PREVENTION OF SIGNIFICANT DETERIORATION (PSD)

PERMIT SUMMARY SHEET

Permit No.: 1770030

Source Name: Tecumseh Energy Center-Westar Energy, Inc.

Source Location: 2nd and Dupont Road, Tecumseh, KS 66542

I. Area Designation:

K.A.R. 28-19-350, Prevention of significant deterioration of air quality, affects new major sources and major modifications to major sources in areas designated as "attainment" or "unclassifiable" under section 107 of the Clean Air Act (CAA) for any criteria pollutant. The State of Kansas is classified as attainment for the National Ambient Air Quality Standards (NAAQS) for all the criteria pollutants except for lead.

The Tecumseh's area in Shawnee County, Kansas, where this modification is taking place, is in attainment for all the criteria pollutants.

II. Project description:

Westar Energy, Inc. (Westar) owns and operates the Tecumseh Energy Center (TEC), an existing coal-fired electric generating plant, located in Tecumseh, Shawnee County, Kansas. Westar is proposing to make certain modifications to the existing burner and combustion system on the Unit 8/10 boiler at the TEC. The burner and combustion system modifications include installation of new low NO_X burners (LNBs), windbox air actuators, windbox dampers, coal feeders, coal piping and coal piping support, the installation of separated overfire air (SOFA) ducting, dampers, and air tips, and boiler tuning. This project will result in an overall decrease in NO_X emissions. As a result of lowering NO_X emissions there may be an increase in carbon monoxide (CO) emissions. With the increase in CO emissions a decrease in carbon dioxide (CO_2) emissions is anticipated.

III. Significant Applicable Air Emission Regulations

This source is subject to Kansas Administrative Regulations relating to air pollution control. The application for this permit was reviewed and will be evaluated for compliance with the following applicable regulations:

A. K.A.R. 28-19-300. Construction Permits and Approvals. Requires "Any person who proposes to construct or modify a stationary source or emissions unit shall obtain a construction permit before commencing such construction or modification."

B. K.A.R. 28-19-350 Prevention of significant deterioration of air quality. "The provisions of K.A.R. 28-19-350 shall apply to the construction of major stationary sources and major modifications of major stationary sources in the areas of the state designated as an attainment area or an unclassified area for any pollutant under the procedures prescribed by section 107(d) of the federal clean air act (42 U.S.C. 7407 (d))."

IV. Air Emissions from the Project:

The potential-to-emit of one of the PSD regulated pollutants from the existing Tecumseh Energy Center exceeds 100 tons per year. Hence, TEC is considered to be a major stationary source under provisions of K.A.R. 28-19-350.

The potential-to-emit from the proposed modification, i.e. from the NOx Reduction Project, are listed in Figure 1.1 of Section 1 and detailed out in Appendix B of the application. Proposed potential-to-emit of NOx, CO and CO_2 were compared with the Significant Emission Rates for PSD applicability for the criteria and non-criteria pollutants. The increase in potential-to-emit is above the PSD significance level for CO and will be reviewed under the PSD regulations. NOx emissions were greatly reduced under this modification. CO_2 emissions will also be reduced under this project.

This project will be a major modification of an existing major stationary source resulting in a net significant increase of CO. This project will be subject to the various aspects of K.A.R. 28-19-350 such as the use of best available control technology, ambient air quality analysis, and additional impacts upon soils, vegetation and visibility. Good combustion practices were selected as BACT for CO with a limitation of 0.40 lb/mmBtu on a 30 day rolling average. Compliance with the CO limitation will be determined with a continuous emission monitor system (CEMS).

