has stated that it is relevant to consider such studies when evaluating potential mechanisms for PM_{2.5}-related effects. 71 Fed. Reg. at 61,151. However, the reports relied upon by Cinergy’s expert, Peter Valberg (“Valberg”), to form his opinion that PM_{2.5} does not have adverse health effects are a minority view and the bulk of the scientific literature on the subject concludes that PM_{2.5} has significant effects on human health. (*Id.* at 1-60 to 62, 1-73 to 75.)

Cinergy’s reliance on the February 1998 study by the EPA on Hazardous Air Pollutants from Electric Utility Steam Generating Units (the “HAPS report”), is unavailing.

(See Defs.' Ex. DR-244.) First, the HAPS report only modeled the effects in a 50-kilometer ("km") radius from the Wabash River plant. (*Id.* at ES-12, 14 to 15.) The primary source of harm from the excess emissions in this case, PM_{2.5} generated downwind of the Wabash River plant, causes effects beyond the 50-km radius of the report. Second, the HAPS report did not address SO₂, NO_x, PM_{2.5}, or ozone. (*Id.* at ES-27.) The HAPS report recognizes this deficiency as a significant omission. (*Id.*)

Cinergy's reliance on the Toxicology Excellence for Risk Assessment ("TERA") report is equally unavailing. (Defs.' Ex. DR-025.) Like the HAPS report, the TERA report does not address the health impacts or risk from PM_{2.5}. (Remedy Tr. at 4-861 to 867.) The TERA report does not attempt to measure the health impacts of emissions from Wabash River that has mixed with pollution from other sources or, specifically, the health risks associated with PM_{2.5}. (*Id.* at 4-863, 4-867; McElfresh, Nov. 14, 2008, Dep. at 120, 124.) Furthermore, the efficacy of the TERA report is in question because there is no evidence of the model used by the report authors to form the conclusions contained therein. (McElfresh, Nov. 14, 2008, Dep. at 92-95, 115-16; Defs.' Ex. DR-025, at CINERGY 1547785-87; Remedy Tr. at 4-864 to 867.) In other words, there is no way to test the validity of the air quality model used to form the basis of the conclusions in the report. (Remedy Tr. at 4-864 to 867.)

Plaintiffs' expert, Lyle Chinkin ("Chinkin"), analyzed the extent to which excess SO₂ and NO_x emissions from Wabash River units 2, 3, and 5, contributed to secondary PM_{2.5} formed in the air. (*Id.* at 1-118.) To perform his analysis, Chinkin primarily relied upon two different air quality models, the Community Multi-Scale Air Quality Model ("CMAQ"), and

the Comprehensive Air Quality Model with Extensions (“CMAx”). (*Id.* at 1-125, 1-131, 1-133.)

CMAQ is a photochemical grid model that represents the atmospheric science of air pollution in three dimensions. (*Id.* at 1-125.) The atmosphere is simulated in a series of “grid cells,” or boxes, over a community. (*Id.*) CMAQ provides an estimate of air pollution concentration in each of the grid cells for PM_{2.5} and ozone. (*Id.* at 1-126.) This model accounts for emissions, atmospheric chemistry, meteorology, and physics. (*Id.* at 1-125 to 129.) CMAQ is one of the most peer-reviewed air quality models and reflects years of scientific testing, experiments, and comparisons of the model’s predictions to measured air pollution by air quality monitors. (*Id.* at 1-125 to 126, 1-129 to 130.)

The CMAQ modeling used by Chinkin was derived from “VISTAS,” a regional planning organization of Southeastern states that was formed to address air pollution problems. (*Id.* at 1-133 to 134.) In its study, VISTAS modeled the year 2002, including SO₂ and NO_x emissions from multiple sources and the Wabash River plant, to determine both PM_{2.5} and ozone impacts. (*Id.* at 1-133 to 135.) Peer-reviewed papers concluded that the VISTAS study was reliable. (*Id.* at 1-135 to 136.)

Chinkin used a CMAQ model identical to the VISTAS model, however, he removed the excess emissions of SO₂ and NO_x from the Wabash River plant, as provided to him by Dr. Fox, to determine the impact of the excess emissions on PM_{2.5} and ozone concentrations. (*Id.* at 1-130, 1-132 to 133, 1-139 to 140.) Chinkin selected June 2002 to model because there were a number of days in that month when air quality exceeded the

National Ambient Air Quality Standard (“NAAQS”) for PM_{2.5} and ozone. (*Id.* at 1-138, 1-181 to 182.)

The CMAQ modeling indicated that the excess emissions from the Wabash River plant contributed to PM_{2.5} levels in Indiana, Ohio, Kentucky, Illinois, Maryland, Rhode Island, New York, Connecticut, and New Jersey. (*Id.* at 1-141, 1-143 to 147.) Specifically, the excess emissions from Wabash River contributed about 0.50 µg of PM_{2.5} to Indianapolis, Indiana, on half of the days modeled. (*Id.* at 1-206 to 208.) The average monthly impact on PM_{2.5} ranged from 0.17 to 0.10 µg in Indiana, with smaller impacts in states such as Illinois, Kentucky, Ohio, Michigan, and Wisconsin. (*Id.* at 1-148 to 149.) Chinkin opined that this monthly impact is representative of the likely annual impact on PM_{2.5} concentration from the excess emissions as confirmed by other modeling and analysis. (*Id.* at 1-138, 1-171 to 173.)

CAMx is another photochemical grid model that Chinkin used to form his opinions. (*Id.* at 1-131.) CAMx is similar to CMAQ in that both models provide estimates of PM_{2.5} and ozone impacts based on emissions, atmospheric chemistry, and meteorology. (*Id.* at 1-132.) For other purposes, the EPA recently used CAMx to estimate PM_{2.5} impacts from the emissions from the Wabash River plant in the calendar year 2005. (*Id.* at 1-150 to 152.) The area, or domain, modeled included Indiana, Illinois, Wisconsin, Michigan, Kentucky, and Ohio. (*Id.* at 154.) Chinkin opined that the EPA’s CAMx model is reliable and consistent with the EPA’s guidelines on good “model performance.” (*Id.* at 1-154 to 155.)

Although the CAMx modeling estimated the PM_{2.5} impact of the entire plant's emissions, approximately one-third of that impact is due to the excess emissions from Wabash River units 2, 3, and 5, because excess SO₂ emissions represent approximately one-third of the total SO₂ emissions from the plant and the relationship between SO₂ and sulfate formation is fairly linear. (*Id.* at 1-152 to 153, 1-177 to 178.) The parties' experts agreed that this proportionality technique was reasonable. (*Id.*; *id.* at 3-631 to 632, 3-633 to 634.)

During the 2005 model year, the greatest daily impacts from the excess emissions on PM_{2.5} occurred during the summer, when it is hot, humid, and the air is stagnant; these are conditions that are most conducive to conversion of SO₂ to sulfates. (*Id.* at 1-159 to 162.) For example, on June 6, 2005, the excess emissions had about a 0.70 µg impact on the Indianapolis area, with lesser impacts extending to Louisville, Kentucky; Cincinnati-Dayton, Ohio; and Lafayette, Indiana. (*Id.* at 1-159 to 161; Pls.' Ex. 2139.) On August 26, 2005, the highest daily impact of excess emissions on PM_{2.5} occurred. (Remedy Tr. at 1-161 to 162; Pls.' Ex. 2139.) On that day, the Wabash River plant had a 6.40 µg impact, one third of which was from excess emissions. (*Id.*) Nonattainment areas impacted that day included Gary, Indiana, and Chicago, Illinois. (*Id.*)

Using the CAMx modeling, the EPA compiled a list of PM_{2.5} nonattainment areas that were most impacted on days when PM_{2.5} concentrations were predicted to be high. (Remedy Tr. at 1-165 to 168.) Those areas included: Evansville, Indiana; Knox County, Indiana; Dubois County, Indiana; Louisville, Kentucky; Marion County, Indiana; Chicago, Illinois; Cincinnati, Ohio; Lafayette, Indiana; Kent, Michigan; McCracken County, Kentucky;

Madison, Illinois; St. Louis, Missouri; and Dayton, Ohio. (*Id.*) The average daily impact on those areas ranged from 0.65 μg to 0.19 μg , approximately one-third of which is attributable to excess emissions from Wabash River units 2, 3, and 5. (*Id.*)

The average annual impacts on PM_{2.5} concentrations from the excess emissions from Wabash River units 2, 3, and 5, was predicted by CAMx to be approximately 0.15 to 0.16 μg . (*Id.* at 1-171 to 172.) On an annual basis, the most impacted area was near the Wabash River plant and extending into Indianapolis, with smaller impacts over the states of Illinois, Wisconsin, Michigan, Ohio, and Kentucky. (*Id.*)

The annual impacts predicted by CMAQ and CAMx corroborate one another because their predictions are remarkably similar: annual impact of 0.17 μg predicted by CMAQ compared to an annual impact of 0.16 μg predicted by CAMx. (*Id.* at 1-138, 1-150 to 152; 1-169 to 173.)

Chinkin also analyzed data from a third analytical tool called "CALPUFF." (*Id.* at 1-124 to 125.) CALPUFF is an air quality model that tracks the movement of air pollution from a source, however, it uses simplified chemistry compared to the CMAQ and CAMx models. (*Id.*) The CALPUFF data that Chinkin considered was performed by the Indiana Department of Environmental Management ("IDEM"), and modeled the emission from the Wabash River plant for its impact on PM_{2.5} concentrations in the year 2003. (*Id.* at 1-174 to 175.) CALPUFF predicted impacts from the Wabash River emissions over all of the Midwest, and into the states of New York, New Jersey, and Connecticut. (*Id.* at 1-175.) The PM_{2.5} concentrations predicted by CALPUFF modeling were smaller than the

predictions from the other two models; however, Chinkin attributed this difference to the simplified chemistry of the CALPUFF model. (*Id.* at 1-175 to 176.)

