MEMORANDUM

TO: Senator Thomas F. Eagleton

SUBJECT: Problems With the Closed Loop Strategy

A good example of the failure of the "closed loop" control strategy is the ASARCO Smelter in Tacoma, Washington -- 282 violations in the first two years of the closed loop system. Only 13 violations resulted in penalties of $250 each, all paid under protest by ASARCO.

An example of an allegedly more successful closed loop system which may be cited is the ASARCO lead smelter in Glover, Missouri. The Missouri lead smelter apparently has five monitoring stations, maintained by ASARCO but paid for half by the company and half by the State. The State sets the limit on ambient air quality which, when exceeded, will result in company action to curtail operations. The lead smelter is considered to lend itself particularly to the closed loop system because pollution output can be directly and quickly controlled by the amount of lead input.

For a closed loop system to have a chance of success, all of the following factors are considered necessary:

1) Isolation from any other pollution sources.

2) A sufficient number of monitoring devices, properly placed, to monitor ambient air quality under any conditions.

3) A manufacturing process whose input and pollution output can be varied as needed to comply as conditions change without substantial disruptions of the industrial process. (A manufacturing operation which could substantially reduce pollution output within a two-hour time span would be considered sufficient.)

There are many serious problems with the closed loop:

1) Even where closed loop is successful, it is really only applicable to short-term conditions. Manufacturing operations cannot be curtailed indefinitely, nor can wastes which are regularly burned be stored for long periods of time without causing other serious disruptions.
2) Where there is more than one polluting source, very serious problems arise in assessing blame and dividing control responsibility. This division of responsibility becomes particularly acute where an understaffed State agency may be trying to assess civil or criminal penalties which will involve complicated interpretations of technical data.

3) It will likely be very expensive to purchase, monitor, and maintain the monitoring stations. The State may not have the funds or personnel for the job. If the company purchases and maintains the monitoring system, serious questions arise as to how well the system will be maintained, how accurately the data will be interpreted to the State, and how zealous company personnel will be in enforcing controls on themselves when a shutdown is called for. In addition, where all monitoring devices are owned by the company 5th Amendment defenses may limit the ability of States to bring successful criminal prosecutions.

4) Placing monitoring stations at the right places to catch all violations is nearly impossible.

5) Policy arguments aside, the closed loop does not appear to be a control strategy contemplated under the Clean Air Amendments --

(a) The Amendments require emission limitations.

(b) They also require a compliance timetable, but it is impossible to apply such a timetable to a closed loop system which assumes pollution levels in excess of air quality standards will occur from time to time.

(c) Section 113 (Federal enforcement section) speaks in terms of enforcing "requirements" which appears to assume that the States would adopt specific requirements against which individual polluters' compliance with the law could be judged. The closed loop system, in effect, makes the ambient air quality standard the "requirement" against which compliance is judged. If Congress had intended this, it would have used the word "standard" in section 113 instead of the word "requirement".
MEMORANDUM

TO: Senator Edmund S. Muskie
FROM: Leon G. Billings
SUBJECT: Summary of Energy Emergency Legislation

I have been asked to attend a meeting at 2:00 p.m. today to begin to work out a "compromise emergency energy bill" with Administration spokesmen. I have also been informed that Senator Jackson announced that the staffs of the Congress and the Administration would work through the weekend in order to have a proposed bill by Monday. Finally, I have been informed that it is Senator Jackson's intent to seek action in the Senate on such legislation before the end of next week.

This procedure virtually precludes the possibility of hearings by the Subcommittee on the environmental aspects of any such proposal. It also precludes any legitimate public comment on the overall implications of such a proposal. I find it difficult to believe that the public is interested in vesting Draconian powers in the President at this time, especially permanent powers rather than temporary emergency authority. The fact that the Administration bill would waive virtually all regulatory functions including all procedural safeguards for virtually every check on the energy industry is simply overwhelming in its implications. Therefore, I thought it would be useful to summarize for the environmental issues the facts as we know them versus the fictions which have been generated.

