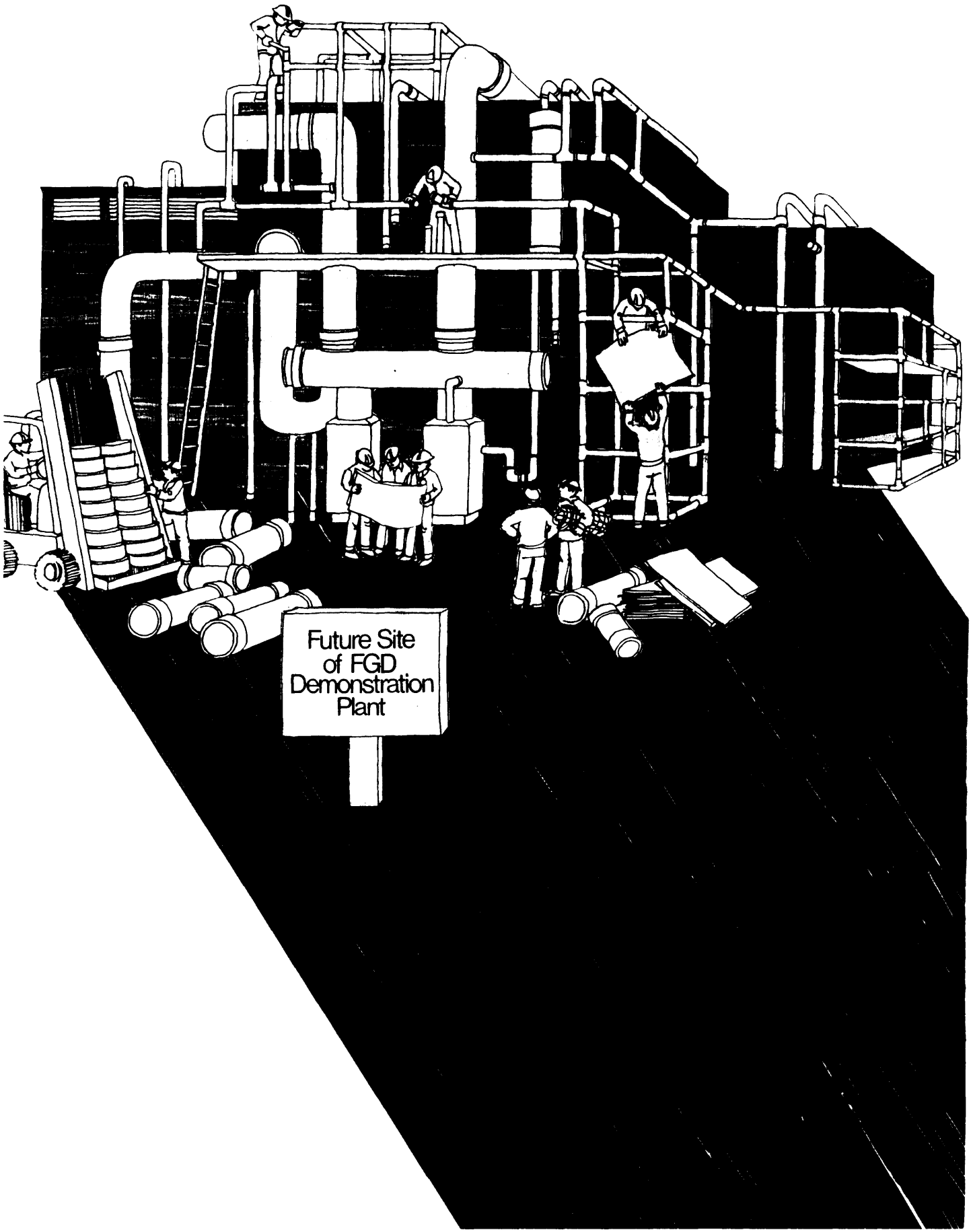
III. Control and Abatement Technology Research


Future Site
of FGD
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III. Control and Abatement Technology Research

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III. Control and Abatement Technology Research

INTRODUCTION

During the past 10 years, Federal environmental control efforts have been complemented by new initiatives in the private sector. These initiatives have included the development of major new industries in such areas as environmental monitoring, pollution control, and industrial process modification. With the growth of these new capabilities, alternatives and supplements to publicly funded control efforts have been created. Evaluation of the control technology elements of the ORD 5-Year Plan raises issues regarding the balance, substance, suitability, and utility of the planned research program.

