Supplemental Technical Comments of Allen County Citizens for the Environment Concerning a Proposed Prevention of Significant Deterioration Permit for the Global Energy IGCC Power Plant, Lima, OH

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1 Introduction

These are the supplementary technical comments of the Allen County Citizens for the Environment (ACCE) concerning the proposed Prevention of Significant Deterioration for the proposed Global Energy Integrated Gasification Combined Cycle (IGCC) Power Plant. Because the comments below identify regulatory and factual issues which are unresolved and because all applicable requirements for the proposed facility have not been met, ACCE opposes issuance of the proposed permit by the Ohio EPA at the present time.

2 Regulated Hazardous Air Pollutants are not Adequately Listed, Characterized, Compliance Tested and Regulated for Purposes of MACT Determinations

The application claims that CAA Section 112 hazardous air pollutant emissions will total 9.5 tons per year. The list of claimed hazardous air pollutant emissions is shown at page 2 of Appendix A of the application. However this list doesn't show emissions of hydrogen chloride. Hydrogen chloride emissions are shown as 9.5 tons/year at section 2.2 of Global's July 13, 2000 submittal of the air toxic screening analysis.

As a result, the admitted HAP emissions are at least 19 tons per year – putting the facility within striking distance of the 25 ton threshold for combinations of hazardous air pollutants triggering a requirement for Maximum Achievable Control Technology Review.

Listed volatile organic compound emissions are shown as 133.4 tons/year total for both turbine exhaust stacks. However, Appendix 8 to the application lists only benzene (1.36 t/y) and formaldehyde (2.6 tons per year) as the only hazardous air pollutants that are also volatile organic compounds (VOC).

If this facility claims in its BACT application that it requires VOC emission limitations of 133.4 tons per year in order to ensure compliance, then it is quite likely that is emitting far more than the 3.96 tons total of VOC-related hazardous air pollutants other than benzene and formaldehyde. EPA's AP-42 document lists the following pollutants as potential emissions from uncontrolled natural gas-fired turbines: 1,3 butadiene, acetaldehyde, acrolein, benzene, ethylbenzene, formaldehyde, naphthalene, PAH, propylene oxide, toluene and xylenes. At the very least, expected emissions of all of these hazardous air pollutants should be quantified in order to determine whether the aggregate HAP emissions exceeds the 25 ton threshold for MACT review requirements.

The proposed permit should be amended to require a complete compound specific speciation of all VOC emissions from the facility in order to distinguish specific VOC-related hazardous air pollutants rather than merely relying on VOC measurements as total non-methane organic compounds measured as carbon.

The application lists nickel as the largest toxic metal emission expected at 4.793 tons per year. Other toxic metals were listed 1 to 3 orders of magnitude less in emission rate. However, there is no physically plausible reason to believe that other refractory toxic metals will behave significantly different in gas cleanup systems than nickel. If nickel emissions among trace elements can be so high then other toxic refractory metal should also pass through gas cleanup at similar rates. Use of emission factors derived from the Indiana IGCC plant (being fed predominately with petroleum coke) that don't reflect fueling with Ohio coal and RDF may cause serious errors in estimating hazardous air pollutant emissions from the proposed facility.

3 Issues on the Determination of Required Emission Control Technology

3.1 Best Available Control Technology Requirements (BACT) under Federal Prevention of Significant Deterioration Regulations

3.1.1 Ohio EPA Failed to Conduct a *de novo* Analysis of the Global Energy Best Available Control Technology Determination

Attached to the public release materials on the proposed permit found at the Ohio EPA Northwest District Office is a document entitled:

> "Staff Determination for the Application to Construct under the Ohio Prevention of Significant Deterioration Regulations for the Lima Energy LTD (Integrated Gasification Combined Cycle Facility) - Lima Plant PTI No. 03-13445, for Two Combined-Cycle (580 Megawatts) Synthetic Gas and Natural Gas Fired General Electric 7FA Turbines to be Located in Lima, Allen County, Ohio"

This document is remarkable because the vast majority of the document's text, notably the entire section on best available control technology going on for at least 20 pages, is a 100% verbatim copy of Section 6 of the Global Energy application. At the end of the so-called "Staff Determination" is a paragraph:

> "Conclusions. Based upon the review of the permit to install application, the Ohio EPA staff has determined the installation will comply with all applicable State and

Federal environmental regulations and that the requirements for BACT are satisfied. Therefore, the Ohio EPA staff recommends that a permit to install be issued."