1. Distillate fuel oil - it is true that there is a shortage of distillate fuel oil. It is not true that that shortage was caused by environmental requirements. The shortage is due to cutbacks in "interruptable" supplies of natural gas to utilities, which gas was used in turbine peaking units. The only substitute for gas in these units is distillate fuel oil (or load shedding of interruptable industrial and commercial loads). This shortage, according to the best information available to us, amounts to 200,000 barrels per day. There is no substitute for this distillate, either high or low sulfur and, if there was, EPA's variance procedure would be more than adequate to handle the temporary situation posed by peaking facility needs.
The oil companies had hoped to obtain additional distillate to make up a national shortage of 550,000 barrels per day from Europe. This source is now dried up. The alternative has nothing to do with air quality standards. There appears to be little real option except to prohibit use of distillate fuel oil in peaking units and require "load shedding" as an option unless the utilities can demonstrate that "load shedding" would have an adverse effect on public health and safety. The remainder of the distillate short-fall would have to be made up through a priority distribution system. In the longer term, the national distillate short-fall will have to made up through greater emphasis on distillate production in our refineries and less emphasis on production of gasoline. This will require limitations on the consumption of gasoline.

2. Residual oil -- it appears that there will also be a short-fall in the available supply of residual oil because our European sources have dried up and because the Middle Eastern oil refined in the Caribbean and trans-shipped to the Northeast has now been cut off. This residual oil is high sulfur. Venezuelan, Canadian and domestic residual oil is low sulfur. Here again the issue is not directly an air quality problem -- it is a supply problem. If there is enough residual oil to go around, and it is properly distributed, it will have acceptable sulfur content. In the absence of sufficient residual oil, it appears that authority may be required to direct or permit conversion to coal. The attached letter from Administrator Russell Train to Energy Director John Love suggests an available procedure. So far as I know the only legislation required here would be authority for the President to direct the conversion. It may be that there are modifications which can be made in the Clean Air Amendments to expedite the Administrator's decision and to enhance his capability to deal with problems. Certainly, everyone recognizes that reversion to coal has to be more than an emergency measure. The coal industry and the railroads will not be able to gear up to supply the increase demand without some kind of guarantee that their investment will be compensated. Certainly, no new mines will be opened on the basis of emergency measures nor will railroad cars be diverted or coal handling facilities be installed.

3. Gasoline -- it is counter-productive to discuss the gasoline shortage in the context of the current crisis. It is cars on the road, not cars that will be produced that primarily contribute to the demand for gasoline. Even if environmental requirements could somehow be altered to reverse the situation, available evidence indicates that tougher standards will enhance, rather than restrict fuel economy.
4. Nuclear power -- there is a provision in the Administration's proposal to eliminate part of the hearing process for the Atomic Energy Commission to permit more rapid construction of nuclear power plants. The fundamental effect of this would be to shortcut procedural protections (eliminate public power suits, environmental suits, safety suits, etc.). It would have no effect whatsoever on either the near or the middle term energy crisis. A nuclear power plant takes twelve years to build. Six months more or less is irrelevant. At least if this issue is significant, it can be handled in legislation from the Joint Committee on Atomic Energy because no power plants which would have any relevance to today's energy crisis would be affected by this provision.

5. Water Pollution -- there is absolutely no justification to consider any change in laws relating to water pollution in terms of the current crisis or any anticipated crisis. Effluent guidelines for refineries, power plants, and other energy facilities have not even been issued. Permits for these facilities are not required under the Act before the end of next year and that may be optimistic. Schedules of compliance for those plants will run over a two and one-half year period and virtually all of them have scheduled outages annually for regular repair. According to our information, water pollution control facilities can be phased in during scheduled outages. This is a ridiculous provision. Even if, in the future, an individual facility was confronted with a difficulty associated with meeting short-term energy demands, legislation would not be required until after July 1, 1977. This is an example of what EPA described as an attempt by the Office of Energy Policy to deal with 1979 problems in 1973 rather than dealing with the energy crisis.