Research Balance

EPA efforts planned in the development of control technologies appear to favor large demonstration projects as opposed to striking a balance with exploratory research projects. At this time, greater benefit may possibly result if ORD conducted more exploratory research projects and less large demonstration projects. (Issue 1)

Research Suitability

In general, the Extraction and Processing Technology subprogram relates poorly to program objectives and funding estimates. There may be unproductive overlap between ORD's planned efforts and those of other Federal agencies. (Issue 2)

In the area of flue-gas desulfurization (FGD), the ORD Plan projects significant expenditures to develop technology based on "throwaway" processes. Because such technology is now commercially available, further efforts on first-generation FGD systems appear unnecessary. If it is the intention of EPA to work on second-generation technology which recovers sulfur products, then the Agency should present the information required to justify that course of action. It is necessary to demonstrate: first, that sludge disposal poses serious environmental problems; and second, that there are insufficient incentives for private industry in this area. (Issue 3)

ORD seeks to develop environmental-control technology for offshore oil and gas production. The extensive efforts of both private industry and Government agencies such as the U.S. Geological Survey and the U.S. Coast Guard appear to have not been adequately recognized. The ORD program in this area may duplicate current work outside EPA. (Issue 4)

The EPA, through ORD, conducts extensive research which can be used as the basis for promulgation of EPA standards and regulations. So long as EPA performs the dual role of developer and regulator, some may claim that EPA promotes its own control technology versus other approaches to compliance with its standards. (Issue 5)

Research Substance

Mobile source emissions are a significant source of environmental pollution. Several agencies, including EPA, ERDA, as well as the Department of Transportation, work in this area. While EPA's automotive engine technology program has been transferred to ERDA, gaps still exist in the basic data and management methodologies and they need to be filled in order for EPA to reduce transportation emissions as mandated. (Issue 6).

A problem which is receiving increased attention concerns small particle control technology. Such particles, those less than 3 microns in diameter, are now recognized as a substantial health problem. The ORD Plan underemphasizes the need to develop control and monitoring technology in this area. (Issue 7)

The ORD Plan for Minerals, Processing, and Manufacturing focuses on creating a data base for air and water standards established by law. However, the Plan fails to discuss research associated with the identification and control of pollution from new industrial technologies, changes in raw material usage, or new requirements in industrial energy. *(Issue* 8)

The ORD Plan does not indicate the direction of its solid waste management research program. Also not discussed are coordination and balancing of various alternatives and the meshing with ERDA's energy recovery program. (Issue 9)

Technology Transfer

Useful technology has been developed by ORD for secondary and tertiary wastewater treatment and for community-systems wastewater and sludge management. Because the required technology has high operating costs relative to original capitalization and Federal funding concentrates on capital costs, not operating costs, it is important that available R&D information be translated into practice in communities across the Nation. ORD needs to commit additional resources to researching the economic and institutional problems of secondary and tertiary wastewater management as well as the nonstructural approaches to wastewater treatment practices. (Issue *10*)

III. Control and Abatement Technology Research

ISSUES

BALANCE BETWEEN EXPLORATORY RESEARCH AND DEMONSTRATION OF CONTROL TECHNOLOGY

Issue 1

The Plan neglects exploratory research while emphasizing the demonstration of control systems that are readily applicable to cope with mandated emissions standards.

Summary

The EPA has an extensive mandate to identify, develop and, where necessary, to demonstrate control technology which is applicable to air and water pollutant emission standards. While a number of demonstration projects have been funded, insufficient resources are devoted to exploratory or fundamental research into control principles or novel control approaches. These areas should receive greater attention if effective and economic control options are to be developed to meet the long-term needs of the Nation. Such efforts should be detailed in the Plan.

Questions

1. How does EPA identify exploratory research opportunities?

2. What has been EPA's experience in funding exploratory research? What have past efforts yielded?

3. What portion of EPA's budget is earmarked for exploratory control methods research? What expenditure level would be sufficient to meet long-term national needs in this respect?

4. What exploratory research is EPA conducting to identify pollution control technologies which consume less energy than present systems?

5. What exploratory pollution control research is being carried out by other agencies? How is it coordinated with EPA's research ?

Background

Regulatory requirements have affected the allocation of research resources among exploratory, developmental, applied, and demonstration projects in ORD's control systems research. Emphasis has been placed on identifying, demonstrating, and refining existing technological options. This is an appropriate emphasis in the control program. However, it has been developed in the Plan to the virtual exclusion of exploratory work essential to long-term development of environmental controls in new technology areas.

The Plan indicates that several demonstration plants are being funded, but it reveals scant information on planned exploratory or fundamental research. The funds allocated for just one of these plants could support a variety of exploratory projects. For example, the chemical form in which nitrogen exists in coal, oil, or shale oil is not well enough understood. If it were, a method for removal of the nitrogen might be conceived, thereby reducing or eliminating NO_x emissions from combustion of those fuels.

EPA-funded research into new methods of physical coal cleaning has led to the identification of promising techniques for removing inorganic sulfur from coal. The research in the physical coal-cleaning area appears to have undergone a logical transition from an analysis phase, in which fruitful areas of control technology were identified, to an exploratory phase, in which a significant number of exploratory projects were carried out, and finally to a technology-developed phase. Such an approach may constitute an appropriate model for other areas of control technology research.

In sum, increased support for exploratory research is warranted.

ENERGY EXTRACTION AND PROCESSING TECHNOLOGY

Issue 2

The projects listed in the Energy Extraction and Processing Technology subprogram appear to relate poorly to the program objectives and funding estimates. The projects do not seem to be planned with a sufficient awareness of existing control technology and research activities outside EPA.