It is the required task of an environmental agency such as the Ohio EPA to conduct its own independent review of company submittals before permits are granted. There can be no public confidence in the decisions of Ohio EPA in a circumstance where the action of making findings of fact and conclusions of law and subsequently granting a permit devolves to a mere rote recitation of the permit applicant's application as the agency's own conclusion. This type of conduct by Ohio EPA erodes public confidence in the agency's decisionmaking and seriously damages the credibility of the agency in carrying out its environmental protection missions.

3.1.2 Global Energy's Sulfur Dioxide BACT Determination Fails to Consider All Technically Feasible Means of Additional Control of Sulfur Dioxide

The Sulfur Dioxide Best Available Control Technology determination in the application for the proposed permit is inadequate because it fails to consider all technically achievable means to limit sulfur dioxide emissions that is required in the "top down" BACT review.

One technically feasible means of sulfur dioxide control is to use coal in the plant with a lower sulfur content. Consideration and use of potentially cleaner fuels is part of the definition of "Best Available Control Technology" provided in both 40 CFR Sec.52.21 and the definition of BACT found in the Clean Air Act. The application discusses the use of high sulfur Ohio coal only. No other coal has been considered as an alternative. To the extent that high sulfur coal will include a higher content of mercury sulfides, failure to consider lower sulfur coal also fails to consider the effect of a BACT determination on unregulated toxic air contaminants. This type of consideration is required as part of the environmental effects analysis in a BACT determination as indicated by longstanding precedent decisions before the EPA Environmental Appeals Board.

The second way in which the application fails to provide an adequate sulfur dioxide BACT decision is the failure to indicate a specific design for hydrogen sulfide and other reduced sulfur compound cleanup of syngas and to show why additional measures should not be considered. For example, the application fails to show why additional amine contactors, additional sulfur recovery capability or other elements of the design of the gas cleanup system could not be designed to take out even more hydrogen sulfide, carbonyl sulfide and carbon disulfide from syngas. Until such measures are demonstrated to be either technically or economically infeasible, the application remains deficient. In

addition, the failure to provide design information about the alternative chosen as BACT for sulfur dioxide prevents the public from commenting further on this issue.

3.1.3 Global Energy Summarily and Improperly Dismissed Catalytic Oxidation for Carbon Monoxide and Volatile Organic Compound BACT

Global Energy admits that catalytic oxidation for control of carbon monoxide and volatile organic compounds is technically feasible and is not eclipsed by unresolved technical problems (See Global Application, p. 6-34). Catalytic oxidation must be considered the top-level technically feasible control for both carbon monoxide and volatile organic compounds.

Global Energy's demonstration for carbon monoxide BACT fails to recognize as an environmental benefit that implementation of catalytic oxidation reduces VOCs and certain organic hazardous air pollutants. Similarly, Global Energy's demonstration for volatile organic compound BACT fails to recognize as an environmental benefit that implementation of catalytic oxidation reduces carbon monoxide emissions. Such environmental benefits must be recognized in top-down BACT determinations in order to be approvable. Global's BACT analysis cannot be approved without consideration of such environmental aspects in setting BACT emission control.

Global's application fails to apportion costs between BACT control for carbon monoxide and BACT control for volatile organic compounds. Cost apportionment is appropriate given that a catalytic oxidation system will control both types of emissions. Global's BACT analysis for VOC and CO effectively double counts the cost of catalytic oxidation control when the cost calculus must be integrated between these pollutants. Abusive economic review of this nature in double counting costs must not be considered a valid demonstration of the economic consequences of imposing catalytic oxidation controls.

