Section II

EXCERPTS FROM OTA REPORTS

During 1976, OTA published 10 reports totaling 23 separate volumes. Because these reports represent the scope, depth, and breadth of OTA assessments, excerpts from several are presented in this section. These samplings provide a flavor of the report from which they were taken—they do not purport to cover the full range of findings or public policy options considered in the assessment. In addition, adjustments have been made in some cases to reflect conditions which may have changed since publication. Individual reports and their purposes are discussed further in section III.

The Feasibility And Value Of Broadband Communications In Rural Areas

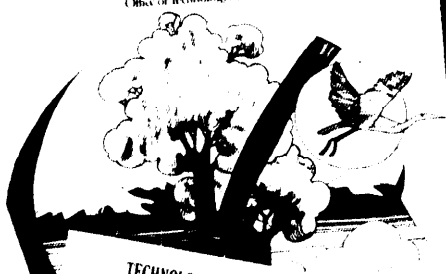
A Preliminary Evaluation

FOOD INFORMATION SYSTEMS

A Review of the
U.S. Environmental Protection Agency
Environmental Research Outlook
FY 1976 through 1980

August 1976

United States Congress
Office of Technology Assessment



TECHNOLOGY ASSESSMENT ACTIVITIES IN THE INDUSTRIAL, ACADEMIC, AND GOVERNMENTAL COMMUNITIES

An Assessment of Alternative Economic Stockpiling Policies

ANNUAL REPORT TO THE CONGRESS

for the

OFFICE OF TECHNOLOGY ASSESSMENT

HEARINGS
BEFORE THE
TECHNOLOGY ASSESSMENT BOARD
OF THE
OFFICE OF TECHNOLOGY ASSESSMENT
CONGRESS OF THE UNITED STATES
NINETY-FOURTH CONGRESS
FIRST AND SECOND SESSIONS

SEPTEMBER 24, 25, AND DECEMBER 20, 1976, FEBRUARY 4, 1976

Printed for the use of the Office of Technology Assessment

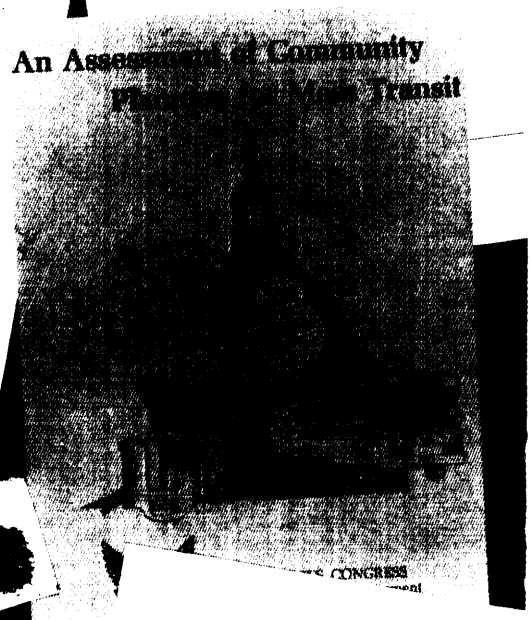
HEARINGS
BEFORE THE
TECHNOLOGY ASSESSMENT BOARD
OF THE
OFFICE OF TECHNOLOGY ASSESSMENT
CONGRESS OF THE UNITED STATES

OTA-F-35

Food Information Systems
Summary and Analysis

UNITED STATES CONGRESS
Office of Technology Assessment
August 1976

An Assessment of Community
Transit



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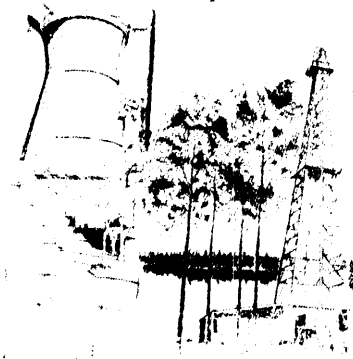
Opportunities for