Summary

Since coal is expected to play a major role in satisfying the Nation's energy needs, it is appropriate that the ORD Plan emphasize research to achieve environmentally acceptable use of this resource. The Plan also acknowledges a significant potential for energy recovery from waste, biomass, solar and geothermal sources but does not include projects to enable ORD to assess the environmental implications of large-scale use of these energy sources. ORD does not explain how projects to produce new technology to desulfurize oil will represent an improvement over existing technology.

In general, there may be duplication of effort in this area of research between ORD and other Federal agencies as well as an inability to accomplish significant progress at the proposed funding level because of the large number of tasks identified.

Questions

1. What projects have been formulated to assess the environmental implications of large-scale use of new energy sources such as biomass, solar and geothermal?

2. What is the relationship between EPA, ERDA, and the U.S. Bureau of Mines programs in developing environmentally acceptable new technologies for mining and use of coal and the work proposed by ORD?

3. The Federal Government has devoted substantial effort for many years to support R&D in the area of acid drainage control from coal mines, and control techniques are now available. Why does the Plan suggest more research in this area?

4. In view of existing commercial processes for desulfurizing oil, what is ORD's justification for developing control technology in this area ?

Background

To meet national energy needs, techniques must be developed to permit increased coal use in an environmentally acceptable manner and encourage the commercialization of alternative energy sources. In recognition of this, the ORD Plan defines a large number of broad programs aimed at reducing the environmental impacts of coal use. Since increased use of coal can impact quickly and significantly on our energy needs, this emphasis is proper. However, the Plan ignores environmental research into other potential energy sources. Although a project is proposed to develop a data base for oil shale mining, definitive projects aimed at assessing the environmental implications of large-scale use of other energy resources—such as geothermal, waste, biomass, solar, and wind-are absent. These energy resources, although further from commercialization, should be studied now because environmental constraints may influence the course of their utilization. For example, the problems of hydrogen sulfide evolution during the processing of geothermal brines and the difficulties of disposing of these mineral-laden liquors could seriously delay use of this resource unless solutions are found.

The Bureau of Mines proposes to spend in excess of $250 million over the next 5 years to develop new coal-mining systems with enhanced productivity and improved environmental performance. The ORD Plan does not indicate how or if ORD and the Bureau of Mines will cooperate on this large program.

A variety of Federal and State agencies for many years have supported research in the area of acid mine drainage control. As a result

Acid drainage from mine near Rico, Colorado.

of this work, the causes of the problem are now well understood and a variety of control systems have been tested and commercially demonstrated. In light of these accomplishments, the need for further work by ORD in mine drainage control is questionable.

The petroleum industry currently uses catalytic hydrogenation processes to reduce the sulfur content of refined products. These processes can also be used in the treatment of liquids from oil shale, tar sands, and coal. In view of the present availability of technology for desulfurizing oil, ORD has not presented adequate justification for the further development in the control technology area.

Finally, it is difficult to understand how significant progress can be accomplished in the large number of projects which have been defined and targeted for completion by 1980. The proposed annual budget of $15 to $30 million appears to be seriously inadequate. The program would have more credibility if it contained an explanation of priorities among the research tasks along with expected timetables and milestones for their achievement.

DEMONSTRATION OF FLUE-GAS DESULFURIZATION TECHNOLOGY

Issue 3

The commercial availability of flue-gas desulfurization (FGD) technology indicates a need to reevaluate the ORD development program in this area.

Summary

There appears to be little justification for ORD to continue spending large sums of money on FGD systems based on so-called "throwaway" processes, because these systems are commercially available. Although continued research is needed on second-generation FGD systems designed to recover sulfur products, ORD has not established a justification that the Federal Government should do it.

Questions

1. What is the justification for ORD funding "throwaway" FGD systems when they are already commercially available?

2. What conflicts of interest exist when EPA is both the regulator as well as the developer of FGD technology?

3. Do adequate incentives currently exist for private industry to develop second-generation, regenerable FGD systems? If not, how will ORD funding in this area significantly hasten the introduction of advanced systems that recover sulfur products?

Background

Over the past 5 years, ORD has funded a number of flue-gas desulfurization demonstrations, The primary emphasis has been placed on the so-called "throwaway" processes using lime or limestone as the absorbing alkali. Although some have criticized EPA's role in the development of FGD technology, it is generally acknowledged that the demonstration projects and symposia supported by EPA have advanced the state of the art and hastened commercialization of the technology. Today there are about a dozen FGD manufacturers who have expertise in designing workable lime/limestone systems. Since the "throwaway" flue-gas desulfurization system is now commercial, there seems little reason for continued ORD involvement. The ORD Plan states that "R&D efforts will focus on remaining problems such as upgrading operating performance and reliability, minimizing costs, waste product disposal problems and treatment, and byproduct recovery." These activities are properly carried out by manufacturers, to improve the competitive advantages of their product. As such, the justification for the three test systems at Shawnee—the Louisville Gas & Electric test program, the pilot and prototype double alkali FGD program, and Bakco FGD systems—is weak at best.

The development of second-generation FGD systems designed to recover sulfur products raises somewhat different questions. There are many areas of the country, especially urban areas, where it is impractical to dispose of the calcium-sulfur sludges resulting from the operation of "throwaway" FGD systems. If EPA can make a case that industries manufacturing FGD systems lack incentives and/or resources to develop the sulfur recovery technology, then a basis would be established for ORD work in this area.