Global's application attempts to dismiss catalytic oxidation controls on the basis of a $6,796 cost effectiveness. Such a cost is not necessarily unreasonable, particularly since catalytic oxidation control for carbon monoxide and volatile organic compounds is frequently applied for combined cycle turbines. Where an emission control technique in an industry is relatively common for combined cycle turbines it is inappropriate to reject such controls merely on a cost basis under longstanding EPA guidance and interpretation in the setting of BACT determinations.

3.1.4 Global Energy's Nitrogen Oxide BACT Determination Fails to Consider the Potential for More Syngas Sulfur and Metals Cleanup as Technically Feasible Controls that would Allow Selective Catalytic Reduction

Top down BACT determinations under the PSD Regulations must consider combinations of controls that might influence the mix of emission control technologies. Global Energy's BACT submittal for nitrogen oxides rejects selective catalytic reduction by saying that SCR is technically infeasible because of the metals and sulfur contents of syngas. The application, however, fails to identify what amount of metals reduction in the pre-combusted syngas and what amount of sulfur dioxide reduction might allow implementation of this technology.

Required top-down BACT determinations must consider both technology transfer and consideration of a mix of controls and process techniques in making decisions on the technical and economic feasibility of emission control options. However, nothing in the application examined additional techniques for filtering solid phase metal toxicants out of pre-combustion syngas streams. For example, all potential methods of filtering such gases to remove catalyst-toxic metals were not identified and considered, either as technically feasible or infeasible. The applicant should have considered whether toxic metals and residual sulfur might be controlled by scrubbing of pre-combustion syngas, or whether solid phase metal particles might be controlled through use of filter beds, use of high efficiency particulate filters or other available techniques. Consideration of other potential sulfur controls discussed in a prior section should have been added to the discussion on the mix of controls potentially available to allow use of selective catalytic reduction.

Global Energy attempts to evade these questions by raising irrelevant comparisons to traditional coal-fired power plants or refinery fuel gas treatment units, older and inherently dirtier technologies. Such comparisons beg the question about whether alleged "clean coal" plants as Global seeks to identify itself can be made cleaner.

3.2 Mercury Emissions and Ohio EPA Requirements for Best Available Technology for Mercury and Toxic Metals

3.2.1 Global Energy's Mercury Emission Characterization is Almost Certainly Wrong

Global Energy officials insist that mercury emissions from their facilities will not exceed 22 pounds per year, but this emission estimate lacks credibility. The estimate is

apparently based on an IGCC unit in Indiana. However, no detailed information to support such a low mercury emission estimate has been provided. For example, Global Energy has provided nothing in their application showing the mercury content of fuels used at the Indiana facility during stack testing that Global has relied upon to derive an emission factor applicable to the Lima plant. Without a specific understanding of the mercury content of fuels used in Indiana during mercury stack testing, mere rote application of an Indiana-derived emission factor to the Lima plant is not appropriate as an emission characterization.

A fact sheet found in the Ohio EPA files indicates that the Indiana plant has been primarily fueled recently by petroleum coke. Pet coke is not a fuel which is likely to have as much mercury as some native high sulfur Ohio coals. If the mercury stack test of the Indiana plant was done while burning pet coke, the result would be inappropriate for use at the Lima plant.

Global Energy has made physically unrealistic, confusing and conflicted claims about the process disposition of mercury introduced in the proposed plant through mercury present in fuels. Global's insistence that recycling mercury back to the gasifier in gas cleaning process wastewater and in particle chars and oils from gas cleaning somehow disposes of this problem when such treatment ignores likely equilibrium distribution issues raised by such practices. Insistence by Global Energy that mercury partitions to the slag from the gasifier is not physically plausible because temperature considerations. Information found in Ohio EPA's files that is a paper submitted at a scientific meeting on gasification indicates that partition of mercury to slag does not occur to any great degree in practice. Mercury that enters this proposed plant will either be discharged as wastewater, flow with the syngas to the turbines and then out or possibly be emitted from molten sulfur tank vents or any tailgas combustion unit (such as a flare)..

Global Energy should be required to conduct a mass balance study of mercury in this proposed facility to determine the fate and emissions of mercury in the process.