The proposed NOx Reduction Project is described in Section 2 of the application. The air emissions estimates are shown in the table below:

Pollutant Type	Baseline Actual (tons per year)	Projected Actual (tons per year)	Change in Emissions (tons per year)
CO	152	1,929	1,777
NO_X	1,838	868	-970
CO_2	1,122,872	1,120,080	-2,792

On June 3, 2010, the U.S. Environmental Protection Agency (EPA) issued the final Greenhouse Gas (GHG) Tailoring Rule (75 FR 31514). This rule established the thresholds for GHG emissions under the PSD permit program for new and existing

industrial facilities. GHGs are a single air pollutant defined as the aggregate group of the following six gases:

- carbon dioxide (CO_2)
- nitrous oxide (N_2O)
- methane (CH_4)
- hydrofluorocarbons (HFCs)
- perfluorocarbons (PFCs)
- sulfur hexafluoride (SF_6)

Starting in January 2011, sources currently subject to the PSD permitting program (i.e., those that are newly-constructed or modified in a way that significantly increases emissions of a pollutant other than GHGs) are subject to permitting requirements for their GHG emissions under PSD. For those affected facilities, only GHG emissions increases of 75,000 tpy or more of total GHG, on a carbon dioxide equivalent (CO_2e) basis, need to determine the Best Available Control Technology (BACT) for their GHG emissions.

PSD does not apply to the GHG emissions from this proposed project. Even though the proposed modification is considered a major modification under the PSD permit program and Westar is required to obtain a PSD permit (called an "anyway source"), there is no potential emissions increase of GHGs from the modification.

V. Best Available Control Technology (BACT)

BACT requirement applies to each new or modified affected emissions unit and pollutant emitting activity. Also, individual BACT determinations are performed for each pollutant emitted from the same emission unit. Consequently, the BACT determination must separately address, for each regulated pollutant with a significant emissions increase at the source, air pollution controls for each emissions unit or pollutant emitting activity subject to review. Westar Energy was required to prepare a BACT analysis for KDHE's review according to the process described in Attachment A. KDHE's evaluation of the BACT for the proposed NOx Reduction Project's analysis is presented in Attachment B of this document and Appendix C of the application.

In short KDHE has concurred with the Westar Energy for the following:

BACT for Carbon Monoxide is 0.40 lb/mmBtu, thirty day rolling average; BACT for CO is good combustion practices.

KDHE has included the following to the BACT requirement:

The emission limitation established in the permit applies to TEC Unit 8/10 at all times, including startup, shutdown and malfunction, except as provided in section "VI. Monitoring, Recordkeeping and Reporting, E. Malfunction" of the permit.

VI. Ambient Air Impact Analysis

The owner or operator of a proposed source or modification must demonstrate that allowable emission increases from the proposed modification, in conjunction with all other applicable emissions increases or reductions, would not cause or contribute to air pollution in violation of:

1) any national ambient air quality standard in any air quality control region; or
2) any applicable maximum allowable increase over the baseline concentration in any area (increment).

Westar has submitted a PSD permit application for modifications to the existing burner and combustion system on Unit 8/10 at the existing TEC facility located in Tecumseh, Kansas. The project's purpose in to reduce nitrogen oxide (NOx) emissions and will result in a significant increase in carbon monoxide (CO) emissions.

The facility performed dispersion modeling using BREEZE AERSCREEN Version 1.3.1 and BREEZE AERMOD Version 7.6, which incorporate the current regulatory versions of AERSCREEN (11126), and AERMOD (1206). Modeling was used to evaluate ambient impacts due to the increase in CO and to determine whether the ambient impacts from these emissions increases were above the significant impact level (SIL) for 1- hour and 8-hour averaging periods. Impacts at 50%, 75%, and 100% load were evaluated. For a detailed description of input parameters, refer to the permit application submitted September 17, 2012, Appendix D.

The screening model showed no significant impacts due to the increase in CO emissions. Results for each averaging period and load range are as follows:

Tecumseh Energy Center Unit 8/10 AERSCREEN Results
Carbon Monoxide

	Maximum Predicted Impact (ug/m^3)			
Averaging Period	**100% Load**	**75% Load**	**50% Load**	**Significant Impact Level (SIL)**
1-hour	266.6	229.7	163.9	2,000
8-hour	239.9	206.7	147.5	500

The modeled ambient impacts from the proposed project are less than the respective SILs, therefore no further cumulative analysis is required. KDHE considers this to be a sufficient demonstration that the project does not cause or contribute to a violation of the National Ambient Air Quality Standards (NAAQS).