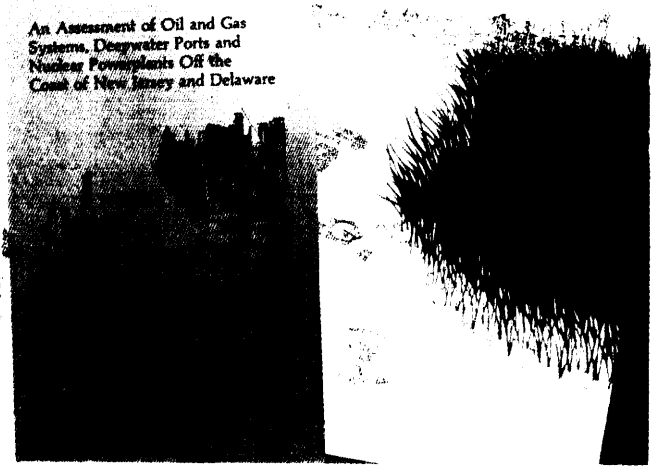
Comparative Analysis of the
1976 ERDA Plan and Program

An Assessment of
Information Systems Capabilities
Required To Support
U.S. Materials Policy Decisions

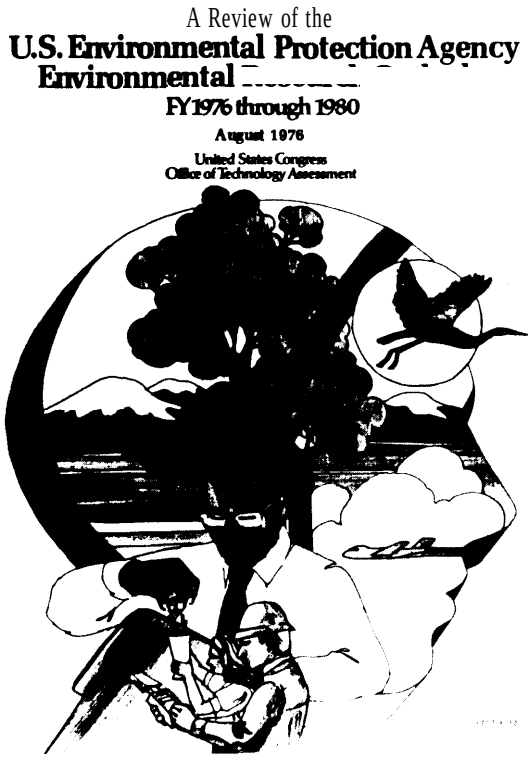


UNITED STATES CONGRESS
Office of Technology Assessment
May 1976

An Assessment of Oil and Gas Systems, Deepwater Ports and Nuclear Powerplants Off the Coast of New Jersey and Delaware



Section II
EXCERPTS FROM OTA REPORTS



A Review of the U.S. Environmental Protection Agency Environmental Research Outlook: FY 1976-80

In February 1976, the Environmental Protection Agency (EPA) presented a 158-page document to Congress setting forth its plans for research and development over the next 5 years. The Plan, proposing a comprehensive 5-year environmental research agenda for congressional review, provides a unique opportunity to develop a dialog between Congress and EPA that goes beyond the usual considerations of plans and programs for the upcoming fiscal year. Congressional interest in forward research planning by EPA, including the request for this OTA analysis, indicates the increasing importance of environmental research and development to the legislative process. . . .

The EPA 5-Year Plan does not indicate a clearly defined commitment to long-range environmental research. Where the Plan does address long-range activities, it discusses the development of techniques rather than considering which long-range issues are important. Yet, such broad long-range concerns must be at the heart of an effective environmental research planning process. . . .

The document prepared by EPA lacks the essential characteristics of a plan. It does not clearly delineate program priorities nor does it relate priorities to overall program goals. The planning process is vague and no guidelines are offered for future updates of the Plan. It is difficult to discern a rationale for the strategic thrusts suggested in the budget. . . .

Much of the work planned in researching the transport, fate, and monitoring of pollutants seems fragmented. Research into the complex processes that link emissions from a source and their effect on the biosphere has not been assigned a high enough priority to support the scientific basis of the regulatory process. . . .

Although analyses of global processes of chemical transport and transformation of pollutants may seem to have little apparent relevance to the Agency's immediate regulatory needs, EPA should ensure that no gaps exist in data about atmospheric and oceanic processes of transport of pollutants throughout the biosphere. Moreover, studies should

EPA--Documerica Photo.

Air, noise, and eye pollution emanate from situations depicted in this photograph of rush-hour traffic.

be undertaken to develop a taxonomy of ecosystems not covered by generalized studies conducted by EPA's Office of Research and Development (ORD). Such long-range studies may lead to regulations which reflect regional variations in environmental sensitivity, . . .