3.2.2 Potential Mercury Feed Inputs at the Proposed Global Facility Indicate Potentially Large Mercury Flux through the Facility

Information from the U.S. Geological Survey indicates that the average mercury emissions potential for Appalachian coal (which includes Ohio high sulfur coals) is 15.4 lbs of mercury per 10^{12} BTU heat input. Assuming 0.011 MMBTU per pound of coal and 2800 tons of coal per day consumed and 365 days of operation per year, a total of 346 lbs of mercury per year will be introduced to the gasified in fuel feed from coal alone. This

does not include the additional mercury contained in RDF from disposal of mercury containing consumer and industrial materials. Given this potential amount of mercury flux through the proposed plant, it is not credible to expect that there will be only 22 lbs/year of mercury emissions and that somehow the mercury introduced to the process will merely be cycled back to the gasifier as Global Energy incredulously maintains.

3.2.3 Ohio EPA Has Not Conducted a Best Available Technology Review for Mercury

Global's application is deficient because it does not indicate in detail the mercury contents expected for RDF and Ohio high sulfur coal that they expect to use. The proposed permit itself is deficient because no restrictions and testing requirements are placed on mercury contents of these fuels. There is no restriction placed on the RDF in the proposed permit, for example, that would require such RDF to be magnet processed to remove batteries that may contain mercury and other toxicants. Failure to review and consider mercury (and other toxicant) controls implicit with mercury content review of RDF and coal is inherently a failure to conduct an Ohio EPA BAT review at this facility. Moreover, Global Energy's failure to include information on the mercury content of both coal and RDF in the company's application violates rules requiring complete applications for air permits and renders the proposed permit unapprovable.

Placing restrictions on the mercury content of coal and RDF and imposing processing requirements to remove toxicants contained in RDF used at the proposed Lima plant are technically feasible and prudent measures for limiting mercury emissions from the proposed plant that are required by duties to impose BAT under Ohio EPA rules.

Given the potential mercury input to the gasification process, a one time stack test conducted within 180 days is not sufficient to make the mercury emission limitation in the proposed permit enforceable in practice. The proposed permit should be amended to include a maximum mercury content limit in coal as received at the facility along with specific requirements for periodic coal mercury testing requirements. In addition, annual mercury emission stack testing requirements should be imposed.

3.2.4 Carbon Bed Controls for Cleanup of Pre-Combustion Syngas are Technically and Economically Feasible to Limit Emissions of Mercury

The proposed Global Energy facility should have been considered for implementation of pre-combustion carbon bed absorption of mercury as part of the Ohio

Best Available Technology requirement to control mercury emissions. Carbon bed technology is technically and economically feasible to limit emissions of mercury in this manner. Concentrating mercury that is introduced into the process into a carbon bed is far preferable to atmospheric dispersion of this neurotoxic, persistent and bioaccumulative toxicant.

Appendix A is information from the 1977 Mercury Study Report to Congress considering carbon bed technology for municipal waste combustors which can be viewed for technology transfer to IGCC units like the proposed Lima Plant. Carbon beds are also used in chlor-alkali plants for very efficient mercury emission reduction.

Carbon bed technology has been incorporated into gasification systems that produce chemical feedstocks in which mercury contaminants would be undesirable. For example, a carbon bed for mercury control has been incorporated on a gasifier unit a the Eastman Chemical Plant at Kingsport, TN. Appendix B shows cost calculations and engineering information for consideration of mercury controls at the Polk IGCC plant. Appendix C is some additional summary information about mercury control considered for the Polk plant.

Nothing in the Ohio EPA "staff report" shows any indication at all that any of these issues were considered or evaluated or that Ohio EPA properly carried out its duty to evaluate BAT requirements in the context of mercury emissions from the proposed facility.

4 Issues Related to Permit Content and Other Regulatory Issues

4.1 The Proposed Permit Fails to Regulate the Global Energy Flare

The proposed Ohio EPA permit fails to include the Global Energy on-site "emergency" flare as an emission point and emission unit. This is highly objectionable since Global Energy will be under no federal/state enforceable obligations or limitations concerning flare emissions, design and operational requirements. Since the flare will at times be combusting products of municipal solid wastes, the flare must be shown to comply with large municipal waste combustor standards, 40 CFR part 60, subpart Eb. At the very least, design and operation requirements must be imposed on the flare for both federal and state enforce ability. For example, it must be a violation of the permit for the facility to release uncontrolled emissions from the flare stack, to operate the facility while the flare pilot light is out and to fail to maintain a system to monitor the flare pilot.