6. Preemption -- the White House and the conservatives want to preempt State and local regulations which affect the siting and operation of energy generating facilities. Purportedly, this would permit the President to overrule State and local environmental requirements. I have talked to State Administrators about this question. I know of no incidence in which they have indicated a reluctance to mesh environmental requirements with fuels availability. Their problem is and has been knowing what fuel of what sulfur content is available so that fuel can be properly distributed among competing sources in order to minimize environmental degradation and maximize energy output. Unfortunately, it is very much in the private interest to remove the capabilities of States and local governments to determine the course of their own affairs vis-a-vis the environment. Unlike many other areas, many States have been vigorous in this regard. Environment is a much more significant issue at the State and local level than it appears to be at the Federal level. I think that preemption at this time on this issue would be unwise. To argue that preemption is necessary to deal with the energy crisis is to argue that Governors compromise the public health and welfare demand for an adequate supply of heating oil for short-term environmental enhancement. As a practical matter, the reason that the White House and
utilities want to overturn State authority is because the States have been using their capabilities under the Clean Air Act to force utilities to install stack gas scrubbing equipment. To remove this authority and thus remove this pressure would not increase the availability of energy, but only continue the use of high sulfur fuels without any corresponding regulation of stack gas emissions.

ATT.
MEMORANDUM

TO: Senator Thomas F. Eagleton

SUBJECT: Background Material for February 24 Air Oversight Hearing

The Copper Industry

Background: Copper smelters annually pour four million tons of sulfur oxide (SO₂) into the atmosphere. Some smelters also cause significant degrees of acid pollution to air and land in their immediate area. The SO₂ from copper smelters constitutes 1/9 of the total SO₂ problem with steam generators for electric power the largest source of SO₂ pollution -- 20 million tons annually in damage to personal health and property. About $1 billion of this would be chargeable to smelters.

One example of the problem is the Tacoma, Washington smelter of the American Smelting and Refining Company (ASARCO). It pours an average of 22 tons of SO₂ into the atmosphere each hour. Also, because of the smelter, arsenic levels in the air over Tacoma are eight times the national average. The smelter has been estimated to cost Tacoma citizens $8 million a year in household damages.

A closed loop enforcement system was applied to the smelter in March 1968; in two years of operation 282 violations were reported. For these violations, the only sanctions imposed were 13 civil penalties of $250 each which ASARCO paid under protest. Today the smelter is under a mandate to achieve a 90% reduction of emissions by 1976.

Position of the Copper Smelters Re 1970 Clean Air Amendments: During 1969 and 1970, before passage of the 1970 Amendments, most smelters faced actual or proposed regulations by their States (Arizona, Montana, Nevada, Utah and Washington) which would require a 90% reduction in emissions. These regulations, opposed by the smelters, were supported by EPA and its predecessors (as summarized in the August 18, 1970 memo) with estimates that total capital costs for smelters to achieve this emission level would approximate $87 million.
By early 1971, smelters in several States had recognized that deadlines were approaching and had begun action to meet the 90% limitation. In Arizona, for example, Kennecott presented a plan for cutting SO₂ emissions from 361 tons to 32 tons a day and Kennecott and two other smaller smelters indicated that they could comply within a reasonable time.

The smelters also began working, through the Mining and Non-Ferrous Metals Sub-Council of NIPCC, to gain a reversal of the EPA data supporting the 90% limitation. A key element of this effort was the March 8, 1971 sub-council meeting which included technical presentations by key men in the copper industry. In 1970 the copper companies had organized the Smelter Control Research Association, a joint effort which apparently yielded the data with which the copper companies argued that the 90% standard was impossible to achieve. The joint research effort was headed by Mr. David Swan, a Vice President of Kennecott.

The main points made by smelters in opposing the 90% limitations are:

1. That it is too costly. A Fluor, Utah study places capital costs at between $264 and $607 million, depending upon several variables.

2. That ambient air quality standards, not emission limitations, are the best device to obtain a true measure of air quality. Emission limitations impose an across-the-board solution that is not appropriate to all situations.

3. That the "closed loop" enforcement device is the best control strategy. The 16 smelters could obtain the necessary weather station and monitoring devices for this strategy for $300,000 - 500,000 each.