Chinkin opined that the excess emissions from Wabash River units 2, 3, and 5, had a substantial or meaningful impact on the PM_{2.5} concentration in nonattainment areas. (*Id.* at 1-118, 1-194 to 197.) The daily NAAQS for PM_{2.5} is 15 µg, while the annual NAAQS is 35 µg. (62 Fed. Reg. 38,679 (July 18, 1997); 71 Fed. Reg. 61,144, 16,165, 61,171 (Oct. 17, 2006); 62 Fed. Reg. 38,856, 38,895 (July 18, 1997); 73 Fed. Reg. 16,435 (Mar. 27, 2008).) No single source is considered alone when determining whether the PM_{2.5} concentration in any given area exceeds these standards. (Remedy Tr. at 1-197, 3-634 to 637.) When communities are within just a few tenths of a µg from compliance with the annual and/or daily NAAQS, contributions on the order of one-tenth of a µg are significant. (*Id.* at 1-150, 1-173, 2-225 to 226, 2-237 to 239, 2-241.) Therefore, contributions of single sources can make a difference in areas where the difference between attainment and nonattainment is very small. (*Id.* at 2-259.) Dayton, Ohio, is one such area. (*Id.* at 2-225 to 226, 2-238 to 239, 2-241.) There are other such areas in the Eastern United States. (*Id.* at 2-240 to 241.)

Chinkin also opined that continued emissions from the Wabash River plant would have the same impacts in the future. (*Id.* at 1-176.)

2. Ozone

In addition to PM_{2.5}, NO_x contributes to ground level ozone, another secondary pollutant. (*Id.* at 1-91, 1-121.) In the presence of heat and sunlight, NO_x reacts with

hydrocarbons—also referred to as volatile organic compounds (“VOCs”)—to form ozone. (*Id.*; Pls.’ Ex. 1907, at CINERGY 1005842.) In the air, ozone is measure in parts per billion (“ppb”). (Remedy Tr. at 1-123.)

According to Dr. Schwartz, ground-level ozone causes acute inflammation of the lungs, reduction in lung function, increased respiratory symptoms and changes in day-to-day mortality rates; it can trigger asthma attacks; and it can increase hospital admissions for respiratory illnesses. (*Id.* at 1-54 to 55, 1-91 to 92.) Similar to the effects of PM_{2.5}, the scientific consensus is that human health effects from ground-level ozone is linear down to low levels and that any threshold is below current ambient levels. (*Id.* at 1-92 to 93.)

At the excess NO_x emissions calculated by Dr. Fox if SCR was BACT at the time of the projects at Wabash River units 2, 3, and 5, the CMAQ model indicated that the excess emissions contributed to ozone pollution in Indianapolis, Indiana, and further downwind in Ohio. (*Id.* at 1-147 to 148.)

3. Acidic Deposition or Acid Rain

The third type of harm associated with emissions of SO₂ and NO_x is acidic deposition or acid rain. (*Id.* at 1-64, 1-118, 1-121.) As previously discussed, SO₂ is a precursor for sulfates and NO_x is a precursor for nitrates; sulfates in the form of sulfuric acid and nitrates in the form of nitric acid, are the major components of acid rain. (*Id.* at 2-270 to 271.) Plaintiffs’ expert, Dr. Charles Driscoll (“Dr. Driscoll”), testified to the general environmental effects of acid rain. (*Id.* at 2-260 to 302.) Generally, those effects include restricted growth of fauna, decreased ability of fauna to fight diseases and insect

infestation, and similar detrimental effects on aquatic ecosystems. (*Id.* at 2-275 to 284.) Dr. Driscoll opined that the general trajectory pattern of the Wabash River emissions, as described by the models used by Chinkin, is very similar to the emissions pattern that other modeling and trajectory studies have reported in the scientific literature about acidic deposition. (*Id.* at 2-272 to 274.) Therefore, Dr. Driscoll opined that the effects of the excess emissions from Wabash River units 2, 3, and 5, would be consistent with those of previously-reported studies. (*Id.*)

Dr. Driscoll stated that the overwhelming consensus among the scientific community is that acidic deposition has cumulative, long-term effects on both forest and aquatic ecosystems. (*Id.* at 2-276 to 277, 2-281, 2-287.) Reductions in acidic deposition can reduce and reverse these adverse effects, however, recovery is very slow. (*Id.* 2-277 to 278, 2-285 to 286.) Dr. Driscoll opined that the greater the extent of acidic deposition reductions, and the sooner such reductions are achieved, the faster the recovery. (*Id.* at 2-277 to 278, 2-287.)

Plaintiffs presented no evidence, however, from which Dr. Driscoll purported to analyze the extent to which any measured acid deposition was attributable to emissions from Wabash River units 2, 3, and 5. (*Id.* at 2-272, 2-300.) Despite having performed environmental quality modeling in the past, Dr. Driscoll did not perform such modeling for the emissions from the Wabash River plant. (*Id.* at 2-272, 2-299 to 300.)

4. Mercury Effects

Plaintiffs' expert, Dr. Driscoll, also testified about the general environmental effects of mercury, which is another byproduct of coal combustion that is emitted from the Wabash River plant. (*Id.* at 2-288 to 298.) Even Cinergy understands that power plants are the largest source of mercury emissions in the United States. (Geers Oct. 24, 2008, Dep. at 27, 35-38, 89-90.)

Mercury is emitted in three forms from a coal-fired power plant like Wabash River: elemental mercury, gaseous oxidized mercury and particulate oxidized mercury. (Remedy Tr. at 2-289 to 290.) Oxidized mercury is deposited generally close to the source, or within 250 miles of the source. (*Id.* at 2-289.) The mercury emitted from the Wabash River plant largely are in the oxidized form. (*Id.* at 2-290.)

Mercury that ends up in the soil undergoes a chemical transformation called methylation. (*Id.* at 2-291.) The formation of "methyl-mercury" is heightened by acid rain, specifically, sulfate deposition. (*Id.* at 2-292.) Methyl-mercury bioaccumulates in food chains and is the form of mercury found in fish. (*Id.* at 2-291 to 292.) Most importantly, the concentration of methyl-mercury goes up by a factor of one to ten million from the time it enters lakes and streams, moves through the food chain, and, finally, accumulates in larger fish consumed by people and animals. (*Id.* at 2-294.)

There is plenty of literature to support Dr. Driscoll's opinion that methyl-mercury deposition has negative effects on the aquatic ecosystem in Indiana and surrounding states. (*Id.* at 2-294 to 297; Pls.' Ex. 1913.) Dr. Driscoll also opined that reduction of

mercury emissions from Wabash River would likely result in benefits to Indiana and surrounding areas within a 250-mile radius. (Remedy Tr. at 2-290, 2-297 to 298.)

Wabash River units 2 through 6 emit approximately 170 pounds of mercury per year; units 2, 3, and 5, emit approximately 58 pounds of mercury per year. (*Id.* at 2-351; Pls.' Ex. 2100, at CINREMETREX000917; Docket No. 1499, Stip. of Fact No. 29.) Operation of FGDs and SCRs together can remove from 70% to 80% of the mercury that is otherwise emitted from a coal-fired power plant. (Pls.' Ex. 1912.) An FGD alone would remove from 40% to 60% of the mercury. (Remedy Tr. at 2-391.)

Plaintiffs did not do any modeling or other environmental risk assessment to determine where Wabash River mercury emissions may have been transported or to gauge any impact these emissions may have had. (*Id.* at 1-183, 1-190, 2-300.) Moreover, the EPA's HAP report did study mercury and concluded, generally, that mercury emissions from the utility industry are not expected to have any adverse health effects. (Defs.' Ex. DR-244; Remedy Tr. at 4-826 to 831.)

D. WABASH RIVER COMPLIANCE TODAY

Compliance with NSR today would require installation of BACT at Wabash River units 2, 3, and 5. (Remedy Tr. at 2-329 to 330.) BACT would require a scrubber that removed 99% of the SO₂ and an SCR that would remove 90% of the NO_x from the units' emissions. (*Id.*)

Cinergy, however, through James L. Turner ("Turner"), Duke Energy Corporation's Group Executive and President and Chief Operating Officer of Duke's franchised electric

and gas business segment, stated that it would not make sense to install pollution controls on Wabash River units 2, 3, and 5, because they are too old for such modifications to be economical. (*Id.* at 4-679.) Moreover, Turner testified that absent a finding of liability in this case, Cinergy did not plan to shut down Wabash River units 2, 3, and 5, in the foreseeable future. (*Id.* at 4-679 to 680.) However, as environmental restrictions are likely to become tighter over time, generally, smaller, older units like Wabash River units 2, 3, and 5, “are likely the ones that over time will be shut down.” (*Id.* at 2-680.) In fact, in 2007, Cinergy opined that retirement of Wabash River units 2, 3, 4, and 5, around the year 2012 is

an important scenario to consider given the high cost to retrofit these units with pollution control equipment, especially if more stringent environmental regulations are to be enacted. These are the next oldest coal units on Duke Energy Indiana’s system . . . and, with more stringent environmental requirements, likely the next units to face retirement.

(Pls.’ Ex. 1971, at CINERGY 1407877-78. See also Remedy Tr. at 4-720 to 722.)

Cinergy presented evidence that Midwest ISO (“MISO”) has concerns about an immediate shut down of Wabash River units 2, 3, and 5. (Remedy Tr. at 5-957 to 992; Defs.’ Ex. DR-321.) Specifically, a MISO representative, Roger Harszy (“Harszy”), MISO Vice President of Real Time Operations, testified that MISO is responsible for the transmission of power in fourteen states across the Midwest, and in the Canadian province of Manitoba. (Remedy Tr. at 5-958.) Upon Plaintiffs’ request, MISO undertook an analysis of the potential impact of the immediate shutdown of Wabash River units 2, 3, and 5 (“MISO report”). (*Id.* at 5-960; Defs.’ Ex. DR-321.) Based on the analysis in the report, Harszy opined that the immediate unavailability of Wabash River units 2, 3, and 5, would

cause a significant problem in MISO's service of the electrical demand in the Terre Haute load pocket. (Remedy Tr. at 5-962.)

