

# **MCDOWELL ENERGY CENTER ELWOOD, ILLINOIS**

## **PROJECT SUMMARY**

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### **I. INTRODUCTION**

The Peoples Gas Light and Coke Company (Peoples Gas) currently operates the McDowell Energy Center (Center) located at 21100 Noel Road, near Elwood, Illinois. Peoples Gas has requested a permit for the construction of natural gas combustion turbines at the Center to be utilized for generation of about 3100 MW of electricity.

Since the Center's original construction in 1975, the facility has operated as a utility, converting liquid petroleum products (such as naphtha) into methane (the main constituent of natural gas) for use by Peoples Gas' customers in the Chicago area. With intentions to continue to provide energy to the public from the Center, Peoples Gas is planning on using the facility's existing connection to a natural gas supply pipeline to power the electric generation facility. The plans for the new electric generation plant include utilization of the Center's existing capabilities, as well as new combustion turbines. As such, the installation of the turbines would be a modification to the existing facility.

### **II. PROJECT DESCRIPTION**

The proposed project for the electric generation facility will include four simple cycle combustion turbines (SCCT) and ten combined cycle natural gas combustion turbines (CCCT) to directly generate electricity. Each CCCT also includes heat recovery on its exhaust to generate steam, which is also used to produce electricity with steam turbine powered generators.

The SCCT units will utilize low NO<sub>x</sub> burners, that minimize formation of nitrogen oxides (NO<sub>x</sub>). These turbines are intended for use during peak loading periods only. Peak loading currently occurs during daylight and evening hours on hot summer weekdays. As such, Peoples Gas anticipates that these "peaking units", will operate at most 1,500 hours per year per unit. Heat recovery would not be effective on these units because the turbines will change operating levels rapidly to respond to changes in electrical demand from consumers.

The CCCT units are intended for based-load operation year-round (*i.e.*, up to 8,760 hours per year). The CCCT units will be installed in a two on one pattern. The steam produced from each pair of CCCT and associated heat recovery steam generator (HRSG) will be used by a single common steam turbine/generator.

The emissions from each CCCT are controlled through the use of add-on Selective Catalytic Reduction (SCR) in the HRSG. SCR uses a catalyst operated in an appropriate temperature range that normally is present in one section of the HRSG to control NO<sub>x</sub>, by reaction with ammonia, urea

or other similar chemicals. The NO<sub>x</sub> is converted back into nitrogen and oxygen, as originally present in the atmosphere, and water is formed as a byproduct.

In addition to the combustion turbines, the project also includes five cooling towers to dissipate waste heat from the CCCT steam cycle. Hot water from the steam turbine condensers and other heat exchangers at the facility is routed to the cooling towers for cooling. In turn, the cooling tower systems provide cooled water back to this process equipment. A single mechanical draft cooling tower is required for each steam turbine.

Fuel heaters will be used in conjunction with all the turbines in order to restore the temperature of the natural gas from the pipeline after its pressure is lowered to the operating pressure of the combustion units. Steam, electric or small natural gas-fired fuel heaters will be utilized. The overall project would require use of fourteen fuel heaters.

### III. PROJECT EMISSIONS

Emissions of combustion products (carbon monoxide (CO), nitrogen oxide (NO<sub>x</sub>), particulate matter/particulate matter <10 microns (PM/PM<sub>10</sub>), sulfur dioxide (SO<sub>2</sub>) and volatile organic material (VOM)) and hazardous air pollutants (HAPs) result from the combustion of fuel in the turbines and the fuel heaters. The cooling towers utilized in conjunction with the CCCT operation are sources of PM emissions.

The potential emissions from the proposed modification at the McDowell Center are noted below. For the SCCTs, potential emissions were based on 1,500 operating hours per year, as these units only will be used for peak loading operations. Potential emissions for the CCCTs, cooling towers and fuel gas heaters were based on full operation of 8,760 hours per year.

Potential Project Emissions (ton/yr)

<u>Pollutant</u>	<u>Current Actual</u>	<u>Source Decreases</u>	<u>Project Increase</u>	<u>Project Potential</u>	<u>Significant Emission Rate*</u>
CO	31.89	--	2,259.0	2,259.0	100
NO <sub>x</sub>	151.39	--	1,567.7	1,567.7	40
PM/PM <sub>10</sub>	8.45	--	923.4	923.4	15
VOM	91.6	-57.7	57.7	0	40
SO <sub>2</sub>	0.40	--	35.8	35.8	40

\* Significant emission rates defined by 40 CFR 52.21.

As shown, the increase of NO<sub>x</sub>, CO and PM/PM<sub>10</sub> emissions noted above exceed the significant net emissions increase threshold of the Prevention of Significant Deterioration Air Quality regulations (PSD), 40 CFR 52.21.

With regard to VOM emissions, Peoples Gas is requesting emissions limitations so that there would not be a significant net increase in these emissions. Because the overall increase in VOM emissions will be less than 25 tons per year, requirements for lowest achievable emissions rate (LAER) controls and emissions offsets per the nonattainment New Source Review (NSR) program are not required.