VII. Additional Impact Analysis:

A. Visibility Impairment Analysis

Federally designated Class I areas are afforded special protection in the air permitting process. Generally, Class I area visibility analyses are only conducted for projects located within 100 km of a Class I area. The nearest Federal Class I Area is Hercules Glades Wilderness Area in Missouri, over 400 km from the proposed project.

An additional visibility impact analysis may be used to determine if the air emission increases associated with a proposed PSD project will have an impact on Class II sensitive areas such as state parks, wilderness areas, or scenic sites and overlooks. Visibility impairment is a function of the emissions of primary particulate matter, NO_x (including NO_2), elemental carbon (soot), and primary sulfate (SO_4). This project will substantially decrease the emissions of NO_x, thereby improving visibility over current conditions. As CO, not a visibility impairing pollutant, is the only pollutant with an emission increase, the project is not predicted to negatively impact visibility.

A visibility analysis was not required since the proposed project results in a substantial decrease in NO_x emissions and there is no increase in any other visibility-impairing pollutants.

B. Impacts on Vegetation and Soils

Carbon monoxide (CO) is not known to harm soils, as there is no deposition of CO onto soil. This project will actually decrease NO_x emissions, providing a benefit to the surrounding area. Therefore, the proposed project is not expected to result in harmful effects to soils.

Air pollutants can affect vegetation through direct absorption through the foliage, or uptake from the soil of trace elements deposited in the soil. The effects of air pollution on vegetation can include visible damage to foliage and fruit, changes in metabolic function, adverse changes in plant activity, and crop yield reduction. The effects of air pollutants on vegetation fall into three categories: acute (short exposure to high concentration), chronic (lower concentration over months or years), and long term (abnormal changes to ecosystems and physiological alterations in organisms that occur gradually over very long time periods).

Analysis of the land cover of the area surrounding TEC shows the primary land cover in the immediate area around TEC is urban open land/urban residential or woodland and water. This local area is surrounded by land used for agriculture and grassland.

According to EPA publications, there are no reports of measured CO levels producing any adverse effects on plants[1]. In its most recent review of the CO NAAQS, EPA concluded that "the currently available scientific information with respect to non-climate welfare effects, including ecological effects and impacts to vegetation, does not support the need for a CO secondary standard."[2]

The results of the air quality analysis presented in Appendix D of the application demonstrate that the maximum ambient air impacts due to the increase in CO emissions from the project will be under the applicable SILs, which are lower than the NAAQS.

CO Modeled Impacts vs. CO NAAQS			
Averaging Period	**CO NAAQS ($\mu g/m^3$)**	**Maximum Impact ($\mu g/m^3$)**	**Percentage of CO NAAQS**
1-Hour	40,000	266.6	0.67%
8-Hour	10,000	239.9	2.4%

Therefore, the proposed project is not expected to result in harmful effects to vegetation.

C. Growth In Commercial, Residential and Industrial Activity

The growth analysis considers predicted air quality impacts due to emissions resulting from the commercial, industrial, and residential growth associated with the NO_x Reduction Project. Only permanent growth is considered and impacts from emissions from temporary and mobile sources are not included in the analysis.

There will be no associated growth due to the NO_x Reduction Project. Project construction will be limited and no commercial or residential growth is projected to occur because of this project. Given the temporary nature of the construction and the lack of other source growth in the area, the NOx Reduction Project is not expected to cause any adverse construction or growth related air quality impacts

[1] EPA Air Quality Criteria for Carbon Monoxide (EPA 600/P-99/001F), June 2000, p. 1-1.
[2] Federal Register Volume 76, Number 169, Wednesday, August 31, 2011.

Attachment A
KEY STEPS IN THE "TOP-DOWN" BACT ANALYSIS

STEP 1: IDENTIFY ALL POTENTIAL AVAILABLE CONTROL TECHNOLOGIES.