Harszy explained that without Wabash River units 2, 3, and 5, to generate power, MISO would use power generated in other parts of Indiana, Illinois, and Michigan, to service the Terre Haute load pocket. (*Id.* at 5-964.) Such a situation would put a strain on the Dresser transmission substation during the summer peak of electricity demand.¹ (*Id.* at 5-964 to 965.) Transmission of power through the Dresser substation is limited by the transformer equipment at that location. (*Id.* at 5-966.) Without Wabash River units 2, 3, and 5, in operation, coupled with the loss of one of the transformers at Dresser, the Dresser substation could overload and MISO would have to shed load to the Terre Haute region to alleviate the situation. (*Id.* at 5-967 to 968, 5-975 to 976.) If MISO instructs a power supplier to "shed load" it asks the power supplier to turn off the supply of electricity to a certain number of customers. (*Id.* at 5-968.)

Harszy testified that the MISO report recommends two things to alleviate its concerns about the limitation on the Dresser substation: (1) add another transformer to the Dresser substation; and (2) add another 138,000-volt transmission line from Dresser to the Allendale, and Margaret substations. (*Id.* at 5-969 to 970.) Cinergy believes the addition of another transformer at Dresser would alleviate MISO's concerns completely. (*Id.* at 4-690 to 691; Gesweing Nov. 5, 2008, Rule 30(b)(6) Dep. at 108-09.) The addition of another transformer at Dresser has already been planned for by Cinergy and accounted

¹For purposes of the MISO study and this Order, the summer peak of electricity demand is defined as days of ninety-degrees or higher in the Terre Haute area. (Remedy Tr. at 5-974 to 975.)

for in models used at MISO, but not in the immediate future. (Remedy Tr. at 5-997, 4-778 to 779.)

Turner testified that on or about January 30, 2009, he authorized his personnel to move forward with the acquisition of a transformer for Dresser, which Turner targeted for installation in June 2012. (*Id.*) Cinergy stated that it would take approximately two years to obtain a transformer of the appropriate size for Dresser. (Geswein Nov. 5, 2008, Rule 30(b)(6) Dep. at 109.) In addition, Cinergy generally keeps a spare transformer of the size needed at Dresser in the system. (*Id.*) Turner testified that Cinergy has already planned to use its only spare transformer to replace a more critical failure in the Cincinnati, Ohio, area. (Remedy Tr. at 4-692 to 694, 4-767 to 678, 4-772.) Turner also testified that Cinergy could have a the new transmission line in place by September 2012. (*Id.* at 4-695 to 696.)

Harszy stated that if MISO knew for certain that Wabash River units 2, 3, and 5, were going to go offline; or if there were some catastrophe that would take Wabash River units 2, 3, and 5, offline; or if Cinergy had approached MISO and asked it to study such a scenario, MISO would have performed an Attachment Y study,² and it would have worked with Cinergy to formulate a plan to alleviate the concerns identified in the MISO study. (Remedy Tr. at 5-972 to 974, 5-989 to 990.)

²An "Attachment Y study" is a detailed engineering analysis of different transmission and capacity scenarios that MISO would perform if a power plant owner told MISO that the power plant owner intended to shut down a generating unit. (Remedy Tr. at 5-970, 5-971.) The MISO report is not an Attachment Y study. (*Id.* at 5-960, 5-970, 5-973.)

E. THE SO₂ CAP-and-TRADE PROGRAM

Since 1995, under the acid rain cap-and-trade program, total SO₂ emissions from certain coal-fired electric generating units have been capped at 8.9 million tons. 42 U.S.C. § 7651b(a)(1). In part, the purpose of the SO₂ cap-and-trade program is to achieve “reductions in annual emissions of sulfur dioxide of 10 million tons from 1980 emission levels.” *Id.* § 7651(b). Within the SO₂ cap-and-trade program, the EPA has allocated SO₂ allowances to utilities; each allowance constitutes authorization to emit one ton of SO₂ for the specified year. *Id.* § 7651b(a)(1); *id.* § 7651a(3). (See also Remedy Tr. at 3-445 to 448.) Utilities may purchase needed allowances to cover their actual emissions or sell extra allowances so long as they do not emit more SO₂ in total than the amount for which they have allowances. 42 U.S.C. § 7651b(b); 40 C.F.R. § 73. (See also Remedy Tr. at 3-446, 4-698 to 700.) In addition, if a company reduces emissions at one facility by putting on controls, for example, the utility can sell those allowances to other utilities, or use them in another part of its system. (Remedy Tr. at 3-445 to 446, 4-700.) Cinergy has always operated within its cap. (*Id.* at 4-698, 4-704.)

The SO₂ allowance allocation for the Wabash River plant is approximately 12,000 allowances per year. (*Id.* at 3-475.) If Wabash River units 2, 3, and 5, are shut down, they will no longer emit SO₂, but Cinergy will retain those allowances for use elsewhere in its system. (*id.* at 3-446, 3-475 to 476, 4-698 to 699.)

F. VIOLATIONS AT BECKJORD

By Order dated September 28, 2007 (“Beckjord Order”), this Court concluded that Cinergy exceeded limits established for particulate matter (“PM”) emissions at its Beckjord facility in violation of both an Administrative Consent Order (“AOC”),³ a settlement contract that Cinergy Corp. had entered into with the Environmental Protection Agency (“EPA”), which was effective for the years 1998 through 2000; and an Ohio State Implementation Plan (“Ohio SIP”), a permit and statutory obligation of Cincinnati Gas & Electric Company. Docket No. 984, at 2. Specifically, the Court found that Cinergy exceeded PM emissions limits on October 12, 1999; October 21-22, 1999; May 4, 2000; and May 26, 2000. *Id.* In addition, the Court concluded that Plaintiffs could hold each party liable under the two sets of obligations because, in essence, the duties thereunder were separate. *Id.* at 4-5. Since the Beckjord Order issued, the parties have stipulated that the various defendant entities are jointly responsible for any penalty imposed for the Beckjord violations. Docket No. 1499, at No. 24.

The Ohio SIP limit for PM emissions from Beckjord units 1 and 2 was 0.1 pounds per million BTU. (Remedy Tr. at 2-415.)

PM emissions at Beckjord units 1 and 2 are controlled by devices known as electrostatic precipitators (“ESPs”) that were installed on those units in or about 1974. (Boots Oct. 16, 2008, Dep. at 67-68; Boots Nov. 24, 2008, Rule 30(b)(6) Dep. at 150, 152-54.) However, the Beckjord units have no PM emissions continuous monitoring equipment;

³The Court notes that the AOC was reached in response to an enforcement action brought by EPA for a March 27, 1997, PM emissions test failure at unit 1. (Remedy Tr. at 2-414.) In conjunction with the AOC settlement, Cinergy paid a \$63,000.00 penalty. (*id.* at 2-417 to 418.)

rather, compliance is measured through periodic stack tests known as Method 5 tests. (Remedy Tr. at 5-1034 to 1035.) Method 5 tests are based on averaging three hours of data and are only performed periodically. (*Id.* at 5-1042 to 1043.)

The failed emissions test at Beckjord unit 2 in October 1999, was associated with a test burn of alternative fuel, which was a mixture of coal and paper pellets. (*Id.* at 5-1008.) This was the only time that Beckjord unit 2 burned this alternative fuel. (*Id.*)

The parties agree that as a result of the PM emissions tests failure of October 12, 1999; May 4, 2000; and May 26, 2000; unit 1 was not in compliance for twenty-three days. (*Id.* at 2-416 to 417; Defs.' Ex. DR-333.) The parties also agree that as a result of the PM emissions test failures of October 21 and 22, 1999, unit 2 was not in compliance for two days. (Remedy Tr. at 2-418 to 419; Defs.' Ex. DR-333.) At the time of these violations, the statutory maximum penalty was \$27,500.00 per day per violation. (Remedy Tr. at 2-417.)

After each emissions test failure, Cinergy promptly removed the unit from service, hired an inspector, and made the changes and/or repairs to the ESPs that the inspector recommended. (*Id.* at 5-1000 to 1004.)

Plaintiffs presented evidence at the remedy phase trial about additional PM emissions test failures at Beckjord not addressed by the Beckjord Order. Beckjord unit 1 failed another PM emissions test in October, 2003. (*Id.* at 5-1004.) In addition, Beckjord unit 2 failed a PM emissions test in April 2006. (Boots Oct. 16, 2008, Dep. at 68.)

After the unit 1, October 2003, failure, Cinergy looked to a different consultant to systematically identify the problems associated with the ESP on unit 1. (Remedy Tr. at 5-

1004 to 1007.) Cinergy hired NELS Consulting Services to do a full evaluation of the ESP on unit 1. (*Id.* at 5-1005.) NELS performed a gas flow evaluation at that time and concluded that it could significantly reduce the emission rate of the ESP through better distribution of the gas flow through the precipitator. (Pls.' Ex. 2054, at CINERGY1404615.) Specifically, NELS recommended improvements in the vertical distribution of the air flow through the precipitator. (*Id.* at 1323469.) According to NELS, a 1972 Research-Cottrell study had suggested to Cinergy that horizontal flow through the precipitator was excellent, however, vertical distribution was poor. (*Id.* at CINERGY1323472.) As a result of the poor vertical distribution of gas in the ESP, gas only hit the top portion of the precipitator. (Remedy Tr. at 5-1019 to 1020.) NELS designed a set of baffles and vanes to alleviate this problem; Cinergy installed the baffles and vanes in May 2004. (*Id.* at 5-1006 to 1007.) There have been no stack test failures at Beckjord unit 1 since installation of the baffles and vanes. (*Id.* at 5-1007.)