In addition, the applicant has insisted that flare operation will not cause any smoke because of the high content of hydrogen in syngas. However, during circumstances when

raw, uncleaned gasifier gas containing aerosals, oils, tars and particles is directed to the flare stack, it really isn't clear that the flare will not smoke. Accordingly, the flare stack should have steam assist capabilities that are maintained as required by permit provisions.

4.2 The Routing and Treatment Process for Sulfur Recovery Unit Tail Gas at the Proposed Facility is Unclear and Poses Certain Emissions and BACT Issues

Figure 3-2 on page 3-2 of Global's application shows the process flow diagram for the proposed facility, but this schematic fails to show how flows of tailgas from the sulfur recovery unit is handled. As a result, the application is incomplete and not approvable. There has been no control technology determination in regard to control of sulfur recovery tailgas. Discharge of sulfur recovery tailgas to the flare will have significant implications for emissions and ambient impacts, as well as sulfur dioxide BACT determinations. No sulfur dioxide BACT determination has been done for sulfur recovery tailgas. There has been some informal mention that sulfur recovery tailgas is returned to the gasifier. If so, then there has been no discussion or analysis of whether this practice constitutes BACT for sulfur dioxide emissions from the main turbine discharge stacks. Return of sulfur recovery tail gases to the gasifier can be expected on an equilibrium basis to increase the sulfur content of the syngas being fed to the turbines. A separate tailgas incineration unit, such as those sometimes used in the petroleum refining industry, may allow more sulfur dioxide to be removed from the turbine combustor stream with consequences for BACT review for NOX/selective catalytic reduction, as well as sulfur dioxide BACTR review.

4.3 The Proposed Permit Should Incorporate Certain Shutdown Requirements on Global's Gasifier Equipment

The proposed permit should be amended to incorporate certain conditional shutdown requirements on Global's gasification processes. The permit should contain a provision requiring that the operator must cease feed inputs to the gasifier and proceed with gasifier shutdown procedures (consistent with safe operating procedures) whenever there is an outage in the sulfur recovery unit or when the emergency flare system is not operating properly with a pilot flame capable of ensuring combustion of gases directed to that flare.

4.4 The Proposed Permit Does Not Contain a 25 Ton Ceiling on Hazardous Air Pollutant Emissions

The "staff report" contains the following statement on page 3:

> "The Lima Energy Facility will be accepting HAP emission restrictions to levels below 10 tons per year of any individual HAP and 25 tons per year of any combination of HAPs to avoid submitting a MACT determination."

Although it is true that no individual HAP emission limitation in the proposed permit exceeds 10 tons per year, it is also true that the proposed permit does not contain HAP emission limitations for all HAPs likely to be emitted. A more serious problem, however, is that the permit contains no provision which limits emissions to "25 tons per year of any combination of HAPs." Despite a diligent search by the author for such a provision, none can be found in the proposed permit. Accordingly there is no assurance that the proposed facility is a synthetic HAPs minor source for purposes of avoiding Maximum Achievable Control Technology review.

5 Other Ambient Impact and Airborne Toxicant Issues

5.1 Anomalous Air Quality Modeling Result for Location of Maximum Ambient Impacts

The application included detailed ISC3 ambient modeling to deal with requirements to control increment consumption for criteria pollutants. For sulfur dioxide and nitrogen dioxide, the overwhelming contribution to ambient impacts comes from the two main combustion turbine stacks. These two stacks are thus wholly dominate on the emissions regime for these two pollutants and influences from other stacks are either non-existent of completely diminimus. Air quality modeling procedures from Appendix W require air quality modeling efforts to be conducted under conditions of maximum potential emissions. Both sulfur dioxide and nitrogen oxides from the two combustion stacks are released under the same stack conditions of temperature, exit gas flow, stack diameter, stack height, etc. As a result, it must be expected that the location of predicted ambient maximum concentrations would be virtually the same.