ENVIRONMENTAL CONTROL IN OFFSHORE PETROLEUM OPERATIONS

Issue 4

The proposed Office of Energy, Minerals, and Industry program to develop environmental control technology for offshore oil and gas production apparently does not recognize existing industry programs and technologies.

Summary

The EPA/ORD Office of Energy, Minerals, and Industry (OEMI) proposes to develop and demonstrate control technologies to minimize adverse environmental effects from the installation and operation of offshore oil and gas production facilities, including platforms, pipelines, and other transportation systems, and onshore terminal facilities. The Plan does not specify definitive goals for R&D in offshore pollution-control technology. Further, the program statements convey the impression that ORD may be pressed into an area where their expertise is undeveloped compared to that already developed by the private sector in response to regulations. If this is true, then EPA's entry into a hardware development program related to the offshore oil and gas extraction industry may be questionable. Federal involvement already exists through agencies such as the U.S. Geological Survey and the U.S. Coast Guard. The EPA program may be more usefully directed toward biological and geological research in the coastal and marine environment. EPA can also provide the needed coordination of Federal activities in the offshore area.

Questions

1. Has OEMI thoroughly investigated the available technology in the offshore pollution-control industry?

2. What environmental control technology research for offshore operations is being carried out in other Federal and State agencies?

3. How does EPA intend to identify research opportunities in the offshore area, or have they already done so? Are these efforts coordinated with efforts in the U.S. Coast Guard, Department of the Interior, etc. ?

4. What effect will EPA's entry into the offshore control systems development area have on private-sector work in the same area?

Background

The offshore petroleum industry is into its third decade of development. Recently, private industry has emphasized the safe and efficient extraction of oil and gas. The efforts of industry in developing control technology, not only in preventing oilspills, but also in the areas of leak-detection systems, underwater completion devices, automated drilling procedures, general-support equipment development, waste management priorities, and pipeline construction need to be reflected in an ORD evaluation of the state of the art when initiating hardware development in the offshore area. Since hostile environments may present different problems, a Federal exploratory control technology program for offshore development of oil and gas in hostile environments may be necessary,

The social-environmental impact of offshore development upon onshore communities is being studied in Louisiana, Delaware, New Jersey, Texas, California, and other coastal regions. Yet, more research remains to be done. There are also many areas of biological and geological research in the

coastal and marine environment which need further attention. These are activities in which EPA should be involved. The proper EPA role in the control of offshore petroleum operations should include coordination of Federal activities.

POTENTIAL CONFLICT OF INTEREST WITH REGARD TO EPA RESEARCH ON ENVIRONMENTAL CONTROL TECHNOLOGY

Issue 5

The Plan does not adequately define ORD's role in developing and demonstrating environmental-control technology which may subsequently form the basis for promulgation of EPA emissions standards.

Summary

As was the case with the now defunct Atomic Energy Commission, any agency of the Government which both develops a technology and regulates its use may come under suspicion of favoring, promoting, and enforcing the use of the technology which was developed internally. Suspicion in this respect may never be completely eliminated, and it is necessary, therefore, to examine the benefits and liabilities which arise from EPA's current dual role.

Questions

1. Should a regulatory agency develop control technologies that it will eventually regulate or use as a regulatory tool?

2. What mechanisms are provided by EPA to insure that the Agency does not bias its decisions in favor of internally developed control options?

3. What objective mechanisms are used in the control system research program to reassess and, if necessary, modify or abandon research projects which do not measure up to the quality of work being done outside of EPA?

4. What criteria does EPA use to identify, justify, or terminate major development and demonstration projects? How does research done outside of the Agency influence these decisions?

Background

The concerns raised here center on the circumstances under which control technology development is appropriate, the criteria for project review (initiation, continuation, or termination) and the general ability of EPA to assess and use in regulatory actions its own technological developments in an u n - biased manner, The potential for conflict of interest is great. It is unfortunate that the Plan never addressed these issues. The following is a summary of the arguments for and against control technology development by EPA.

Pros

EPA's research on control technologies is a critical element of the entire emission control program and provides the Agency with a means of accelerating pollution-control efforts, eliminating undue costs to control technology users, and developing a strong information base for regulatory action.

In particular, EPA's control technology research program is essential to development and demonstration of control options which industry has no incentive to develop or is unwilling to develop. EPA's control development program may also in certain instances be able to do research more economically than industrial sectors that are too small, diverse, and dispersed to fund research individually or have not organized to develop a unified research effort.

In many cases, EPA's regulatory action depends upon demonstrable technological feasibility y. Without a control research program to insure this requirement, EPA would have no means of assessing technology improvements.

Generally, EPA's control research program gives the Agency access to key scientific fields, This provides the Agency with the necessary scientific knowledge to develop sound regulatory requirements and to observe the value and quality of control development work going on outside of Government.

Con

As long as EPA is both developing and regulating environmental control technologies, there will always be potential for the misuse of data and biasing of decisions toward the control methods and information developed within the Agency.