4. After the Clean Air Amendments were passed, the smelters argued to the States that ambient air quality standards were mandated by the Federal law. (They also challenged the Federal secondary standard for SO₂ in court and won a favorable court of appeals decision on February 18 of this year.)

5. After publication of the August 1½ guidelines the smelters used the cost-effectiveness language combined with their high cost estimates and the specter of lost jobs to pressure States to retreat from the 90% limit.

Recent Developments: After publication of the August 1½ guidelines with cost effectiveness language, Nevada and Utah backed away from the 90½% limit they were considering. Citing the "cost effectiveness" language, the Anaconda Corporation asked for a hearing on the Montana standard which
had previously appeared certain to be imposed. Despite EPA repudiation of its prior position on costs and White House intervention supporting Anaconda, the Montana board kept the 90% emission limitation, but the Governor refused to sign the plan, citing economic factors.

In Arizona, the board of health deleted any reference to SO₂ emission limitations from its plan, despite the fact that a year earlier most smelters had presented plans for achieving 90% emission reduction.

On December 11, 1970, Phelps-Dodge testified before the Arizona Board that it had a plan to meet the emission standards.

On January 8, 1971, Mr. Ivor G. Pickering of Kennecott testified before the Arizona Board that Kennecott did indeed have a plan to meet the Arizona standard and that this plan would ultimately result in emission of only 32 tons of sulfur a day into the atmosphere compared to the current rate of 361 tons a day -- a 91.1% removal rate.

On October 20, 1971, Phelps-Dodge filed a petition for reconsideration of the emission limitations, citing the EPA guidelines and new (and much higher) cost data as grounds for reconsideration.

At about that time, Kennecott and most of the other Arizona smelters filed a joint petition urging reconsideration. That petition stated:

"On August 14, 1971, the federal Environmental Protection Agency (EPA) issued final regulations for the development of state implementation plans to achieve national ambient air standards. These regulations reflect a new attitude by the federal authorities toward emission control standards. Contrary to the views of certain federal representatives that were previously presented to this Board, the new regulations now make clear that:

"No fixed uniform emission standard, such as the 90% standard, is necessarily appropriate or desirable.

"Control strategies for major emission sources should be directed toward meeting ambient standards and should be flexibly tailored to local conditions.

"Alternatives to fixed emission standards, including temporary curtailments in production during adverse conditions, should be considered by the states and adopted where appropriate.

"Consideration of costs, cost effectiveness and social and economic consequences should play an important role in the selection of control strategies."
"As explained in this petition, these new national policies require reconsideration of Arizona's present approach to air quality control."

Despite this, Kennecott technical people reaffirmed that a 90% emission reduction was possible in a presentation to the Arizona board in January 1972.

A Strategy for Questioning the Copper Companies:

1. Establish that in 1970 and early 1971 several companies were seriously planning to meet 90% emission limitation deadlines set by States, particularly Arizona.

2. Establish the extent of their joint working relationships by inquiry into:
   
   a) joint research activities like the Smelters Joint Research Association or a cooperative sulfur reduction plant being developed by Phelps-Dodge and Kennecott in El Paso, Texas;
   
   b) hiring of consultants such as Fluor-Utah on a joint basis;
   
   c) work within NIPCC;
   
   d) work within their trade association, the American Mining Congress.

3. Question the value of these joint efforts. Do they contribute to progress or just provide a convenient cover under which to develop alibis why progress is not being made?

4. Bring out the companies' loss of resolve to meet the 90% limitations in late 1971 as a result of:

   a) Their cooperative (collusive) activity in getting together to present a solid front, saying it can't be done.

   b) EPA's August 14 guidelines which gave new technical, legal, and political levers to pressure States through 1) cost effectiveness language, 2) the change in Appendix B which stated that 90% emission reduction might not be technically feasible in all cases, and 3) deletion of the requirement for emission limitations.

   c) White House and NIPCC advocacy of the smelters' cause and EPA's retreat from its previous support of State emission limitations.

5. Establish the smelters' strong support for ambient air quality standards as a better enforcement standard than emission limitations, and their view of the closed loop system as the best control strategy.
6. Ask why, if they support ambient air quality standards, they have attacked the EPA SO₂ ambient air quality standards in court.