Beckjord unit 2 failed a PM emissions test in April 2006. (*Id.* at 5-1009.) In or about February 2007, Cinergy installed the baffle and vane system in the unit 2 ESP that it had installed in unit 1 in May 2004. (*Id.*)

The parties agree that PM continuous emissions monitors ("PM CEMS") should and could be installed on Beckjord units 1 and 2. (*Id.* at 5-1045 to 1046, 5-1086.) Such monitors have been installed on a number of coal-fired units. (*Id.* at 5-1046.) Currently, the EPA has approved the use of PM CEMS to determine compliance with PM limits for coal-fired utilities, at the source's option. (*Id.* at 5-1047.) However, PM CEMS have a high

“error band,” meaning they are more susceptible to erroneous readings than other forms of testing. (*Id.* at 5-1035, 5-1037 to 1040.)

Cinergy’s expert, Richard McRanie (“McRanie”), testified that averaging time is a key component in any emissions limit. (*Id.* at 5-1043.) “A longer averaging time enables you to squish the error out of measurement and arrive at the truth.” (*Id.*) Although the EPA recommends a 24-hour averaging time, McRanie testified that if PM CEMS were used as a compliance measurement tool at Beckjord units 1 and 2, a 30-day averaging time would be sufficient to “squash the error out.” (*Id.* at 5-1043 to 1044.)

II. DISCUSSION & LEGAL CONCLUSIONS

The Court has addressed the available remedies in this case in at least four orders. See Docket Nos. 647, 984, 1440, 1524. It is with that backdrop that the Court concludes the following.

A. REMEDIES FOR VIOLATION OF THE CAA AT WABASH RIVER

On November 1, 2005, this Court concluded that 28 U.S.C. § 2462 barred Plaintiffs’ claims for civil penalties for violations of the CAA. In so concluding, the Court declined Plaintiffs’ invitation to revisit this Court’s decision in *United States of America v. Southern Indiana Gas & Electric Co.*, No. IP 9901692-C-M/F, 2002 WL 1760752 (S.D. Ind. July 26, 2002) (“*SIGECO*”), in which it held that a violation of the CAA’s preconstruction permit regulations is complete at the time the construction project is completed. *Id.* at *8. However, in the November 1, 2005, Order the Court declined Cinergy’s invitation to apply

the statute of limitations in 28 U.S.C. § 2462 to bar Plaintiffs' claims for equitable relief because the equitable relief sought by Plaintiffs was merely compensation for the injury caused by Cinergy's violation of the CAA and was not a penalty. Docket No. 647, at 8-9. This ruling implied that injunctive relief in the form of mitigation or remediation for past harm caused by the violation would be available.

The Court clarified its view on this issue by Order dated October 14, 2008. See *United States v. Cinergy Corp.*, 582 F. Supp. 2d 1055 (S.D. Ind. 2008) (cited to herein as *Cinergy II*; referred to herein as "Scope of Remedies Order"). Relying upon *Porter v. Warner Holding Co.*, 328 U.S. 395 (1946), and its progeny, the Court concluded that the remedy provision of the CAA applicable to Cinergy's NSR violations at Wabash River did not limit the Court's equitable power to provide remedies for past violations. *Cinergy II*, 582 F. Supp. 2d, at 1060-62. Specifically, the Court stated:

[I]n this case an order requiring [Cinergy] to take actions that remedy, mitigate, and offset harms caused to the public and the environment by [its] past CAA violations would seem to give effect to the CAA's purpose "to protect and *enhance* the quality of the Nation's air resources so as to promote the public health and welfare." 42 U.S.C. § 7401 (emphasis added). See also 42 U.S.C. § 7470 (stating the purpose of the PSD program is "to protect public health and welfare from any actual or potential adverse effect . . . from air pollution"). This Court therefore concludes that its equitable authority granted by [42 U.S.C. § 7413(b)] includes the authority to order relief aimed at redressing the harms caused by [Cinergy's] established violations of the CAA. In other words, this Court's equitable authority is not limited to providing prospective relief only.

Id. at 1061-62.

In addition, the Court concluded that any ruling on the propriety of any retroactive mitigation remedy at that time was premature:

This Court has indicated that a significant delay between a violation and [Plaintiffs'] filing suit may be relevant in determining whether to grant injunctive relief or other equitable relief at all. Such a delay may also be relevant in determining the extent of such relief to be awarded. A determination on these questions awaits the presentation of evidence and factual development at trial, however.

Id. at 1066.

By Order dated January 7, 2009, the Court confirmed that traditional principles of equity would apply to the Court's consideration of the appropriate injunctive relief in this case. Docket No. 1524. The Court concluded that *Weinberger v. Romero-Barcelo*, 456 U.S. 305 (1982), compelled the Court to weigh the equities rather than conclude that the Jury's finding of a violation automatically entitled Plaintiffs to injunctive relief. Docket No. 1524, at 9. See also *Sierra Club v. Franklin County Power of Ill., LLC*, 546 F.3d 918, 935-36 (discussing the application of traditional injunctive relief analysis after *eBay Inc. v. MercExchange, L.L.C.*, 547 U.S. 388 (2006), to a citizen suit under the CAA). Therefore, to determine the appropriate relief for Cinergy's violations of the CAA at Beckjord, the Court will consider (1) whether Plaintiffs have suffered an irreparable injury; (2) whether there are inadequate remedies available at law to compensate for the injury; (3) whether, considering the balance of hardships between Plaintiffs and Cinergy, a remedy in equity is warranted; and (4) whether a permanent injunction would not disserve the public interest. *eBay*, 547 U.S. at 391.

Plaintiffs contend that a multiple-part remedy is warranted for Cinergy's violation of the NSR provisions of the CAA for the projects at Wabash River Units 2, 3, and 5. Specifically, Plaintiffs argue for (1) the immediate shutdown of Wabash River units 2, 3, and 5; and (2) mitigation of the excess emissions from Wabash River units 2, 3, and 5, by

(a) installation of BACT on Wabash River units 4 and 6 (or retirement of unit 4); and (b) over a twenty-year period, surrender of SO₂ allowances corresponding to the total SO₂ excess emissions. Plaintiffs assert that they have shown significant and irreparable harm to the environment from emissions from Wabash River units 2, 3, and 5. The irreparable harm includes significant PM_{2.5} effects that extend throughout the Midwest and into the Eastern states of New York, New Jersey and Connecticut; ground-level ozone effects in the same regions; acid rain deposition effects in the forested areas of the Midwest; and mercury effects within a 250-mile area of the Wabash River plant. Although closure of Wabash River units 2, 3, and 5, would have an immediate positive impact on the health effects from those emissions, Plaintiffs argue that the “Court should . . . craft mitigation that confers the maximum environmental benefit related to the kind and degree of the harm from the violations.” (Pls.’ Proposed Concl. of Law, at 36 (citing *United States v. Deaton*, 332 F.3d 698, 714 (4th Cir. 2003)).) Thus, Plaintiffs argue, additional future reductions in the same airshed are necessary to balance out the pollution that Cinergy never would have emitted if it had followed the law. (*Id.* at 32.) In addition, Plaintiffs suggest that the Court order Cinergy to surrender SO₂ allowances in an amount equal to the total SO₂ excess emissions, with the total allowance surrender coming prior to 2029, to ensure that reductions taken at Wabash River units 4 and 6, do not result in increased emissions elsewhere. (*Id.* at 38.) According to Plaintiffs, “This ensures the best possible nexus between the violations and the remedy.” (*Id.*)

Cinergy asserts that, if the Court concludes that Plaintiffs have established irreparable harm, it agrees with Plaintiffs that retirement of units 2, 3, and 5, is an appropriate remedy. However, Cinergy contends that the most equitable remedy is for

Cinergy to retire the units in 2012. In addition, until retirement of the units, Cinergy proposes to operate units 2, 3, and 5, at a rate approximately equivalent to the pre-project emissions levels, or the Rosen baseline levels. Cinergy argues that this solution provides the best balance of harms, keeping in mind the public interest.

Moreover, Cinergy contends that Plaintiffs' proposed remedial measures have an insufficient nexus to Cinergy's violation of the NSR provisions of the CAA. Cinergy asserts that the SO₂ allowance program is separate and apart from its obligations under the NSR provisions and one should not be used to remedy the other. (Cinergy Proposed Findings of Fact & Concl. of Law, at 65-67.) In addition, because Plaintiffs have dropped their claims against Cinergy for any violations at Wabash River units 4 and 6, Cinergy avers that Plaintiffs should not be allowed to achieve through mitigation what they chose not pursue in court. In other words, there is no nexus between the Jury's findings that Cinergy violated the NSR on projects at Wabash River units 2, 3, and 5, and pollution controls on Wabash River units 4, and 6. (*Id.* at 66-67.) Furthermore, Cinergy argues that to the extent that it should have to mitigate any "excess emissions," retirement of units 2, 3, and 5, will accomplish that task; any attempt to put controls on units 4 and 6 (with combined, yearly emissions nearly double that of units 2, 3, and 5, collectively), exceeds the scope of the violations. (*Id.* at 67.)

1. Plaintiffs Proved Irreparable Injury & Inadequate Remedies at Law

At the outset, the Court must note that it declines Cinergy's invitation to decide on the appropriate remedy in a piecemeal fashion. Throughout the remedy phase Cinergy separately analyzed the prospective remedy of shutdown of Wabash River units 2, 3, and

5, from the mitigation remedy of controls on Wabash River units 4, and 6, coupled with surrender of SO₂ allowances equivalent to the excess emissions from Wabash River units 2, 3, and 5, from the date of the projects to the present. Cinergy fails to recognize that the appropriateness of each of these remedies depend upon Plaintiffs' showing of an irreparable injury and an inadequate remedy at law, as well as the balance of harms, including the public interest, weighing in Plaintiffs' favor. The proof is the same; the question is whether the equities warrant all of the relief Plaintiffs request if they proved the first two elements.