Historically, the Atomic Energy Commission came under severe criticism for being simultaneous y the advocate and the regulator of atomic energy technologies. Although EPA's situation is somewhat different (EPA is an advocate of protective measures), EPA's regulation and control requirements can still cause significant socioeconomic effects and even environmental harm.

So long as EPA serves as developer and regulator, it may be suspected of promoting its own technologies, ignoring reasonable alternatives and discounting any secondary or environmental effects of "i n-house' technologies.

EPA's entry into the control system development area can also distort private markets for the same types of controls. When contract research is funded by EPA, one or more developers will be funded, putting other developers at a disadvantage. In addition, once EPA has entered into a control development effort of its own, many private developers assume a wait-and-see position and reduce their own efforts.

A third problem is that Government programs of this kind develop their own momentum, making worthwhile modification, redirection, or termination of control development projects difficult to carry out. For example, in areas such as flue-gas desulfurization development, the prime goal has been achieved, but the Agency appears to be unnecessarily continuing refinement research which may be more properly left to the private sector.

MOBILE SOURCE EMISSION ABATEMENT RESEARCH

Issue 6

The EPA and ERDA mobile source emission abatement research plans and the DOT and EPA transportation research plans appear to ignore several significant research areas.

Summary

EPA's automotive engine technology program has been transferred to ERDA. Nevertheless, automobile and heavy-duty - vehicle emissions control requires added support not provided for in either ERDA or EPA plans. In particular, the fundamental body of analysis needed to design effective and economical transportation plans is not being provided, thereby leaving little chance—to either default on the existing emissions control strategy or to implement costly, disruptive, and largely ineffective plans. In addition, there is a paucity of basic information needed to compare the cost and effectiveness of pollution controls for trucks, cars, and buses, or other mobile sources with those for stationary sources.

Questions

1. What coordination exists between EPA and other Federal- and State-level agencies on control of mobile source emissions?

2. What has EPA done to develop methodologies and information needed to design and implement less costly and more effective transportation control plans? What coordination is provided with DOT?

3. What methods are used to compare control options for new vehicles with transportation controls, control of other mobile sources, and control of stationary sources?

4. What research and analysis is planned to provide design incentives for manufacturers

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to develop fundamentally less polluting engines as opposed to costly modifications to existing designs?

Background

In the ORD Plan the research effort in mobile source control is limited to some test procedure and emissions characterization work and some study of transportation management. ERDA's current research plan calls for demonstration of high-efficiency, low-emission alternatives to the internal combustion engine, such as the diesel, the Sterling, and the gas turbine. DOT is also involved in some transportation research related to env iron mental protection. Yet, gaps remain in the basic data and methodologies needed to fulfill EPA's mandate to reduce transportation emiss ions.

Transportation plans were promulgated for a number of metropolitan areas in the early 1970's. Hastily assembled under tight time and budget constraints and without adequate data and analysis, the plans included proposals to limit automobile travel as well as to retrofit pollution controls to older vehicles and to reduce evaporation of hydrocarbons from stationary sources. Because of the apparent disruption of economic activity and lifestyle implied by these plans, they met with widespread opposition which tended to undermine public and political support for clean-air goals. While the original plans may be moribund, the desirability of plans for air-quality improvement remains. EPA could develop the facts and analytical techniques for a more systematic estimate of the probable economic, social, and environmental conse-

Air, noise, **and eye pollution emanate from situations depicted** in this photograph of rush-hour traffic on the Southwest Freeway, Houston, Texas.

quences of alternative strategies. Then, perhaps more effective and less costly plans with better chances of acceptance could be designed. However, a research mission of this kind is not evident in the Plan.

Among the considerations in establishing an air pollution control program is that pollutants emitted by automobiles are also emitted by stationary sources to varying degrees. While controls must be applied uniformly to vehicles because of their mobility and widespread distribution, controls for stationary sources can be tailored for a particular location--depending on overall pollution load and atmospheric conditions.

In the case of NO_x abatement, comparative analysis of mobile and stationary controls is needed. The 90-percent reduction of NO_x from automobiles which was mandated by the 1970 Clean Air Act Amendments has proven much more difficult than Congress anticipated. Mass-producible catalyst systems with the durability to pass EPA's 50,000-mile test have not been demonstrated and may be well beyond the present state of the art. Moreover, even total elimination of automobile NO_x would not suffice in some urban areas because emissions from powerplants and other stationary sources contribute a significant and growing part of the total. EPA's analysis suggests that, while some control of automobile NO_x. is cost effective, so too is substantial stationary source control. More work is needed, however, to update the cost information, to apply the analysis to different geographical regions, and to account more accurately for the temporal and geographic differences in NO_x. emissions from various sources within each region.

SMALL PARTICLE CONTROL TECHNOLOGY

Issue 7

The development of monitoring and control technology to reduce small particle emissions is given insufficient attention in the ORD Plan.

Summary

The Plan gives little attention to research on the monitoring, characterization, and control of small particles (those less than 3 microns in diameter). Small particles have been recognized as a health problem of consequence. More thorough definition is needed of ORD plans, timetables, and methods of approach for developing technology to deal with small particles.

Questions

1. What is EPA's timetable for the establishment of new source performance standards or ambient air-quality standards for small particles? How is ORD control technology research designed to support this timetable?