As individuals, EPA's scientists are well qualified and dedicated to producing high-quality research. As an organization, however, ORD lacks a clearly defined commitment to research addressing long-range environmental concerns; it appears to be preoccupied with the day-to-day demands of the regulatory process. Short-term research in support of the regulatory process is necessary, to be sure, but this should not preclude a strong commitment by ORD to long-range research. . . .

Inevitably, significant social, technological, and resource changes will affect the environment. While one cannot predict the nature and time of environmental crises, an exploratory research program that attempts to anticipate problems would add a worthwhile dimension to ORD's program.

When a regulatory agency conducts its own research to evaluate and support regulations that it must enforce there is a danger that a strong regulatory orientation will permeate the research program. If this occurs, the efficiency, content, and quality of the research being performed may be seriously degraded, It becomes a matter of special concern when the research program is not only supposed to establish regulatory support data but also promote the development of basic science in the affected areas,

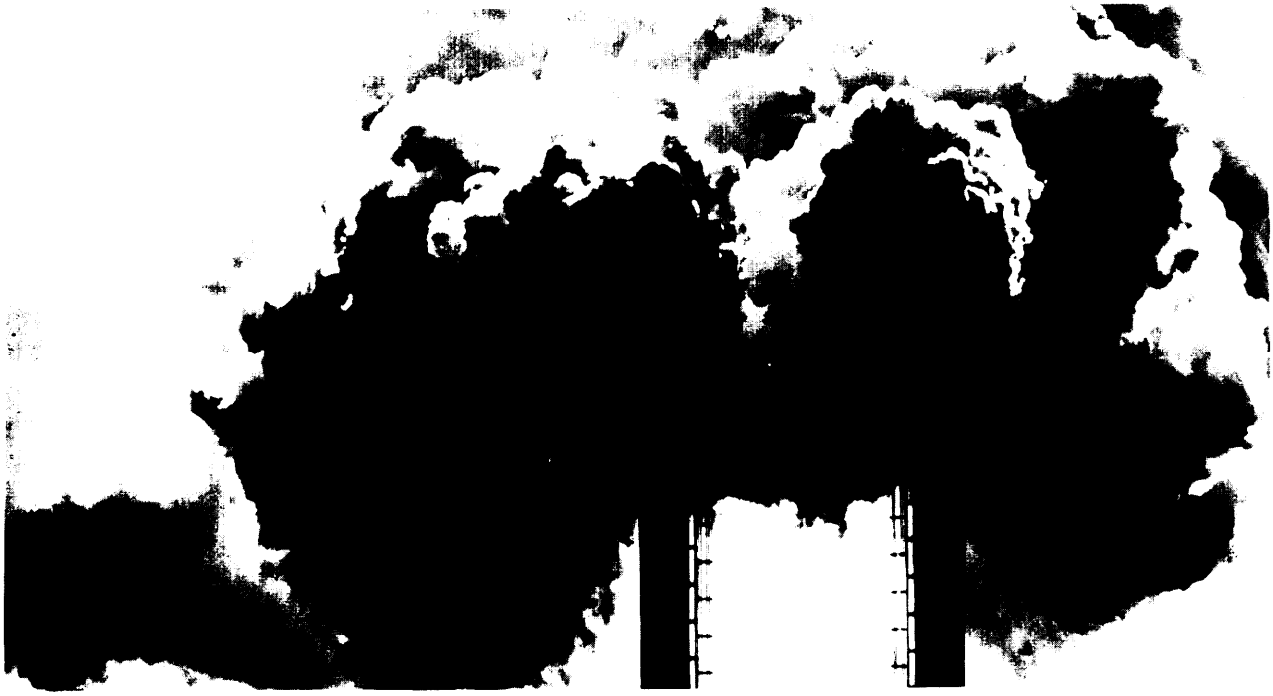
Scientific research staffs are an important base of expertise for any operating regulatory program: The accessibility y of research personnel, however, must be carefully managed to prevent their overinvolvement in the legal, procedural, and political activities of regulatory operations. . .

EPA-funded research into new methods of physical coal cleaning has led to the identification of promising techniques for removing inorganic sulfur from coal. Research in physical coal-cleaning areas 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. . . .