However, it is clear that the locations of maximum ambient impact for sulfur dioxide and nitrogen oxides is very different. A review of the location of maximum ambient impacts reveals that the maximum ambient impact site for annual average results

for sulfur dioxide is more than 4000 feet from the maximum impact site for sulfur dioxide. This is an entirely counterintuitive result and indicates a potential error in the air quality modeling study for the proposed facility.

5.2 Ambient Impact from Airborne Carcinogens

No cancer risk assessment has been conducted for ambient community exposures to emissions that are permissible under the proposed permit. A similar plant proposed for Kentucky shows that proposed emissions lead to a lifetime inhalation cancer risks of 55 in one million, which is far above the one in a million guideline contained in the Federal Clean Air Act for residual risks after the application of technology-based controls on airborne carcinogens. Some states, such as Michigan, enforce emission standards designed to limit such lifetime inhalation cancer risks to the one in the million guideline. However, no such standards are enforced in Ohio. Ohio EPA's procedures for air toxics review do not assess carcinogenic risk from emissions and the MAGLC in Ohio EPA rules do not provide the public adequate or sufficient protection from airborne carcinogens.

The proposed Global Energy facility will discharge the following airborne carcinogenic materials: arsenic, benzene, beryllium, cadmium, chromium (hexavalent form is carcinogenic), formaldehyde and nickel.

5.3 Emissions Limitations for Poly-Chlorinated Dibenzo Dioxins/Furans are Not Properly Written

As written, the emission limitations intended for Poly-Chlorinated Dibenzo Dioxins/Furans are written in a form which creates ambiguities and is open to interpretation. The limitations are set forth as "lb dioxin/furan per hour, "lb dioxin/furan per year" and "ng dioxin/furan per DSCM at 7% oxygen." This exposition of the PCDD/PCDF emission limitations is not exact and open to interpretation. The limitation should either be written to specify all PCDD/PCDF congeners which are to be tested and considered in the total or the limitation should reflect PCDD/PCDF toxic equivalents. None of this is clear from the existing permit language. From the standpoint of risk assessment, it would be preferable to also specify limits in TEQs, toxic equivalents of 2,3,7,8 tetrachlorodibenzo(p)dioxin.

Nothing the in the permit specifies the basis of the lb per year and lb per hour PCDD/PCDF emission limitations. While the 13 ng/dscm limitation is from the federal incinerator regulation, there is no basis provided for the hourly and annual limitations. The

applicant admits that it might be able to meet a significantly lower limit, in the neighborhood of 0.02 ng/dscm. As a result, the proposed permit does not incorporate a PCDD/PCDF emission limitation that constitutes Ohio Best Available Technology.

5.4 The Permit's Stack Testing Requirements are Not Sufficient

Provisions in the permit for stack testing are not sufficient. The company admits that it might be 3 years before maximum utilization of syngas is reflected in plant operations. But the permit contains a requirement only for a single stack test. As a result, the plant will never be tested under this permit for conditions that reflect full utilization of syngas. This is a particularly egregious regulatory error as it relates to protection of the public health from exposure to metals that are airborne carcinogens since such metal emissions will be maximized during maximum syngas use. The facility should be subjected to annual stack testing for at least the first five years of operation to determine all criteria pollutant emissions and airborne carcinogenic emissions.

Although nickel is predicted to be the toxic metal with the highest emissions, the permit does not have a requirement to test the combustion stacks for nickel.

There is no requirement to test the molten sulfur tank for mercury emissions. Any mercury that is scavenged by the sulfur recovery unit would be emitted in that location or from any flaring of sulfur recovery unit tail gas.

5.5 Duties to Separate Waste Under Federal Incinerator Regulations

ACCE objects to the provision of the permit under VI Misc. Requirement #9 which exempts global energy from development of a materials separate plant, claiming that the facility does not accept municipal solid waste. Global must be held responsible for this requirement by holding its RDF supplier to this requirement. Global must not be allowed to evade requirements for toxics reduction implicit in source separate requirements.