2. What is the rationale by which ORD has assigned a high priority to flue-gas desulfurization projects and a lesser one to an expanded research effort on small particle monitoring and control?

3. What progress has ORD made in its recent research on monitoring, characterization, and abatement of small particle emissions?

Background

The effective control of small particle emissions represents a classic dilemma for EPA. The criteria document set ambient air-quality standards for the total mass of airborne particles. At the time that the standard was set, most authorities recognized that health problems of particle emissions were caused primarily by respirable particles, those that enter and remain in the deep alveolar recesses of the lung. Most of the respirable particles are 3 microns or less in diameter. The failure to distinguish between coarse and fine particles in the standard has been attributed to the lack of suitable technology, both to monitor the size distribution of particle emissions and to effectively control emissions of fine particles. Apparently, because the air-quality standards were not set on the basis of size, incentives for

ORD to emphasize small particles were less than incentives to develop improved controls for the criteria pollutants, for which legislative mandates existed. As a result, the pace of research and development related to small particles has lagged behind the expectations of many observers outside and within EPA.

Recent evidence suggests that the problem may be more complicated than originally thought. The composition of the small particle emissions may be an important determinant of their health effects. The major point, however, is that considerable research needs to be done on technologies to monitor, characterize, and control the emissions of fine particles in order to set an air-quality or new source performance standard that industry can comply with and EPA can enforce. To the extent that large and costly demonstration projects on criteria pollutants receive excessive attention by ORD, research on the small particle problem will be inadequate. ORD should define more precisely its goals, timetables, and methods of approach to deal with the small particle emission problem.

FUTURE INDUSTRIAL POLLUTION CONTROL REQUIREMENTS

Issue 8

The ORD Plan for Minerals, Processing, and Manufacturing fails to discuss research directly aimed at the identification and control of prospective pollution problems associated with new industrial technologies or changes in industrial energy and raw material sources.

Summary

The ORD Plan for Minerals, Processing, and Manufacturing focuses on establishing the data base to support water and air emission standards mandated by the associated laws. There are no apparent efforts in the Plan for identifying upcoming pollution control needs resulting from changes in processing technologies, raw materials, and energy sources. Changes in the price and availability of fuels and raw materials are leading to increasing use of lower grade ores as well as recyclable materials and to development of new processes by industry. Research into the environmental impact of these changes would better enable ORD to anticipate upcoming pollution problems and to establish control research priorities.

Questions

1. What is the level of EPA research into the future market penetration of new industrial processes and changing patterns of industrial fuel and raw material use?

2. What is the nature and extent of EPA's effort to discuss with industry the potential conflicts between existing regulations, or controls under development, and new processing technologies being developed?

3. What level of effort is put into projecting trends in industrial pollution—based on shifts in fuel, feedstock and mineral resource use, and new processes? What level of effort is devoted to evaluating new management or hardware options for industrial pollution control ?

Background

Industry is continually developing new p recesses. Associated environmental problems may accompany the eventual commercialization of some new processes, with a resulting requirement for new control measures. If EPA does not anticipate these problems, unnecessary ecological or health risks may result.

An investigative research program is needed to assess the environment control needs associated with future trends in industrial raw material and energy use. Changes in industrial pollutants will result from shifts in chemical feedstocks to heavier hydrocarbons and in mineral sources to low-grade ores and recycled materials as well as the general shift from gas to oil and oil to coal. EPA has a responsibility to investigate trends and encourage development of control methods (either by industry or, if appropriate, by EPA) to reduce potential health and environmental

damage caused by new industrial processes and practices.

SOLID WASTE MANAGEMENT

Issue 9

The direction of EPA's research on solid waste management alternatives cannot be determined from its Plan.

Summary

The Nation faces massive problems in the area of solid waste management. A variety of efforts underway in EPA, ERDA, and the private sector is aimed at reducing solid waste production, recovering usable materials and energy from solid waste, and minimizing environmental effects of solid waste disposal. The ORD Plan's description of the proposed solid waste management research effort lacks substance. In particular, it fails to address significant issues regarding the research program direction, coordination, and balance which are indispensable to an understanding of EPA's intentions in this area.

Questions

1. What research is planned or in process by ORD on the reduction of waste at its source as a control alternative?

2. What economic assessment is being done of material recycle and recovery projects? How are salable products identified and markets evaluated ?

3. How does the ORD Solid Waste Management Program coordinate with the EPA liquid waste and air-quality regulatory programs and with the ERDA and FEA energy-recovery programs?

4. How does EPA cooperate with private-sector groups such as the food industry currently involved in research into waste generation reduction and solid waste recycle, reuse, and energy recovery?