That being said, the Court concludes that the evidence of environmental harm from non-permitted SO₂ emissions and, to a lesser extent, NO_x emissions, from Wabash River units 2, 3, and 5, from the date of the project through 2007, compels a finding of irreparable injury for which there is no adequate remedy at law. There is no dispute that the Jury in this matter concluded that Cinergy violated the NSR provisions of the CAA when it unreasonably failed to expect a net increase of 40 tons or more of either SO₂ and/or NO_x emissions as a proximate result of the refurbishment projects at Wabash River units 2, 3, and 5.

The Court was persuaded by Plaintiffs' expert, Dr. Fox, that at the time of the Wabash River projects, LAER for SO₂ control was an FGD with a 95% removal efficiency. (Remedy Tr. at 2-307.) Cinergy presented little and unpersuasive evidence to contradict Dr. Fox that an FGD with a 95% removal efficiency was running at a coal-fired generating unit in the United States at the time of the projects with reportedly good, if not great, success. (*Id.* at 2-318 to 319.) In addition, there was published literature on the subject and the manufacturer of the unit that was already running had applied for a patent for an

FGD with a 99% removal efficiency. (*Id.* at 2-319 to 320.) As such, the Court can only conclude that LAER for SO₂ removal at the time of the projects was, at a minimum, an FGD with a removal efficiency of 95%.

Rarick's assertion that Cinergy would have applied for a synthetic minor permit cap for SO₂ emissions instead of installing LAER at the time of the Wabash River projects is not credible. Not only had another coal-fired plant installed an FGD at the time of the projects, there is no evidence that Cinergy had ever or has ever obtained a synthetic minor permit for any coal-fired unit. (Pearl Oct. 30, 2008, Rule 30(b)(6) Dep. at 60.) Cinergy admitted that such permits were much more common for combustion turbine units that operate only during periods of peak energy demand. (*Id.* at 60-61.) As Pearl testified, coal-fired units, such as Wabash River units 2, 3, and 5, are "base-load units" that Cinergy would "want . . . available to operate at all times, so [it is] much more hesitant to restrict their operation," as would be required by a synthetic minor permit. (*Id.* at 61.) Pearl's testimony is consistent with Cinergy's reasons for undertaking the Wabash River projects in the first place—life extension of the base-load units. For these reasons, the Court concludes that it is unlikely that Cinergy would have sought a synthetic minor permit cap for SO₂ emissions at Wabash River units 2, 3, and 5, at the time of the projects.

The Court has concluded that LAER for SO₂ at the time of the Wabash River units 2, 3, and 5, projects was an FGD with an SO₂ removal efficiency of 95%. The Court also concludes that Dr. Fox's method for calculating the excess emissions for SO₂ as a result of the projects most accurately reflects the intent of the NSR to measure emissions permit compliance on an annual basis. Therefore, the Court concludes that the excess SO₂

emissions caused by the projects at Wabash River units 2, 3, and 5, total 359,000 tons, in the time period from the date of the projects through 2007.

However, the Court was persuaded by Cinergy's experts, Rarick and DePriest, that BACT for NO_x was a low-NO_x burner, not an SCR. At the time of the projects, the uncontested fact is that no SCR had been installed on a coal-fired generating unit in the United States. (Remedy Tr. at 2-325 to 326, 4-889.) Moreover, there was evidence that SCRs on coal-fired units in Europe and Japan had run into problems when using high-sulfur coals, coal more similar to that available in the United States. (*Id.* at 2-403, 4-559 to 569.)

In addition, the EPA rule-making comments in June 1991 indicate that even at that time SCR was not used in the United States. (*Id.* at 4-887 to 888, 4-890.) In that publication, the EPA recommended low-NO_x burners as BACT for NO_x emissions control. (*Id.*) Although never promulgated into a rule, the EPA's comments are strong evidence that BACT in 1989 and 1990 for NO_x emissions was low-NO_x burners, not SCR.

Cinergy installed low-NO_x burners that would meet an emissions limitation of 0.6 pounds per million BTU on unit 5 at the time of that project. (*Id.* at 4-889.) Cinergy installed a similar low-NO_x burner on unit 3 a few years after the modification to that unit that is at issue in this case. (*Id.* at 4-889.) Even with these installations, Cinergy's excess emissions of NO_x totaled 4,865 tons, through 2009. (*Id.* at 5-946 to 947.)

Like Plaintiffs' expert, Dr. Fox, Cinergy's expert, Rarick, opined that at the time of the projects, installation of BACT for NO_x emissions would have been the most reasonable presumption for how Cinergy would have applied for a permit at the time of the projects on

Wabash River units 3 and 5. (*Id.* at 5-947 to 948.) The Court has no reason to doubt this conclusion and hereby adopts it.

Given the Court's conclusion that Cinergy's failure to apply for permits and install LAER for SO₂ emissions control, and BACT for NO_x emissions control at the time of the Wabash River units 2, 3, and 5, projects, resulted in 359,000 tons of excess SO₂ emissions⁴ and 4,865 tons of excess NO_x emissions,⁵ the Court now turns to Plaintiffs' proof of irreparable harm caused by these excess emissions.

The Court is persuaded by Plaintiffs' experts, Dr. Schwartz and Chinkin, that secondary PM_{2.5} formed in the air from emissions of SO₂ and, to a lesser extent, NO_x, from the Wabash River plant has a significant impact on human health in Indiana, Illinois, Wisconsin, Michigan, Ohio, and Kentucky. (*Id.* at 1-141 to 149, 1-138, 1-171 to 173.)

This is evidenced by the relatively high concentrations of secondary PM_{2.5} in those areas as predicted by Chinkin's CMAQ and CAMx models. (*Id.*) Although those predicted levels do not by themselves approach the NAAQS, they are significant because the NAAQS is a regional standard that measures the PM_{2.5} total from all sources within the region. (*Id.* at 1-118, 1-194 to 197, 3-634 to 637.) The Court found credible Chinkin's statement that the annual excess emissions from Wabash River units 2, 3, and 5, alone would rank among the top 5% of sources of SO₂ pollution in the Eastern United States and would have a substantial and meaningful impact on the PM_{2.5} concentration in

⁴These excess emissions were calculated by Plaintiffs' expert, Dr. Fox, from the date of the projects through 2007. (Remedy Tr. at 2-230 to 231.)

⁵These excess emissions were testified to by Cinergy's expert, Rarick, from the date of the projects through 2009. (*Id.* at 5-946 to 947.)

nonattainment areas. (Remedy Tr. at 1-212, 1-118, 1-194 to 197.) Hayes, one of Cinergy's experts, testified that the annual excess emissions of SO₂ is equivalent to the SO₂ emissions from all other sources of the gas in the State of Indiana. (*Id.* at 3-641.) And, the Wabash River annual excess SO₂ emissions is approximately two times that of the total annual SO₂ emissions from all point sources in all six counties of the Dayton Regional Air Pollution Control Agency, which is in a nonattainment area within the relevant geography of the Wabash River plant. (*Id.* at 2-242 & 2-321.) Reductions in secondary PM_{2.5} of the magnitude of that contributed by the annual excess emissions from Wabash River Units 2, 3, and 5, could effect the nonattainment status of several communities including Dayton, Ohio. (*Id.* at 2-225.) These opinions and figures, that the Court adopts, evidence that Cinergy's un-permitted emissions are quantitatively significant. The measurable secondary PM_{2.5} from emissions at the Wabash River plant extend as far as New York, New Jersey and Connecticut. (*Id.* at 1-141, 1-143 to 147.) Although the effects in these states are less severe than the effects closer to the Wabash River plant, any reduction in PM_{2.5} formation could impact a region's attainment status. (*Id.* at 2-259.)

The relevant public health advisory groups agree that PM_{2.5} causes decreased lung function, increased prevalence of respiratory symptoms, worsened respiratory infections, heart attacks, and early death. (*Id.* at 1-49 to 54.) These same groups conclude that there is clear and convincing scientific evidence that significant adverse human-health effects occur in response to exposures to PM_{2.5} at and below the 15 µg/m³ of the current annual PM_{2.5} NAAQS. (*Id.* at 1-50 to 54; Pls.' Ex. 1911.) Because the relationship between the does-response curve for PM_{2.5} and mortality is linear, any reduction in PM_{2.5}

concentration would have a corresponding reduction in mortality rate. (Remedy Tr. at 1-50 to 54, 1-85 to 87. See also *id.* at 4-873 to 877.)

The Court was not persuaded by Cinergy's expert that the HAPS report and TERA report indicate that SO₂ and NO_x emissions have no adverse health effects for the reasons stated in the Factual Background section of this Order. Cinergy also argues that Plaintiffs' data is not particularized enough to warrant a finding that excess emissions from Wabash River had significant detrimental environmental effects because the PM_{2.5} CMAQ and CMAx model numbers are small compared to the NAAQS. But, as stated earlier, the NAAQS is not the standard against which a single source is measured. Rather, the NAAQS is a regional limit for PM_{2.5} from all sources within that region. (*Id.* at 1-197, 3-634 to 637.) The uncontroverted evidence is that the annual SO₂ excess emissions from Wabash River units 2, 3, and 5, not only exceed the 40-ton threshold in the NSR provisions of the CAA, those excess emissions alone could be ranked in the top 5% of all contributors to the NAAQS in the Eastern United States. (*Id.* at 1-212.) By any measure, the negative effects from such pollution is significant.

The Court also rejects Cinergy's argument that there can be no excess SO₂ emissions because it always stayed within its limits under the SO₂ cap and trade program. Cinergy's obligations under the cap and trade program are separate from its responsibilities under the NSR program. The purpose of the NSR is to ensure that older facilities that undergo certain major modifications are brought within tighter emissions standards. 42 U.S.C. § 7470. Cinergy is required to meet this obligation whether or not it can continue to meet its obligations under the cap and trade program. The responsibility under NSR is not fungible like Cinergy's allowances under the cap and trade program. In

other words, Cinergy cannot escape responsibility for operating Wabash River units 2, 3, and 5, without a proper permit as required by the NSR provisions of the CAA because another provision of the CAA allows it to look at its total emissions under a regional cap. For this Court to so hold would render the NSR provisions superfluous.