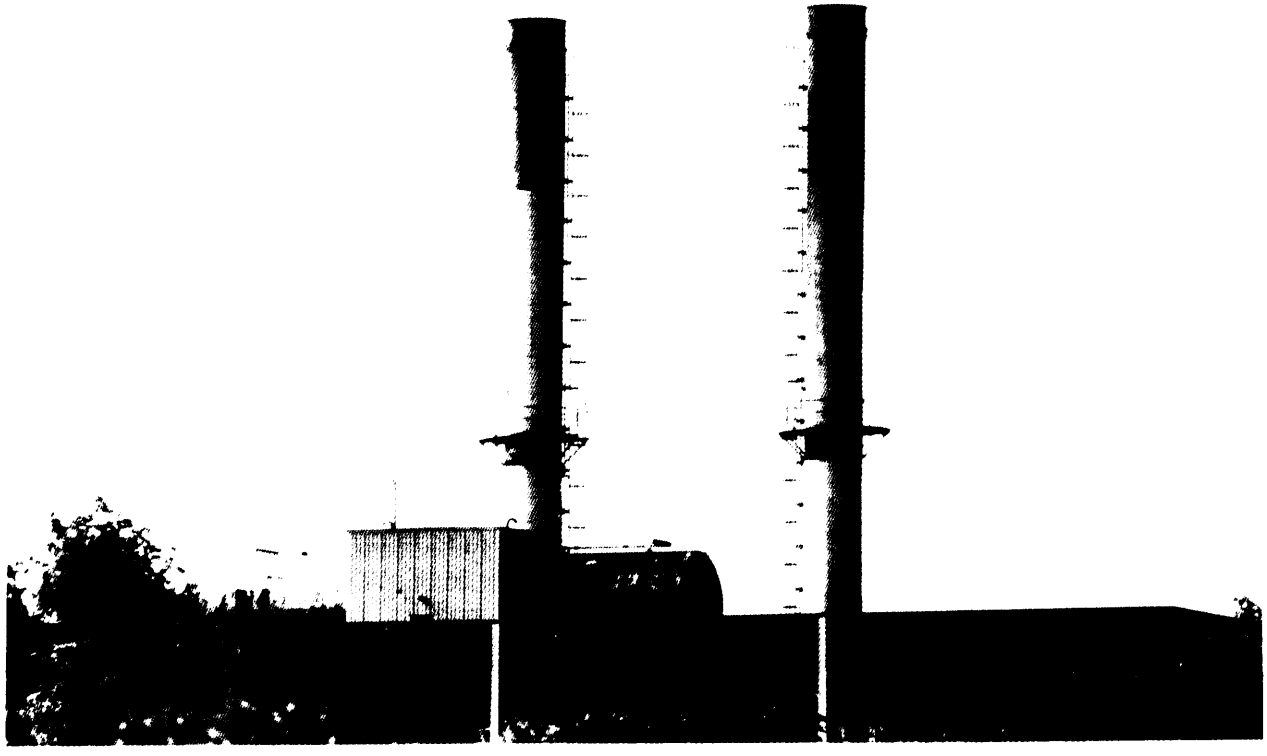
Needed improved instrumentation is currently being introduced into the environmental market. However, the administrative procedures leading to acceptance of an improved instrument or procedure are inordinately time consuming, even after the technology has been proven. Improved analytical methods could be encouraged by establishing an effective, rapid review for a suggested improved technique. This review should not emphasize rapidity at the expense of quality. . . .

Because present primary standards are based on incomplete data, long-term studies of the health effects of chronic, low-level exposure to pollutants need to be made. Parallel to this effort, sequential studies are required during and following incidents when there is a temporary, sharp increase in pollutant levels. Such studies would help give standards a firmer base. The affects of agents in the environment upon health problems such as cardiovascular and chronic respiratory disease should receive as high a priority as carcinogenesis. A method of following the population under study for 20 to 40 years needs to be developed. It is not clear whether these long-term studies are best undertaken by EPA or by another governmental agency, such as the National Institute of Environmental Health Sciences. In any case, EPA should have a strong planning and oversight role. . . .

Chronic degenerative diseases, including cardiovascular disorders, chronic bronchitis and emphysema, renal disease, and arthritis are the major causes of death and disability in the United States. Evidence suggesting that there are significant environmental factors involved in the causation or aggravation of these disorders is accumulating. Hence, there is a great need for better information on the affect on health of long-term exposures to pollutants, over and beyond that of a possible carcinogenic effect.



The pollution generated by this incinerator became so severe that citizen complaints and the closing of nearby schools forced the local government to discontinue its operation in January 1974.



The same incinerator after closing, July 1975

EPA—Documerica Photos.