5. How will EPA's effort be allocated between high versus low technology solid waste management systems?

6. How will EPA consider costs and benefits in identifying and ranking solid waste management research opportunities?

Background

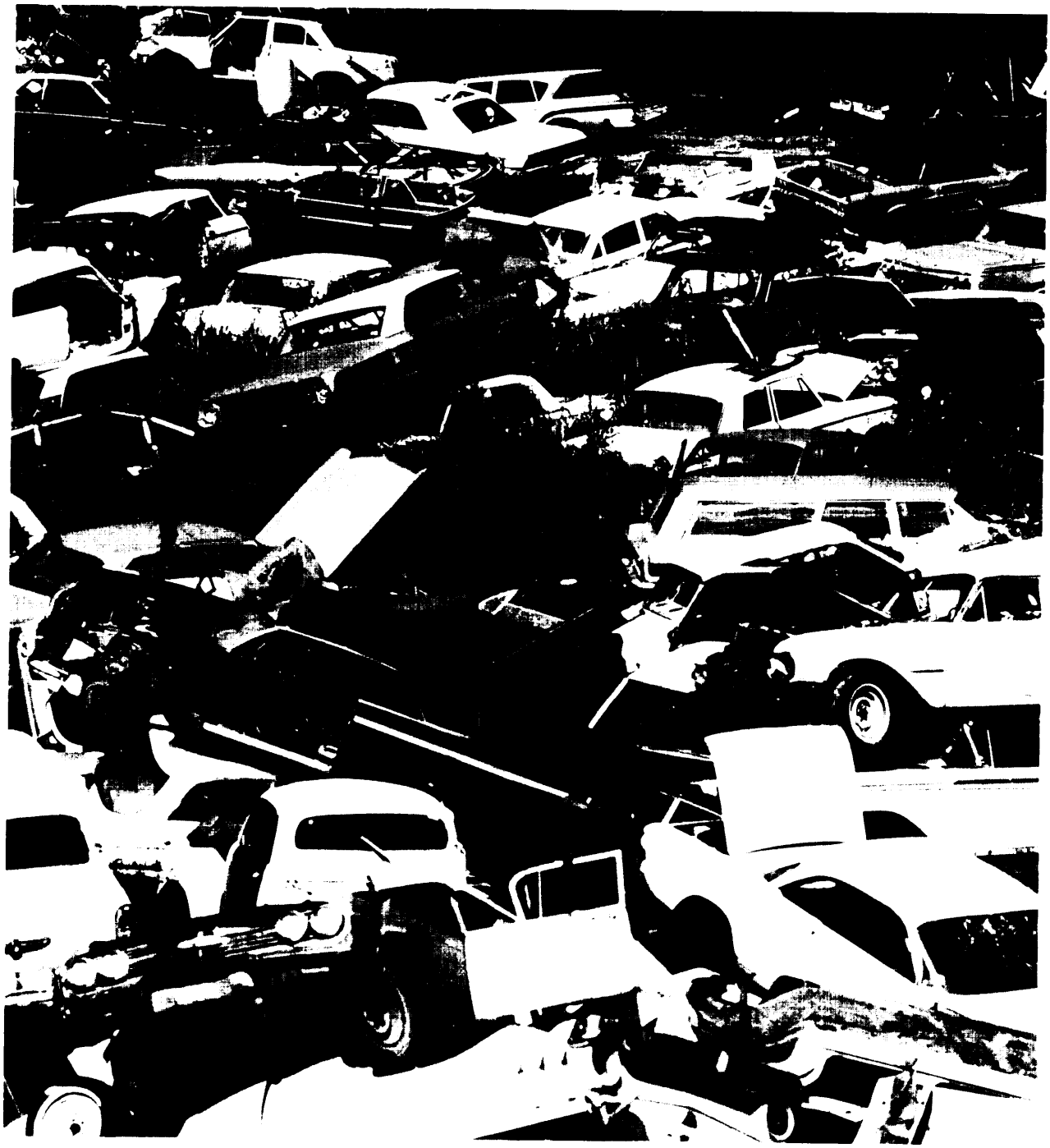
Solid wastes—including consumer product wastes and hazardous wastes—represent a tremendous material depletion, environmental degradation, and public health problem. Waste treatment and reduction require substantive program attention. The Office of Solid Waste Management Programs (OSWMP) was established by EPA to deal with the national solid waste problem.

Working on an annual budget of approximately $20 million, OSWMP is engaged in a variety of research and development as well as demonstration efforts in areas which appear to overlap those planned by its sister division ORD. Moreover, within ERDA, there is still another program of solid waste management aimed at energy resource recovery. An appropriate division of labor among these entities should be specified.

The ORD Waste Management subprogram is budgeted at a slightly lower level than the OSWMP program. It is not clear how much of the Waste Management budget is allocated to consumer and hazardous wastes, and the Plan gives no indication of how the OSWMP program and ERDA programs compare to ORD's effort, how responsibilities have been delegated, and how the three efforts will be coordinated.

The Plan makes no reference to the vital area of research directed at reduction of wastes at the source through education/participation as well as technical means. No mention is made of resolving the conflict between high-technology "blackbox" approaches to waste management and 1ow-tech - nology approaches which incorporate source separation and waste reduction. Recycling of materials for nonenergy uses is not discussed.

Solid waste represents an important energy source and an opportunity for energy conser -



EAST COAST

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therefore, could substantially save energy and resources required to produce certain materials (i.e., aluminum, glass, copper, etc.) and could minimize their environmental impact.