Although the Court did not agree with Plaintiffs assertion that Cinergy's excess NO_x emissions were in the tens of thousands, Cinergy still emitted excess NO_x. Therefore, the Court concludes that such excess NO_x emissions would cause a negative effect with respect to ground level ozone, but not the effects testified to by Chinkin as predicted by the CMAQ and CAMx models.

With respect to Plaintiffs' proof of acidic deposition impacts and mercury impacts, the Court concludes that Plaintiffs did not provide sufficient nexus between the relevant excess emissions and the negative environmental and health effects to support a conclusion of irreparable harm.

In summary, the Court concludes that Plaintiffs have proven that the excess SO₂ and NO_x emissions from Wabash River units 2, 3, and 5, had significant health and environmental effects in the form of PM_{2.5} in the states of Indiana, Illinois, Wisconsin, Michigan, Ohio, and Kentucky. Such health and environmental effects are irreparable and there is no adequate remedy at law.

2. Equity Demands Shutdown of Wabash River Units 2, 3, and 5, No Later Than September 30, 2009 & Surrender of Certain Allowances

The Court concludes that the balance of harms weighs heavily in favor of a relatively immediate shutdown of Cinergy's Wabash River units 2, 3, and 5. When it enacted the

NSR provisions of the CAA, Congress struck a balance in favor of pollution controls on units for which a major modification was expected to result in an increase in net emissions of 40 tons or more of either SO₂ or NO_x. 42 U.S.C. §§ 7475(a), 7479(3), 7502(c)(5), 7503, 7411(a)(4), 7477. Cinergy was aware of this legislation before it undertook the Wabash River units 2, 3, and 5, projects. See *United States v. Cinergy Corp.*, 495 F. Supp. 2d 892, 908-09 (S.D. Ind. 2007). There is no doubt that Cinergy has benefitted from its decision to proceed with its life extension projects without installing pollution controls on Wabash River units 2, 3, and 5: it obtained an additional approximately twenty years of service from these “base-load” coal-fired units. (Pls.’ Ex. 1955, at PSI 0083177, PSI 0083172; Pls.’ Ex. 1319, at CINWA002121-22; Remedy Tr. at 2-271 to 272, 2-300 to 3-02, 2-306, 2-315 to 317.)

Moreover, despite a finding of liability for the Wabash River units 2, 3, and 5, projects by the Jury on May 22, 2008, Cinergy took no action to determine the consequences that a decision to close those units would have on the Terre Haute load pocket, or on the broader region. The evidence is clear that Cinergy had already determined by that time that installation of pollution control technology on those units was not economical. Earlier in May 2008, Turner submitted testimony to the IURC that Cinergy would consider closure of the older units, like Wabash River units 2, 3, and 5, as tighter clean air restrictions were implemented. (Pls.’ Ex. 1971, at CINERGY 1407877-78; Remedy Tr. at 4-720 to 722.) Likewise, at trial, Turner testified that Cinergy has ruled out controlling those units. (Remedy Tr. at 4-679 to 680, 4-730.) Yet, after a finding of liability under the NSR with respect to the Wabash River units and knowing that the alternative was to apply for the necessary permits or shut down the units, Cinergy did nothing. It did

not curtail its emissions from Wabash River units 2, 3, and 5; it did not request an Attachment Y study from MISO to have answers for the Court at the remedy phase trial about the consequences of a decision to immediately shut down those units.

By its actions, Cinergy has indicated to the Court a failure to respect the balance struck by Congress in the NSR and less than due regard for the dispute resolution process presided over by this Court. Cinergy's apparent inability to appreciate the relevance of the regulatory scheme and the Jury's verdict was made plain by Turner's testimony. Turner testified that shortly after the Jury rendered its verdict in May 2008, he learned that the remedy Plaintiffs sought was either installation of pollution controls or immediate shutdown of Wabash River units 2, 3, and 5. (Turner, Nov. 11, 2008, Dep. at 195; Remedy Tr. at 4-739.) But, the following dialog took place during Turner's deposition on November 11, 2008, in preparation for the remedy phase trial:

Q. Okay. In your mind is the shutdown of Units 2, 3 and 5 before 2012 a possibility as a result of this litigation?

* * *

A. – that I think are [sic] not acceptable.

Q. Okay. . . . And what steps, in your view, has Duke taken to address the possibility that Units 2, 3 and 5 could be shut down before 2012 as a result of a court order?

A. At this point we are, I guess for lack of a better way to say it, we're not planning for that to happen. If the Court tells us otherwise, we'll have to change our plans.

Q. Okay. An how, in your view, does that show that Duke has acted prudently with regard to reliability if it has not done any planning yet for the possibility of Units 2, 3 and 5 being shut down before 2012?

[A.] Well, I think we're being prudent in every way that we're looking at the remedy phase of this case and that the remedy we have proposed is

the most prudent. I'm hoping we are not ordered to do something that I think would be less prudent than – than the remedy or the – the – the offer that we've made in this case, but if we're ordered to do something other than the prudent remedy that we've carved out here or we've proposed, we will quickly assess plans and – and shift gears.

* * *

Q. Okay. I mean, why haven't you assessed the – the reliability impacts of shutting down before 2012?

* * *

[A.] I – I think we have a sense of the reliability impacts of shutting down before 2012. I don't know that we've done – I don't know what kind of detailed studies you're looking for, but I think we have an understanding of it as I believe the MISO witness testified as well, and in addition to that we believe, you know, it makes sense to wait until Edwardsport comes on line.

(Turner, Nov. 11, 2008, Dep. at 249-50.) Similarly, at the remedy phase trial Turner testified that at the time Cinergy's answers to interrogatories were filed on October 8, 2008, Cinergy did not contact MISO to request any kind of reliability study connected to the closure of Wabash River units 2, 3, and 5. (Remedy Tr. at 4-729.) Specifically, Turner testified:

A . . . We would not have asked MISO in 2008 to conduct that study for a 2012 shutdown.

Q Because you decided 2012 was the right date for the shutdown, right?

A I decided it was the most appropriate remedy.

(*Id.* at 4-729.)

Cinergy's move in December 2008 to curtail its emissions from Wabash River units 2, 3, and 5, in 2009 comes too late to mitigate the consequences of the Jury's and the Court's conclusion that Cinergy has failed to appreciate the significance of its decision to

ignore the balance struck by Congress in the NSR provisions of the CAA. Cinergy has emitted several hundred thousand tons of excess emissions since the date of the projects and, even faced with a Jury verdict against it, Cinergy did nothing to account for its actions except propose a plan in its own best interests and one that comports closely to its own business plan. All of these factors weigh in favor of immediate shut down of Wabash River 2, 3, and 5.

The Court is mindful, however, that the MISO report raises some legitimate reliability concerns if Wabash River units 2, 3, and 5, are immediately shut down. However, the evidence supports a conclusion that Cinergy has been aware of the need to upgrade the Dresser substation by installing a third transformer because it had planned to supply power through that station from its new Edwardsport, Indiana, plant. (Remedy Tr. at 4-662, 4-674, 4-686, 4-690 to 692.) Moreover, the MISO report indicates that MISO's reliability concerns are greatest for the summer months when temperatures are likely to exceed 90 degrees Fahrenheit. (Defs.' Ex. DR 321, at CINERGY 1665224, CINERGY 1665229; Remedy Tr. at 5-967.) The Court must take these concerns seriously because reliability of electricity in the Terre Haute load pocket could impact the public. Taking this into account in the balance, allowing Cinergy to run Wabash River units 2, 3, and 5, at the Rosen baseline levels, which is where Turner currently ordered them to be run, through the summer months of 2009, but no longer, would allow Cinergy and MISO time to perform a full-blown Attachment Y study; and would allow Cinergy to make alternative plans to make upgrades to the Dresser substation.

In addition, the Court concludes that surrender of SO₂ emission allowances approximately equal to amount of SO₂ excess emissions from Wabash River units 2, 3,

and 5, in the period from May 22, 2008, to September 30, 2009, as an additional remediation measure is appropriate. The Court considers three factors when it evaluates remediation measures: (1) whether the measure “would confer maximum environmental benefits;” (2) whether the measure is “achievable as a practical matter;” and (3) whether the measure bears “an equitable relationship to the degree and kind of wrong it is intended to remedy.” *United States v. Deaton*, 332 F.3d 698, 714 (4th Cir. 2003) (quoting *United States v. Cumberland Farms of Conn., Inc.*, 826 F.2d 1151, 1164 (1st Cir. 1987)).

Under Plaintiffs’ remedy proposal, the surrender of SO₂ emission allowances was tied to their mitigation proposal that the Court require Cinergy to install BACT on units 4 and 6, to further reduce the emissions in the Wabash River region and to ensure that Cinergy does not benefit from installation of pollution control technology on those units. The Court agrees with Cinergy that Plaintiffs’ mitigation proposal does not bear an equitable relationship to the degree and kind of harm it is intended to remedy. There is no dispute that Wabash River units 4 and 6 have combined emissions that are twice that of units 2, 3, and 5, combined. (Remedy Tr. at 1-177 to 178, 3-632.) For the Court to order Cinergy to install pollution control technology on those units would far exceed any mitigation remedy justified by Plaintiffs’ evidence of irreparable harm. Plaintiffs have not proven that Cinergy violated any CAA provisions with respect to units 4 and 6. Therefore, it is the Court’s view that imposition of such a remedy is punitive in nature and the Court has already determined that such remedy is not available to Plaintiffs for Cinergy’s violations of the NSR for the projects at Wabash River units 2, 3, and 5. Thus, any surrender of SO₂ allowances that is tied to installation of pollution controls on units 4 and 6 is also a penalty without sufficient nexus to the violation to be considered mitigation.