7. Bring out the serious problems with enforcing the ambient air quality standard through the closed loop system.

8. Close with a strong statement on public responsibility, citing the serious air pollution problems smelters create, their failure to deal with these problems, their alleged support for but actual court attack on ambient standards, their retreat from plans to meet emission limitations, and the shallowness of the "closed loop" alternative.
MEMORANDUM

TO:    Senator Edmund S. Muskie
FROM:  Leon G. Billings
SUBJECT: Intermittent Control Strategies

You asked Mr. Hubert Nexon of Commonwealth Edison to comment on the enforceability of so-called supplementary control strategies. Nexon subsequently commented in the attached letter, the key paragraphs of which are as follows:

"One of the subjects on which you expressed concern was the possibility that difficulty of enforcement would prevent supplementary control systems from serving as a suitable alternative to constant emission controls. I believe that the kind of system we plan to install will be responsive to that concern.

"Our supplementary control system will consist of three principal elements: (1) a means of acquiring all of the weather and related data required to predict the impact of any given level of emissions on ambient air quality, (2) a predictive model which will utilize these data to describe expected conditions, and (3) a set of monitoring installations around the emission source, to show exactly what is happening to the ambient air at all times. Both the predictions and the output of the monitoring installations will be provided continuously to our control center so that station operations can be conducted in such a way as to avoid violation of air quality standards. The system will provide highly computerized records of data acquisition and analysis, the indications from the data of necessary action, the response to such indications, and ambient air conditions. There will be a clear set of records to show compliance or non-compliance. Indeed, it is no great task to provide all this information on a real-time basis through telecommunication to the appropriate regulatory agency. The enforcement task is, therefore, entirely manageable."
You will note that Nexon does not deal with the fact that none of the three aspects of the supplemental control strategy he proposes to use are "constants". He does not admit to any limitations on the capacity to anticipate meteorological conditions; he does not admit to any limitations on the ability to create accurate "predictive models" for air pollution; and, he does not admit to any limitations on the ability to monitor accurately the impact of emissions on air quality in either a complex or a single source area.

These points are made only to describe specific limitations in his proposal.

More important than these concerns are the questions which Mr. Nexon does not address at all. For example, under the Clean Air Act there is no such thing as a "violation of air quality standards". Air quality standards are an achievement measure -- the performance goals of an emission control strategy. State implementation plans are required to set forth emission limitations needed to meet and maintain ambient air quality standards on a specific time schedule with such emission limitations adapted to each source of each pollutant in question.

There would be no emission limitations under the Commonwealth Edison plan. There would be no fixed end point in which compliance would be achieved. And, even if air quality standards were enforceable, it would be a constant, continuous day-by-day basis. There would be no basis for judging the performance of one source against another in regard to an air quality effect in a complex area because each source would have no specific, legally enforceable requirement to meet.

There would be no credible measure of air pollution control against which the public could judge the performance of the polluter. And, most important, there would be no legal basis against which to take an action if the polluter failed to perform.

This latter point, of course, could be rectified by modifying the Act and making air quality standards the enforcement mechanism. But even then, all enforcement actions would be taken as a condition subsequent to the violation. The adverse health effect would have occurred prior to any enforcement action. And, even if the polluter agreed to take responsibility for violations of standards, there would be no mechanism to prove such a violation occurred or would be caused by the source in question.

Of course, supplementary control strategies should not be precluded as means of dealing with air pollution emergencies. Plant closure, shifting of fuels, reduction in production, and so on, are all essential elements to air pollution emergency strategies associated with a meteorological condition which causes the build up of pollution. As such, supplementary control strategies should be endorsed as emergency control measures.
Also, supplementary control strategies may be the only option after the best available technology for emission limitations achievement has been applied. This is not likely the case and should not be written into the law because of the kind of loophole it would create. But, it is something to bear in mind. One final point: if supplementary control strategies become the base method of control as proposed by Commonwealth Edison, then there are no tools left to utilize in the event of a prolonged air pollution emergency other than massive plant closures and the associated economic and social disruption.