#### **IV. APPLICABLE REGULATIONS**

##### **A. GENERAL**

The proposed project will comply with applicable state and federal air pollution control laws and rules, including the Illinois Environmental Protection Act, the federal Clean Air Act, the Illinois Air Pollution Control Board emission standards and regulations (35 Ill. Adm. Code: Subtitle B) and applicable federal emission standards.

##### **B. ADDITIONAL REQUIREMENTS FOR MAJOR MODIFICATIONS**

Pursuant to the PSD rules for attainment areas, any significant net emissions increase of a regulated pollutant at a major stationary source (i.e., major modification) will trigger a requirement for PSD review.

The project is in an area classified as attainment for NO<sub>x</sub>, CO and PM/PM<sub>10</sub>. The existing facility is a major stationary source under PSD regulations. This project constitutes a major modification because the net increase in emissions of NO<sub>x</sub>, CO and PM/PM<sub>10</sub> is significant, as seen in the table in Section III. Therefore, the proposed project at the McDowell Center constitutes a major modification subject to the additional requirements imposed by the federal rules for PSD.

#### **V. PREVENTION OF SIGNIFICANT DETERIORATION (PSD)**

A project that constitutes a major modification in an attainment area is subject to the federal PSD rules. The PSD rules were established to ensure that new sources will not adversely impact “clean air” areas and will comply with applicable standards.

A PSD review requires: 1) a case-by-case Best Available Control Technology (BACT) determination, taking into account energy, environmental and economic impacts, as well as technical feasibility; 2) an ambient air quality impact analysis, including a baseline determination and dispersion modeling, to determine whether the allowable emissions from the source, in conjunction with the proposed net emissions increase, would cause or contribute to a violation of the applicable PSD increment or National Ambient Air Quality Standard (NAAQS); 3) an assessment of the impact on soils, vegetation and visibility; and, 4) public notice and comment, including an opportunity for public hearing. The Illinois EPA has been delegated authority by the USEPA to administer the federal PSD program.

##### **A. BEST AVAILABLE CONTROL TECHNOLOGY (BACT)**

BACT is defined as an emission limitation based on the maximum degree of pollution reduction determined on a case-by-case basis considering technical, economic, energy and environmental considerations.

A BACT analysis was conducted for NO<sub>x</sub>, CO and PM/PM<sub>10</sub> in order to determine the most appropriate level of control required at the facility for these pollutants. In considering the technical, economic, energy and environmental considerations, the Illinois EPA determined that the project will utilize BACT.

As determined by Illinois EPA, BACT will include use of SCR and dry low-NO<sub>x</sub> combusters on the CCCTs to meet a maximum NO<sub>x</sub> emission rate of 4.5 ppmv at 15% oxygen. Dry low-NO<sub>x</sub> combusters will be used on the SCCTs to meet a maximum NO<sub>x</sub> emission rate of 15 ppmv at 15% oxygen. It also will include utilization of low-NO<sub>x</sub> burners with the fuel heaters to minimize emissions of NO<sub>x</sub>. These practices represent the stringent level of control for NO<sub>x</sub> required on CCCT and SCCT in other similar projects across the country.

Good combustion practices including use of gaseous fuels will be used on the CCCTs, SCCTs and fuel heaters to minimize emissions of CO and PM/PM<sub>10</sub>.

The cooling towers at the Center will be equipped with highly efficient (0.001%) cellular-type drift eliminators to loss of water droplets from the cooling towers and associated PM/PM<sub>10</sub> drift. Use of this type of drift eliminator represents a significant enhancement (3 times) in the control of PM/PM<sub>10</sub> emissions over standard (0.003%) mist eliminators historically used. In conjunction with requirements for control of water pollution addressing wastewater discharges from the plant, these drift eliminators represent BACT for cooling towers.

## **B. AIR QUALITY ANALYSIS**

An ambient air quality analysis was conducted by the consulting firm, Black & Veatch, on behalf of Peoples Gas to assess the impacts of the increased emissions due to the proposed project. Under the PSD rules, this analysis must determine whether the proposed project will cause or contribute to a violation of any applicable air quality standard.

Modeling was done incorporating the proposed emissions increase at the McDowell Center and major stationary sources in surrounding areas. The analysis performed conforms to the guidance and requirements of the USEPA and the Illinois EPA.

Peoples Gas has provided adequate information to determine that proposed emission increases will not cause a violation of the NAAQS or the significant impact levels established under the PSD regulations for NO<sub>x</sub>, CO and PM/PM<sub>10</sub>.

## **C. ASSESSMENT OF ENVIRONMENTAL IMPACTS**

The ambient air quality assessment performed also assessed the potential impact of the McDowell Center project on soils, vegetation and visibility. The Illinois EPA concluded that the project would not cause any adverse effect to these environmental media.

## **VI. PROPOSED PERMIT**

The conditions of the proposed permit contain limitations and requirements on the electric generation activities. The permit also identified the measures that must be used to control NO<sub>x</sub> emissions from the combustion turbines to be utilized at the McDowell Center. The permit also establishes appropriate compliance procedures, including inspection practices, recordkeeping requirements and reporting requirements.

## **VII. REQUEST FOR COMMENTS**

It is the Illinois EPA's preliminary determination that the proposed permit meets all applicable state and federal air pollution control requirements. The Illinois EPA is therefore proposing to issue a permit for construction at the McDowell Center.