The first step in a "Top-Down" analysis is to identify, for the emission unit in question, "all available" control options. Available control options are those air pollution control technologies or techniques with a PRACTICAL POTENTIAL FOR APPLICATION to the emissions unit and the regulated pollutant under review. This includes technologies employed outside of the United States. Air pollution control technologies and techniques include the application of production processes or available methods, systems, and techniques, including fuel cleaning or treatment or innovative fuel combustion techniques for control of the affected pollutant.

STEP 2: ELIMINATE TECHNICALLY INFEASIBLE OPTIONS.

The technical feasibility of the control options identified in Step 1 is evaluated with respect to the source-specific (or emissions unit specific) factors. In general, a demonstration of technical infeasibility should be clearly documented and should show, based on physical, chemical, and engineering principles, that difficulties would preclude the successful use of the control option on the emissions unit under review. Technically infeasible control options are then eliminated from further consideration in the BACT analysis.

STEP 3: RANK REMAINING CONTROL TECHNOLOGIES BY CONTROL EFFECTIVENESS.

All remaining control alternatives not eliminated in Step 2 are ranked and then listed in order of over-all control effectiveness for the pollutant under review, with the most effective control alternative at the top. A list should be prepared for each pollutant and for each emissions unit subject to a BACT analysis. The list should present the array of control technology alternatives and should include the following types of information:

1) control efficiencies;
2) expected emission rate;
3) expected emission reduction;
4) environmental impacts;
5) energy impacts; and
6) economic impacts.

STEP 4: EVALUATE MOST EFFECTIVE CONTROLS AND DOCUMENT RESULTS.

The applicant presents the analysis of the associated impacts of the control option in the listing. For each option, the applicant is responsible for presenting an objective evaluation of each impact. Both beneficial and adverse impacts should be discussed and,

where possible, quantified. In general, the BACT analysis should focus on the direct impact of the control alternative. The applicant proceeds to consider whether impacts of unregulated air pollutants or impacts in other media would justify selection of an alternative control option. In the event the top candidate is shown to be inappropriate, due to energy, environmental, or economic impacts, the rationale for this finding should be fully documented for the public record. Then the next most stringent alternative in the listing becomes the new control candidate and is similarly evaluated. This process continues until the technology cannot be eliminated.

STEP 5: SELECT BACT.

The most effective control option not eliminated in Step 4 is proposed as BACT for the emission unit to control the pollutant under review.

Attachment B
KANSAS DEPARTMENT OF HEALTH AND ENVIRONMENT'S EVALUATION OF WESTAR ENERGY, INC. TECUMSEH ENERGY CENTER PROPOSED BACT OPTIONS

Westar Energy, Inc. evaluated the BACT analysis to control emissions from the NOx Reduction Project. The only significant emission increase from this project is carbon monoxide (CO).

CO BACT for the NOx Reduction Project

Carbon monoxide is formed as a result of incomplete oxidation of carbon in the fuel. The concern is that by minimizing CO formation, NOx emissions are inversely increased.

Carbon Monoxide (CO) controls consist of good combustion practices or an oxidation catalyst. Good combustion practices can insure limits of 0.40 lb/mmBtu, 30 day rolling average for combusting subituminous coal. Catalytic oxidation is capable of reducing CO emissions by 90 percent in a boiler.

The PSD regulations require BACT, which requires the source to evaluate the control options for technical feasibility. The use of CO oxidation catalyst on a coal-fired boiler is considered technically infeasible. Due to the high sulfur trioxide and sulfuric acid gas formation which would cause rapid and destructive corrosion of ducts and equipment downstream of the catalyst, vendors do not offer a CO oxidation catalyst for coal-fired applications. Another reason is because the higher particulate levels of the gas stream would quickly plug the catalyst material, rendering it ineffective. Therefore, catalytic oxidation is determined technically infeasible for this case.

Based on the technical constraints, the use of good combustion practices to meet an emission level of 0.40 lb/mmBtu is proposed by Westar Energy as BACT. KDHE agrees with the analysis.