While Commonwealth Edison and others are prepared to propose load shifting as a means of control (reducing plant output as needed to "maintain air quality standards") load shifting is neither an appropriate nor adequate mechanism on which to base the control program. I find it highly unlikely that under significant pressure from interconnected utilities that Commonwealth Edison would reduce its plant output during a period of general air pollution across the midwest and eastern United States if the effect of that would be to cause other areas to have to shed industrial, commercial and residential loads. And while Commonwealth Edison may be convinced that there is an adequate backup and supply of surplus capacity in the area in which it is interconnected, this runs counter to the general testimony of the electric utilities who argue that environmental controls should be delayed because of the need to use all available capital to build new plants to meet new demand.
July 9, 1975

MEMORANDUM

TO: Senator Edmund S. Muskie

FROM: Leon G. Billings

SUBJECT: Intermittent Control Strategies

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"One of the subjects on which you expressed concern was the possibility that difficulty of enforcement would prevent supplementary control systems from serving as a suitable alternative to constant emission controls. I believe that the kind of system we plan to install will be responsive to that concern.

"Our supplementary control system will consist of three principal elements: (1) a means of acquiring all of the weather and related data required to predict the impact of any given level of emissions on ambient air quality, (2) a predictive model which will utilize these data to describe expected conditions, and (3) a set of monitoring installations around the emission source, to show exactly what is happening to the ambient air at all times. Both the predictions and the output of the monitoring installations will be provided continuously to our control center so that station operations can be conducted in such a way as to avoid violation of air quality standards. The system will provide highly computerized records of data acquisition and analysis, the indications from the data of necessary action, the response to such indications, and ambient air conditions. There will be a clear set of records to show compliance or non-compliance. Indeed, it is no great task to provide all this information on a real-time basis through telecommunication to the appropriate regulatory agency. The enforcement task is, therefore, entirely manageable."
You will note that Nexon does not deal with the fact that none of the three aspects of the supplemental control strategy he proposes to use are "constants". He does not admit to any limitations on the capacity to anticipate meteorological conditions; he does not admit to any limitations on the ability to create accurate "predictive models" for air pollution; and, he does not admit to any limitations on the ability to monitor accurately the impact of emissions on air quality in either a complex or a single source area.

These points are made only to describe specific limitations in his proposal.

More important than these concerns are the questions which Mr. Nexon does not address at all. For example, under the Clean Air Act there is no such thing as a "violation of air quality standards". Air quality standards are an achievement measure -- the performance goals of an emission control strategy. State implementation plans are required to set forth emission limitations needed to meet and maintain ambient air quality standards on a specific time schedule with such emission limitations adapted to each source of each pollutant in question.

There would be no emission limitations under the Commonwealth Edison plan. There would be no fixed end point in which compliance would be achieved. And, even if air quality standards were enforceable, it would be a constant, continuous day-by-day basis. There would be no basis for judging the performance of one source against another in regard to an air quality effect in a complex area because each source would have no specific, legally enforceable requirement to meet.

There would be no credible measure of air pollution control against which the public could judge the performance of the polluter. And, most important, there would be no legal basis against which to take an action if the polluter failed to perform.

This latter point, of course, could be rectified by modifying the Act and making air quality standards the enforcement mechanism. But even then, all enforcement actions would be taken as a condition subsequent to the violation. The adverse health effect would have occurred prior to any enforcement action. And, even if the polluter agreed to take responsibility for violations of standards, there would be no mechanism to prove such a violation occurred or would be caused by the source in question.

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Also, supplementary control strategies may be the only option after the best available technology for emission limitations achievement has been applied. This is not likely the case and should not be written into the law because of the kind of loophole it would create. But, it is something to bear in mind. One final point: if supplementary control strategies become the base method of control as proposed by Commonwealth Edison, then there are no tools left to utilize in the event of a prolonged air pollution emergency other than massive plant closures and the associated economic and social disruption.