On the other hand, by closing Wabash River units 2, 3, and 5, in the relatively near future, Plaintiffs and the public will enjoy a significant reduction in SO₂ and NO_x emissions in the region. The Court's remedy will require Cinergy to retire units 2, 3, and 5, at least three years sooner than it would have otherwise, and likely more years earlier given Turner's testimony that absent this law suit, Cinergy did not plan to shut down those units. (Remedy Tr. at 4-675.) This is a significant step toward remediation by itself. However, surrender of SO₂ allowances tied to excess emissions from Wabash River units 2, 3, and 5, for the time period after the Jury determined liability and until September 30, 2009, the date upon which the Court has ordered herein for shutdown to occur, would further confer an environmental benefit to the region, and bears an equitable relationship to the degree of harm it is designed to remedy. Permanent surrender of SO₂ allowances confers an environmental benefit to the region that has been harmed by the over 350,000 tons of excess SO₂ emissions from Wabash River units 2, 3, and 5, over the past twenty years. Such a surrender would mitigate, in part, the excess emissions from Wabash River 2, 3, and 5, in the year 2008, and mitigate the excess emissions from those units in some fraction of the previous years. Moreover, despite Cinergy's protestations otherwise, surrender of allowances has been used in other cases as part of consent decrees in suits by the EPA against power plant owners. See, e.g., *United States v. Am. Elec. Power Serv. Corp.*, Consent Decree, at ¶¶ 70-84, 91-99 (available at epa.gov/compliance/resources/decrees/civil/caa/americanelectricpower-cd.pdf). Because such a surrender is tied to the facility and units for which Plaintiffs have proven Cinergy liable, there is, as coined by Plaintiffs, an "elegant nexus" between the surrender of this

specific number of allowances and the harm caused by Cinergy's SO₂ excess emissions from Wabash River units 2, 3, and 5.

The fact that Plaintiffs waited until 1999 to file this law suit does not change the Court's conclusion that shut down of Wabash River units 2, 3, and 5, should come as soon as possible rather than on Cinergy's time table or that surrender of some SO₂ allowances is equitable. The Court recognizes that Plaintiffs claims were filed approximately ten years after the projects at issue. However, this fact cannot render insignificant Cinergy's decision to perform life-extension projects at its older units without making any kind of prediction of the potential for increased emissions from those units as required by the NSR provisions of the CAA. Cinergy has benefitted from nearly twenty years of additional service from Wabash River units 2, 3, and 5; Plaintiffs' delay in filing suit does not outweigh the seriousness of Cinergy's NSR violations.

Finally, although the Court considered the public interest when it decided the appropriate time table for the shutdown of Wabash River units 2, 3, and 5, the Court will briefly address Cinergy's argument that the cost of Plaintiffs' proposed remedy will affect its ratepayers. The Court recognizes that any remedy that does not coincide with Cinergy's business plan will adversely affect Cinergy's bottom line. In addition, it is possible that for certain types of remedies, Cinergy may be allowed to petition the Indiana Utility Regulatory Commission for rate changes to pay for those remedies. In these difficult economic times, the Court cannot ignore those possibilities. However, the Court also cannot ignore the Jury's verdict that Cinergy violated the NSR when it did not seek a permit or take action to install LAER for SO₂ emissions controls and BACT for NO_x emissions controls at the time of the Wabash River units 2, 3, and 5, projects. Plaintiffs have proven irreparable harm

to human health and the environment as a result of Cinergy's violations. The Court's remedy attempts to balance the need to redress the harm caused by Cinergy's violation with both Cinergy and its ratepayer's needs to control costs and is significantly less onerous than the remedy proposed by Plaintiffs.

In summary, for its violation of the NSR provisions of the CAA for its four projects at Wabash River units 2, 3, and 5, as found by the Jury in this matter on May 22, 2008, the Court concludes that the equities weigh in favor of an injunction. The following injunctive relief is appropriate:

1. Cinergy shall shut down Wabash River units 2, 3, and 5, no later than September 30, 2009;
2. Cinergy shall run Wabash River units 2, 3, and 5, at a rate that does not exceed the Rosen baseline emissions until the time it shuts down those units; unless Cinergy can show the Court good cause for running those units above said baseline; and
3. Cinergy shall surrender, permanently, SO₂ emission allowances in an amount approximately equal to the amount of SO₂ emissions from Wabash River units 2, 3, and 5, from the period beginning on May 22, 2008, through shut down of those units on September 30, 2009.

B. REMEDIES FOR PM VIOLATIONS AT BECKJORD

Plaintiffs contend that the appropriate remedy for Cinergy's four violations at Beckjord units 1 and 2 is for Cinergy to install a PM CEMS as a compliance measurement tool, with a 30-day averaging time. Plaintiffs argue that this remedy comports with the EPA's standard to use any credible evidence to determine whether a source is in violation of permitted limits. See 40 C.F.R. § 52.12(c). In addition, Plaintiffs assert that the appropriate penalty for the Beckjord PM violations is the statutory maximum penalty of

\$1.32 million. Plaintiffs calculated this amount by adding (a) the product of the statutory maximum penalty of \$27,500.00 per day times twenty-three days, the number of days that Cinergy Corp. violated the AOC; to (b) the product of the statutory maximum penalty of \$27,500.00 per day times twenty-five, the number of days that Cincinnati Gas & Electric violated the Ohio SIP. (Pls.' Proposed Concl. of Law, at 49.) Plaintiffs argue that such a penalty comports with the purposes of the penalty provisions of the CAA, which include retribution, deterrence, and restitution. See *Tull v. United States*, 481 U.S. 412, 422 (1987). Plaintiffs contend that none of the evidence adduced at trial warrants a reduction from the maximum penalty.

Cinergy asserts that the maximum penalty is not warranted because of its good faith efforts to comply with its permit obligations. Specifically, Cinergy argues that as soon as it became aware of each violation it shut down the unit, hired inspectors, and implemented the repairs and/or changes recommended by the outside inspector. In addition, Cinergy spent considerable time and money assessing the appropriate modifications to the ESPs and implemented those changes. Since making those changes, Cinergy argues, there have been no PM violations at Beckjord. In addition, Cinergy avers that by addressing the problems quickly, the seriousness of the violations was minimized. In total, Cinergy contends that the factors weigh against application of the maximum penalty. Furthermore, Cinergy argues that Plaintiffs seek a double penalty for identical violations of the Ohio SIP and the AOC at Beckjord unit 1. The parties have now stipulated that the various Cinergy entities are jointly responsible for any penalty assessed for violations at Beckjord; therefore, Cinergy asserts that there is no reasonable justification for a double penalty.

According to the Seventh Circuit, when considering fines under the CAA, the Court should “generally presume that the maximum penalty should be imposed.” *United States v. B&W Inv. Props.*, 38 F.3d 362, 368 (7th Cir. 1994). However, the Court

shall take into consideration (in addition to such other factors as justice may require) the size of the business, the economic impact of the penalty on the business, the violator’s full compliance history and good faith efforts to comply, the duration of the violation as established by any credible evidence (including evidence other than the applicable test method), payment by the violator of penalties previously assessed for the same violation, the economic benefit of noncompliance, and the seriousness of the violation.

42 U.S.C. § 7413(e)(1). The Court has considerable discretion to determine the proper weight for each factor. *B&W Inv. Props.*, 38 F.3d at 368. Furthermore, a penalty may be assessed for each day of violation. 42 U.S.C. § 7413(e)(2).

The Court concludes that the statutory maximum penalty should apply to Cinergy’s violation of the Ohio SIP, but additional recovery under the AOC would not serve the interests of justice in this case. Despite Cinergy’s avowal that it made good faith efforts to ensure that its ESPs on Beckjord units 1 and 2 worked properly, and to make necessary upgrades of the equipment to improve air flow through the unit to improve results, it took Cinergy four years to implement the key change in vertical airflow to the ESP on unit 1. Although the 1972 study that suggested that vertical airflow was a problem is not conclusive, a history of successive failures in 1999 and 2000 at unit 1 should have prompted Cinergy to delve deeper into the problems with the ESPs. Moreover, after discovering the vertical airflow problem on the unit 1 ESP in late 2003, Cinergy waited until unit 2 failed another test in April 2006 to consider making the necessary vertical airflow adjustments to the ESP on unit 2. In fact, Cinergy waited until February 2007 to implement such improvements on the unit 2 ESP.

Although Cinergy contends that its prompt actions once it learned of a violation reduces the seriousness of the violation, such a view fails to consider that Method 5 is not a continuous monitoring measurement. Rather, it is a spot-check of the average of three hours worth of emissions. Such a method does not account for the potential that Cinergy violated the Ohio SIP at other times during which no test was performed.

The Court notes that Cinergy's violations at unit 2 in 1999 could have been caused by its test burn of an alternative fuel. There is no evidence, however, that Cinergy alerted any regulatory authority about its test burn or negotiated any kind of permit variance during the test burn that would have mitigated the seriousness of a two-day violation.

The Court is not convinced, however, that penalizing the individual defendants under each of the agreements is just given the parties' stipulation that all of the Cinergy defendant entities are jointly liable for the PM violations at Beckjord units 1 and 2. As Plaintiffs point out, the purposes of the CAA penalty provisions include retribution, deterrence, and restitution. See *Tull*, 481 U.S. at 422. Requiring the Cinergy entities to pay the maximum daily penalty for all violations under the Ohio SIP serves all of these purposes.