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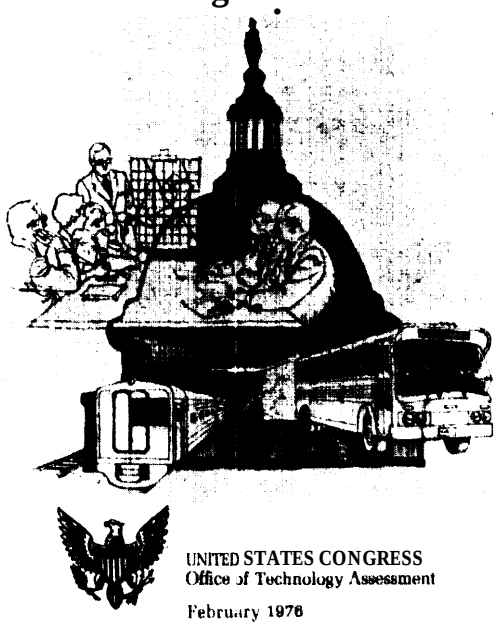


An Assessment of Community Planning for Mass Transit

In spite of efforts to create a structure for effective, coordinated regional planning, responsibility for transit planning and decisionmaking is fragmented among a great number and variety of local, regional, and State agencies of Government. The separate responsibilities of each are not clearly enough defined for any one agency to have decisive authority over either setting policy or obtaining financing and other commitments necessary to implement a plan.

This fragmentation has led to a number of major problems: 1) inability to set priorities among projects and use funds efficiently, 2) inadequate consideration of transit improvements based on changes in management of streets and highways, and 3) ineffective integration of transit and land-use planning. . . .

Critics fear that engineering consultants may be biased toward a particular technology because they are experienced in it, and that the consultants may have a vested interest in producing a plan they would be qualified to design and construct. Under these circumstances, accountability is reduced if decisions are made by the consultant while board members give rubber stamp approval. . . .

Among the shortcomings of transit planning is the inability to control the effects of transit systems, particularly land-use impacts. Transit planning has tended to emphasize fixed, long-range plans at the expense of short-range improvements, despite evidence—in Seattle, for instance—that such short-term plans are popular. [Traditionally, planners have conceived of the construction of transit systems in terms of long segments, instead of small, staged increments.]

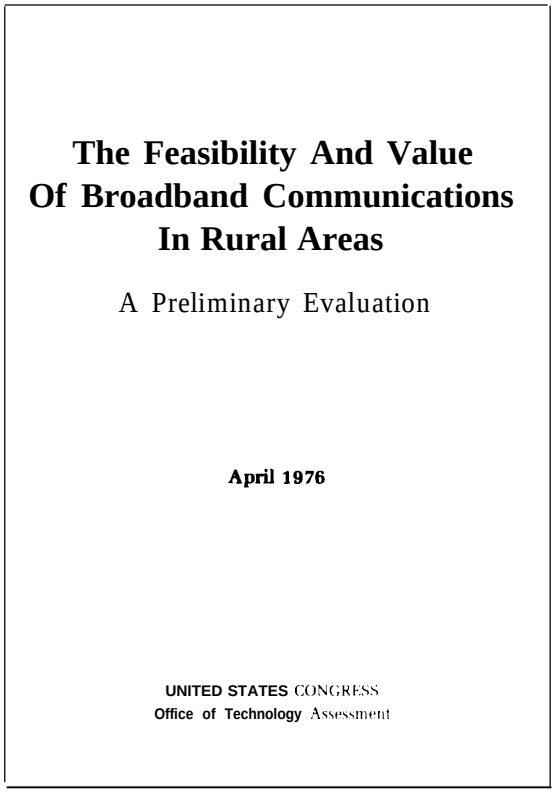
In Washington, for example, 45 miles of the 98-mile Metro system are presently under construction, A Federal report published in July 1975 observed that if Metro planners had focused all available funds on contiguous links, more miles of transit would have been in operation than will be under Metro's present schedule. . . .

The Federal funding program fails to provide incentives to achieve certain national and local goals. Several issues arise from these failings, including insufficiency of current funding levels, narrow definition of the purposes for which funding is available, and separation of highway and transit funding. . . .

Although numerous statements of goals are contained in Federal legislation and administrative guidelines, critics argue that these goals often are formulated in a way that is too general to be useful. In other words, existing goals offer no concrete answers to the central question of how much public transportation people want, what purpose it should serve, and who should pay for it. These questions underlie a national debate over how to create a rational, systematic process of setting specific objectives and developing criteria to determine whether policies and programs are accomplishing what they set out to do. . . .