While Commonwealth Edison and others are prepared to propose load shifting as a means of control (reducing plant output as needed to "maintain air quality standards") load shifting is neither an appropriate nor adequate mechanism on which to base the control program. I find it highly unlikely that under significant pressure from interconnected utilities that Commonwealth Edison would reduce its plant output during a period of general air pollution across the midwest and eastern United States if the effect of that would be to cause other areas to have to shed industrial, commercial and residential loads. And while Commonwealth Edison may be convinced that there is an adequate backup and supply of surplus capacity in the area in which it is interconnected, this runs counter to the general testimony of the electric utilities who argue that environmental controls should be delayed because of the need to use all available capital to build new plants to meet new demand.
July 29, 1975

MEMORANDUM

TO:        Senator Edmund S. Muskie

FROM:      Staff

SUBJECT:   Intermittent Control Strategies/Tall Stacks Relationships to Long Range Transfer of Pollutants and Ecosystem Deterioration

In addition to the impossibility of enforcement of intermittent control and tall stack strategies discussed in a separate memo, these strategies are premised upon pollution dilution or packing the biosphere with pollutants. As such they argue strongly, without regard to questions of enforceability, for reduction of emissions at the source.

Independent research performed in Europe and in the United States (not supported by EPA) has revealed dramatic changes in the character of rainfall downwind (as much as 1000 miles) of urban/industrial centers. These changes are commonly called "acid rain" and relate to the increase of emissions of sulfur and nitrogen and the hydrolysis (adding water) and oxygenation (adding oxygen) in the atmosphere.

The figures are staggering. In a 10-year period 1967-1973 for which data are available in New Hampshire the acidity of rain has increased 36% and is now 50 to several hundred times what natural rainfall would be. The phenomenon is pervasive, especially in the northeast U.S. (the attached map summarizes the distribution) and is producing a wide range of adverse effects. These include effects on terrestrial and aquatic ecosystem, as well as serious deterioration of man made structures and a significant decline in visibility.

Dr. Schofield of Cornell reports: "My research in the Adirondack Mountain region of New York indicates that atmospheric deposition of strong mineral acids ("Acid precipitation") does produce acid levels in the dilute lakes and streams of this remote, wilderness area that are detrimental to fish and other aquatic organisms."

Cogbill and Likens have summarized the literature on the effects of acid rain and have reported:
"Acid precipitation has been falling on almost everything in the Northeast for a considerable period of time. It can affect plants, animals, and inanimate objects.

"Acidity can cause increased leaching of nutrients from foliage (Baton et al., 1973, Wood and Bormann, 1974a), disruption of leaf physiology and growth (Wood and Bormann, 1974b), and possibly increased leaching of soil cations (Overrein, 1972). All the above might contribute to lessened plant growth. Such an effect has been suggested for Scandinavia (Johnson and Sundberg, 1972) and for the northeastern United States (Whitaker et al., 1974). However, forest ecosystems are complex and are subjected to a variety of environmental influences. Acid in precipitation can also lead to an acidification of lakes and streams and thus damage aquatic ecosystems, including fish populations (Bolin, 1971; Beamish and Harvey, 1972, Almer, et al., 1974.)

"Damage to man-made structures can occur with increased weathering of buildings or corrosion of metal objects. Protection of ecosystems is especially difficult for such a widespread problem, which extends over regions very remote from sources. The origins within the source regions as well as exact paths and mode of delivery of acid must be identified. Control then must be implemented at the source of the acid-forming emissions. In this way, changes can be made to avoid damage from an apparently major anthropogenic problem."

Although the long range transport problem is most often identified and described in the context of acid rain ($\text{SO}_2$ and $\text{NO}_x$) the pattern is also exhibited with oxidants, lead, and many other pollutants.

In summary the following points argue against ICS/tall stacks:

1. The atmospheric is not a "sink" for pollutants. Once emitted, pollutants re-enter ecosystems, often many miles distant, to cause serious effects.

2. The release of pollutants, to the air is a waste of resources, sulfur for existence is a commercial product.

3. ICS and tall stacks are unenforceable strategies.

4. ICS and tall stacks repress the development of technology, as they provide an option to control of the emissions of pollutants and induce negotiable agreements over "models"