Turning now to the appropriate injunctive relief, the parties largely agree that the Court should require Cinergy to install PM CEMS on Beckjord units 1 and 2 for continuous emissions monitoring. The Court agrees that the evidence presented at the remedy phase trial supports a conclusion that continuous emissions monitoring is an appropriate remedy for Cinergy's violations of the Ohio SIP and the AOC. There is little doubt that the harm caused by violation of emissions limits is irreparable, and the Court so concludes. In addition, monetary penalties cannot deter completely the harm caused by Cinergy's

multiple violations of emissions limits. As a result, continuous emissions monitoring like that provided by PM CEMS is a logical remedy to ensure that Cinergy complies with the Ohio SIP. The Court notes, however, that using a PM CEMS as a compliance measurement tool on a daily basis is inappropriate given the evidence that the device has a high error band. The Court found this evidence credible. Pursuant to these findings, the Court concludes that the use of the PM CEMS on Beckjord units 1 and 2 for compliance purposes is appropriate only if the averaging time is thirty days. (Remedy Tr. at 5-1043 to 1044.)

In summary, the Court concludes that Cinergy must pay the maximum statutory penalty of \$27,500.00 per day, for twenty-five days of violation of the Ohio SIP; the interests of justice make an additional penalty under the AOC excessive. In addition, Cinergy shall be required to install a PM CEMS for continuous PM emissions monitoring on Beckjord units 1 and 2. The PM CEMS devices shall be used for compliance purposes only if a thirty-day averaging time is used.

III. CONCLUSION & ORDER

For the reasons stated herein, the Court **ORDERS** the following:

As the remedy for defendants', Cinergy Corp., PSI Energy, Inc., and the Cincinnati Gas & Electric Company, violation of the New Source Review provisions of the Clean Air Act as found by the Jury on May 22, 2008, for the following projects: (1) the front wall radiant superheater replacement project at Wabash River, Indiana, unit 2 from June 1989 to July 1989; (2) the high temperature finishing superheater tubes and upper reheater

tubing assemblies replacement project at Wabash River, Indiana, unit 2 from May 1992 to September 1992; (3) the finishing, intermediate, and radiant superheater tubes and upper reheat tube bundles replacement project at Wabash River, Indiana, unit 3 from June 1989 to October 1989; and (4) the boiler pass and heat recovery actions replacement project at Wabash River, Indiana, unit 5 from February 1990 to May 1990; defendants, Cinergy Corp., PSI Energy, Inc., and the Cincinnati Gas & Electric Company, **SHALL:**

1. Shut down Wabash River units 2, 3, and 5, no later than September 30, 2009;
2. Run Wabash River units 2, 3, and 5, at a rate that does not exceed the Rosen baseline emissions until the time said units are shut down; unless defendants can show the Court good cause for running those units above said baseline; and
3. Surrender, permanently, SO₂ emission allowances in an amount approximately equal to the amount of SO₂ emissions from Wabash River units 2, 3, and 5, from the period beginning on May 22, 2008, through shut down of those units on September 30, 2009.

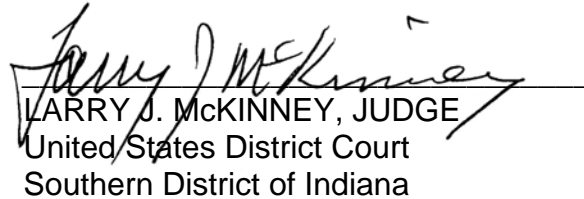
As the remedy for defendants', Cinergy Corp., PSI Energy, Inc., and the Cincinnati Gas & Electric Company, violation of the Ohio State Implementation Plan particulate matter emissions limits at Beckjord units 1 and 2 on October 12, 1999; October 21-22, 1999; May 4, 2000; and May 26, 2000; as concluded by the Court by Order dated September 28, 2007, defendants, Cinergy Corp., PSI Energy, Inc., and the Cincinnati Gas & Electric Company, **SHALL:**

1. Pay to plaintiffs, the United States of America, and plaintiff-intervenors, the States of New York, New Jersey and Connecticut, and the Hoosier Environmental Council and the Ohio Environmental Council, a penalty in the total amount of \$687,500.00;

2. Install a particulate matter continuous emissions monitor on Beckjord units 1 and 2 as soon as practical. Said particulate matter continuous emissions monitors shall be used for compliance purposes only if a thirty-day averaging time is used.

There being no just reason for delay, the Court shall enter partial final judgment on plaintiff's, the United States of America, and plaintiff-intervenors', the States of New York, New Jersey and Connecticut, and the Hoosier Environmental Council and the Ohio Environmental Council, claims that defendants, Cinergy Corp., PSI Energy, Inc., and the Cincinnati Gas & Electric Company, violated the New Source Review provisions of the Clean Air Act with respect to the projects on Wabash River unit 2, 3, and 5, as finally resolved herein.

IT IS SO ORDERED this 29th day of May, 2009.


LARRY J. MCKINNEY, JUDGE
United States District Court
Southern District of Indiana

Distribution attached.

Distributed to:

Scott R. Alexander
TAFT STETTINIUS & HOLLISTER LLP
salexander@taftlaw.com

Kevin P. Auerbacher
STATE OF NEW JERSEY
DEPT. OF LAW & PUBLIC SAFETY
auerbkev@law.dol.lps.state.nj.us

Thomas Andrew Benson
U.S. DEPARTMENT OF JUSTICE,
ENVIRONMENTAL ENFORCEMENT
thomas.benson@usdoj.gov

Meghan Delaney Berroya
SIDLEY AUSTIN LLP
mberroya@sidley.com

Samuel B. Boxerman
SIDLEY AUSTIN LLP
sboxerman@sidley.com

Phillip Brooks
U.S. DEPARTMENT OF JUSTICE
phillip.brooks@usdoj.gov

Jayna Morse Cacioppo
TAFT STETTINIUS & HOLLISTER LLP
jcacioppo@taftlaw.com

Robert R. Clark
TAFT STETTINIUS & HOLLISTER LLP
rclark@taftlaw.com

Larry Martin Corcoran
U.S. DEPARTMENT OF JUSTICE,
ENVIRONMENTAL & NATURAL RESOURCES DIV.
larry.corcoran@usdoj.gov

Michael E. DiRienzo
KAHN DEES DONOVAN & KAHN
mdirienzo@kddk.com

Jason A. Dunn
U.S. DEPARTMENT OF JUSTICE
jason.dunn@usdoj.gov

Steven David Ellis
U.S. DEPARTMENT OF JUSTICE,
ENVIRONMENT & NATURAL RESOURCES
steven.ellis@usdoj.gov

Julie L. Ezell
DUKE ENERGY LEGAL DEPARTMENT
julie.ezell@duke-energy.com

Cynthia Marie Ferguson
U.S. DEPARTMENT OF JUSTICE,
ENVIRONMENT & NATURAL RESOURCES
cynthia.ferguson@usdoj.gov

Myles E. Flint II
U.S. DEPARTMENT OF JUSTICE
myles.flint@usdoj.gov

Richard Mark Gladstein
U.S. DEPARTMENT OF JUSTICE
richard.gladstein@usdoj.gov

Thomas Charles Green
SIDLEY AUSTIN LLP
tcgreen@sidley.com

R. Keith Guthrie
ATTORNEY AT LAW
kgmail@comcast.net

Sarah Dale Himmelhoch
U.S. DEPARTMENT OF JUSTICE
sarah.himmelhoch@usdoj.gov

Eugene J. Kelly Jr.
NEW YORK STATE ATTORNEY GENERAL
eugene.kelly@oag.state.ny.us

Thomas E. Kieper
UNITED STATES ATTORNEY'S OFFICE
tom.kieper@usdoj.gov

Jung W. Kim
NEW JERSEY OFFICE
OF THE ATTORNEY GENERAL
jung.kim@dol.lps.state.nj.us

James A. King
PORTER WRIGHT MORRIS & ARTHUR LLP
jking@porterwright.com

Joseph M. Kowalczyk
NEW YORK STATE OFFICE
OF THE ATTORNEY GENERAL
joseph.kowalczyk@oag.state.ny.us

Jonathan F. Lewis
CLEAN AIR TASK FORCE
jlewis@catf.us

James A. Lofton
U.S. DEPARTMENT OF JUSTICE
jim.lofton@usdoj.gov

Jennifer Anne Lukas-Jackson
U.S. DEPARTMENT OF JUSTICE
jennifer.lukas-jackson@usdoj.gov

Jon C. Martin
STATE OF NEW JERSEY
jon.martin@dol.lps.state.nj.us

Kimberly P. Massicotte
OFFICE OF THE ATTORNEY GENERAL
kimberly.massicotte@po.state.ct.us

Dean M. Moesser
DUKE ENERGY CORPORATION
dmmoesser@duke-energy.com

Carmel Alicia Motherway
CONNECTICUT ATTORNEY GENERAL
carmel.motherway@po.state.ct.us

Michael Joseph Myers
NEW YORK STATE DEPARTMENT OF LAW
michael.myers@oag.state.ny.us

John D. Papageorge
TAFT STETTINIUS & HOLLISTER LLP
jpapageorge@taftlaw.com

Crissy Lyn Pellegrin
ENVIRONMENTAL PROTECTION AGENCY
pellegrin.crissy@epa.gov

Loren A. Remsberg
U.S. DEPARTMENT OF JUSTICE/ ENRD/EES
loren.remsberg@usdoj.gov

Robert T. Rosenthal
NEW YORK ATTORNEY GENERAL'S OFFICE
robert.rosenthal@oag.state.ny.us

Jeffrey K. Sands
U.S. DEPARTMENT OF JUSTICE
jeffrey.sands@usdoj.gov

Justin Aaron Savage
U.S. DEPARTMENT OF JUSTICE
justin.savage@usdoj.gov

J. Jared Snyder
OFFICE OF THE ATTORNEY GENERAL
jared.snyder@oag.state.ny.us

Kosta S. Stojilkovic
SIDLEY AUSTIN LLP
kstoilkovic@sidley.com

Katherine Lynn Vanderhook
U.S. DEPARTMENT OF JUSTICE
katherine.vanderhook@usdoj.gov

Gaylene Vasaturo
UNITED STATES ENVIRONMENTAL PROTECTION
AGENCY
vasaturo.gaylene@epa.gov

Frank R. Volpe
SIDLEY AUSTIN LLP
fvolpe@sidley.com