A number of measures might be taken to improve the efficiency with which the Federal transit dollar is spent. The highway and transit financing mechanisms might be merged to

permit joint planning and implementation of projects. More funds could be allocated by formula or, alternatively, by tying discretionary grants to specific criteria. This would increase financing stability and predictability as well as encourage a better balance between regional and local planning. The flexibility between funds for operating and for capital uses could be increased. This would encourage a better balance between regional and local needs. The purposes for which transit funds could be used might be broadened to improved coordination between transit and land-use planning.



The Feasibility and Value of Broadband Communications in Rural Areas

Broadband systems link doctor and patient, teacher and pupils, police substation and headquarters, or, in other words, substitute communications for travel in the delivery of services. . . In view of the high promise of broadband communications, the reality of their actual use has been the more disappointing. . . As of now, not one system exists which offers rural areas the full range of services' that could be supplied. , . The major barrier to extending broadband systems beyond town limits has been their reliance on entertainment services as a principal source of revenue. . .

A cause for optimism in thinking that rural operators might succeed in assembling combinations of services derives from the potential savings to be realized in a rural setting. Because distances and thereby transportation costs are higher, potential savings from reducing travel might make a given broadband service economically attractive in a farm area where it might not be in a city. . . .

At the present time, a massive Government program to support rural broadband systems might be premature. While planning is well underway for such a system in Trempealeau County, Wis., no full-service area coverage system presently exists anywhere in the United States. Not enough is known about the detailed nature, feasibility, and value of such systems to encourage deployment by means of routine and standard operating programs. . . .

Instead of a large-scale Government program, the logical next step would seem to be a series of system demonstrations in which broadband services would be tailored to meet the specific and different needs of individual rural localities. Different services will have different cost-effectiveness ratios, depending on the demographic, socioeconomic, and institutional characteristics of the community. System demonstrations can provide data on what works, where, and under what conditions. . . .

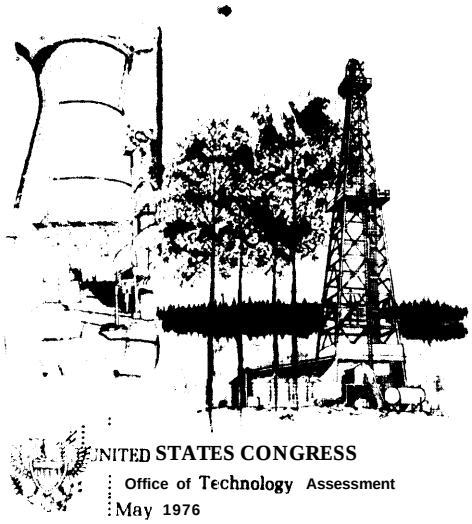
Meeting many rural health needs by broadband communications is technically feasible. In addition, patient acceptance of telemedicine is high and the potential of broadband communications to improve quality of care by increasing patient access to services previously

unavailable to them has been demonstrated. While ensuring privacy and confidentiality remain problems for physicians, these have not prevented application of telemedicine so far. . . .

In general, technology is not now a limiting factor in bringing broadband communications to rural areas. If several two-way public services must be transmitted simultaneously, then channel capacity of conventional cable systems could be a limiting factor. Meanwhile, existing technology is adequate to test the feasibility and value of public service and/or commercial use of broadband communications in rural areas. . . .

The Trempealeau County Project most closely illustrates a systems approach. A county-wide cable and microwave system available to all residents is planned. Schools will use the system to improve the quality of education and reduce costs associated with teacher salaries and transportation of pupils between schools.

Comparative Analysis of the 1976 ERDA Plan and Program



NOTE: This report represents the third on the budget and research and development plans of the Energy Research and Development Administration (ERDA). The 1976 "Comparative" report looked back to what OTA had said in its 1975 "Analysis" report and compared that with what ERDA had done n response in *1976.*

The excerpts taken from the **1976** report therefore include both what OTA said in 1975 and then an analysis of the changes ERDA has or has not made. To note which sections came from which report, the paragraphs are marked "Analysis" to signify the 1975 report, and "Comparative" to signify the **1976** report.