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viable resources. 'Although the EPA Plan addresses resource recovery in a general way, it does not cope with the difficulties of establishing and maintaining markets for waste byproducts, EPA's Solid Waste program needs

WEST COAST

Solid waste litter—Anza-Barego State Park, California.

to focus on research and development of changes in the recycled materials at the recov - ery plant that will improve their acceptance by industry.

Portions of the ORD Plan suggest a lack of knowledge about current industrial solid waste management practices. For example, the Plan indicates that EPA will fund, over the next 5 years, a major project in byproduct recovery from potato processing. In fact, the food-processing industry has for several years been recovering animal feed materials from potato-processing wastes and has several

ongoing programs which are investigating reduced generation of solid waste.

TECHNOLOGY TRANSFER FOR EFFECTIVE WASTEWATER MANAGEMENT SYSTEMS

Issue 10

The research ORD is conducting on wastewater treatment and community systems for wastewater and sludge management is not being fully used in achieving the legislative mandates imposed on EPA.

Summary

Technology which has been developed for secondary and tertiary wastewater treatment and community wastewater and sludge management is not being fully used because it is costly to operate relative to original capitalization. Federal cost sharing concentrates primarily on capital costs rather than operating costs. To provide a better framework for congressional consideration of various alternative strategies, ORD needs to commit more resources to researching economic and institutional problems in secondary and tertiary wastewater management as well as nonstructural solutions to wastewater treatment problems. Many of the performance problems with existing systems arise from improper operating procedures, insufficient instrumentation, and excess hydraulic loading caused by infiltration inflow or combined sewer conditions. These facilities can benefit from knowledge of treatment methods and control needs, and improved operation and repair of wastewater collection systems to minimize peak hydraulic loadings.

Questions

1. What priority has ORD placed on R&D aimed at improving existing waste treatment plants, such as waste treatment lagoons or older mechanical-type plants?

2. What priority has ORD given to financial and marketing research in wastewater and sludge management techniques?

3. What part of ORD's overall control development program is aimed at improving operating procedures? What control benefits are to be derived through better training of operating personnel?

4. Has ORD investigated the potential value of maximizing control of infiltration inflow or flow with combined sewers utilizing existing collection systems?

5. To what extent will EPA explore strategies for wastewater source reduction such as use of porous concrete, improved street-sweeping techniques, and other management strategies ?

Background

There are approximately 25,000 municipal or joint municipal-industrial wastewater treatment plants in the United States. Twenty thousand of these plants are small and serve population equivalents under 10,000 people. About 70 percent of these wastewater treatment plants incorporate secondary treatment facilties; i.e., wastewater lagoons, trickling filters, or activated sludge plants. Recent EPA studies show that more than two-thirds of these secondary treatment plants are not meeting either their design capabilities or the minimum secondary standards as defined by EPA in meeting the goals of Public Law 92-500. This means that approximately 50 percent of the wastewater treatment plants in the United States could benefit from the improvement of existing capital facilities. The remaining 30 percent of wastewater treatment plants have less than secondary treatment plants. This 30 percent could benefit from the construction of new wastewater process technologies without abandonment of existing capital facilities.

Almost all the municipal or municipal-industrial wastewater treatment plants are based on microbiological conversion of waste and the subsequent settling of suspended solids. This is true for wastewater lagoons, trickling filters, and activated sludge plants. Most existing plants were

designed by rule of thumb or to comply with an applicable building code, rather than for opt i mum operation. Not surprisingly, a significant number of these older plants cannot meet secondary treatment standards, Most of these plants have inadequate or poorly developed microbial cultures which produce insufficient treatment or difficult-to-settle solids. A better understanding of the causes of poor microbial behavior and solids settling can lead to improved control measures such as the addition of chemicals or procedural changes. However, the majority of existing plants may be too small and their personnel may not be sufficiently trained in microbiology, chemistry, mechanics, or electronics to insure attainment of the maximum benefits. Management schemes to provide this knowledge should be investigated as a procedural control option.

The wastewater collection system is equal i n importance to the treatment facilities. Wastewater collection procedures can be adjusted to achieve integrated system effectiveness. Infiltration inflow control or flow routing can be used to minimize peak hydraulic loading at wastewater treatment plants. This type of control procedure reduces the need for additional capital investments i n treatment capacity and maximizes the use of the capital investment in the collection system itself.

Another opportunity for improving the effectiveness of existing facilities lies in the improvement of storm sewer and combined sewer operations. Research should be directed at sewer operating procedures. Streets and sewers, unless periodically cleaned, become clogged with solid wastes during periods of low flow, then drop this load on the treatment system when the flow is increased suddenly, as i n a storm. Nonstructural approaches, such as intermittent sewer cleaning or flushing, street sweeping, and in-system flow regulation, can maximize the capacity of sewers and treatment facilities to handle and treat the storm and combined sewer wastes.

For the 30 percent of treatment plants that do not include secondary treatment facilities, a broad base of technology already exists and additional technology is advancing rapidly for both advanced treatment per se and community systems management of wastewater and sludge. Generally, the technology requires a low capital investment relative to operating costs. At the community level, sanitary engineers have been slow in accepting these new technologies. More economic research is needed that analyzes the costs of various alternative strategies for wastewater management, especially as they relate to health and environmental costs.