Comparative Analysis of the 1976 ERDA Plan and Program

Comparative

In the year since the formation of the Energy Research and Development Administration (ERDA), domestic production of natural gas declined 6.9 percent and crude oil 4.5 percent. At the same time, petroleum imports accounted for 37 percent of the Nation's total petroleum consumption in 1975 and are now approaching 40 percent. Achieving energy independence by 1985 has become all but impossible and even holding dependence to present levels through 1985 would be a formidable achievement. The energy situation is serious and continues to deteriorate. In addit ion to Federal action a sense of urgency, public awareness, and participation is required. These factors affirm the need for a national energy policy and a crucial role for ERDA in the years ahead. . . .

Analysis

The ERDA research, development, and demonstration (RD&D) plan states five national energy goals to which energy RD&D should contribute. [The five goals are: U.S. security and independence; a strong and healthy economy; freedom of choice regarding

life styles; world stability and international cooperation; and environmental protection.] Heavy emphasis on self-sufficiency, as opposed to environmental concerns, will have major consequences in the quality of life and economic well-being of the American people. Similarly, emphasizing self-sufficiency rather than international cooperation will have major impacts on U.S. foreign policy. Emphasis among these goals warrants congressional review. Unless there is agreement between the Administration and Congress on the priorities given different energy goals, development of ERDA's RD&D program is made more difficult. . . .

Comparative

Although they have not gone as far as suggested in the OTA analysis, ERDA is focusing their efforts more in the direction of solving energy problems rather than on just developing technology options. The principal evidence for this is ERDA's increased emphasis on conservation. In the revised Plan, they state that "reduction of unnecessary waste in energy consumption" is required for successful achievement of national goals. . . .

Analysis

ERDA's program plans, budgetary commitments, and professional staffing do not give adequate attention to social, economic, environmental, and behavioral research needs, even though the legislative record makes it clear that ERDA is given responsibility beyond technological RD&D. Such research is needed for two reasons: (1) to better understand the relationships of energy and the quality of life, and (2) to identify nontechnological constraints to increased energy supply or reduced energy demands. . . .

Comparative

The increase in funding from FY 1976 indicates a stronger commitment by ERDA to socioeconomic RD&D, although there is no strategy for funding across the whole of ERDA. This does not imply, however, that all socioeconomic research should be funded from one office. This is, in fact, probably not conducive to integration of socioeconomic and technical research, but it does suggest the need for a comprehensive plan for this research. . . .

Analysis

ERDA's basic research program has been largely inherited from the agencies that it incorporated. It is therefore not surprising, but nonetheless worrisome, that given ERDA's short life the basic research program does not, in large measure, reflect its RD&D goals. In particular, a need exists to reexamine a) the relationship between ongoing research and ERDA's program disciplines, b) the integration of basic and supporting research, c) the distribution of emphasis on inhouse and contracted research, and d) the role of the national laboratories vis-a-vis universities and industry. . . .

Comparative

Most of the questions and uncertainties raised by OTA last year about ERDA's basic research program remain. A need still exists to examine the integration of basic and supporting research and the distribution of resources between national laboratories, universities, nonprofit research centers, and private industry. In particular, a need remains to examine the role and purpose of ERDA's basic research program (a) within ERDA, and (b) within the total national R&D effort. . . .

Analysis

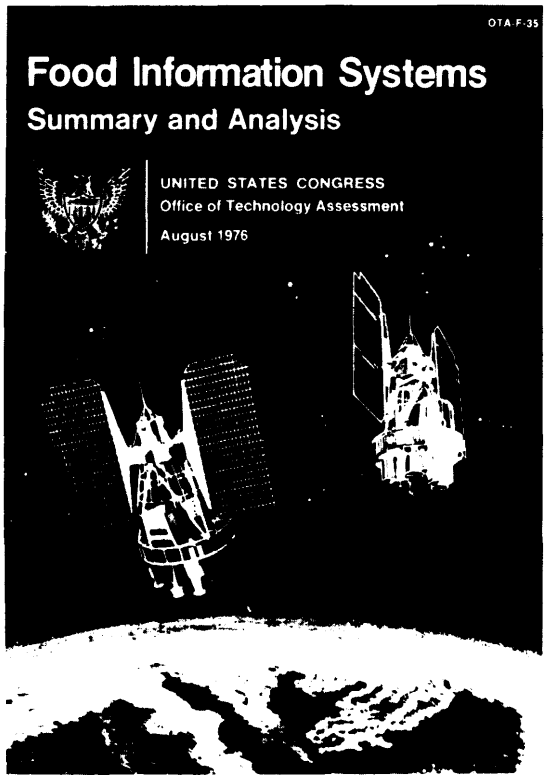
All three major "inexhaustible" sources identified by the ERDA Plan are producers of electricity having high capital cost and low operating or fuel cost, Examination of the functional energy needs indicates that other concepts, although having less ultimate potential, should be given equal priority. Intensive electrification itself will have a noticeable social impact and may present problems of vulnerability and reliability. Alternatives include expanded direct use of solar, geothermal, and other direct heat sources for industrial processes, production of synthetic liquid or gas fuels by solar or nuclear energy,

and increased emphasis on hydrogen, biomass, and conservation. . . .

Comparative

The original issue intended to convey the point that development of nonelectric energy technologies should be given greater emphasis. It was not meant that the technologies supporting electric energy should be deemphasized.

ERDA has changed this relative emphasis to a slight degree in terms of the way it characterizes the various technologies it is developing. The principal example is conservation, which is placed with the highest-ranking RD&D technologies. There has been an increase in emphasis on nonelectric uses of geothermal sources. Beyond these, however, few changes from the earlier ERDA Plan can be identified. . . .



Food Information Systems

The phenomenal increase in prices of grains and soybeans in 1972-73 was not predicted by the Department of Agriculture (USDA) or by land-grant universities. The deficiencies in current information systems include inadequate or obsolete data, poor information systems in other countries, inadequate analysis of information (particularly by the overseas network of agricultural attachés), and a fragmented structure fen- information within USDA that encourages institutional conflicts of interest and hinders effectiveness. Members of Congress had no independent means for dealing with the food policy issues which arose at that time. This apparent breakdown in the information systems on which Congress had traditionally been dependent led to a request that OTA analyze the adequacy of these resources. . . .

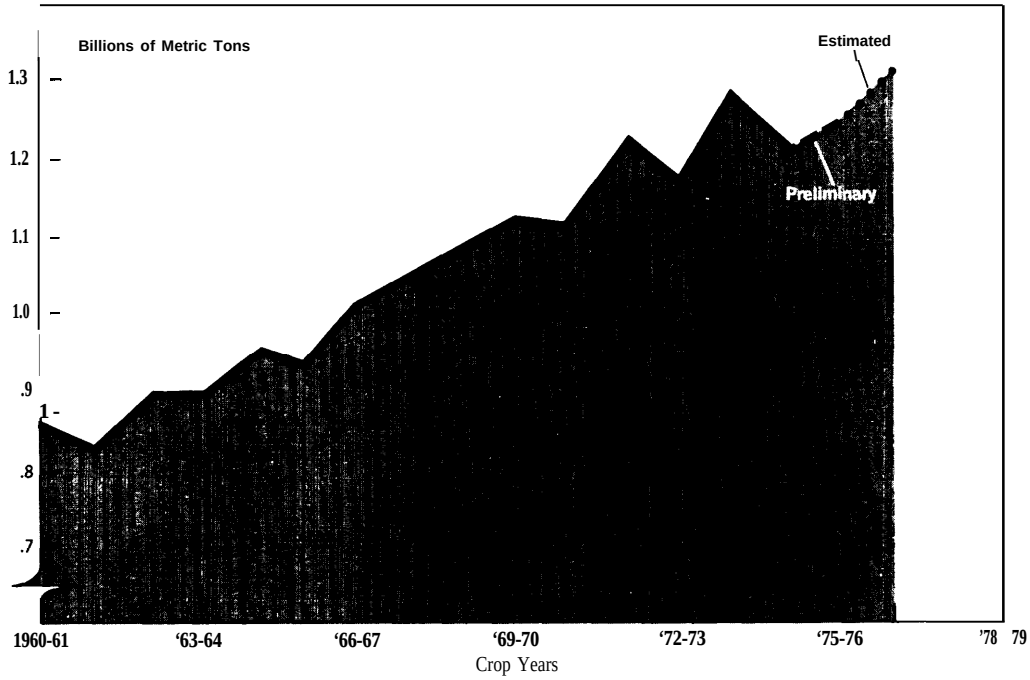
The Food and Agriculture Organization (FAO) of the United Nations is the major source of information on world agriculture, Most of FAO's problems and deficiencies are those encountered in any attempt to collect and disseminate data from a large number of governments with diverse capabilities and policies. These deficiencies can also be attributed in part to the limitations on FAO action inherent in an international or intergovernmental organization. . . .

[Internationally,] in the area of key inputs, fertilizers, and pesticides, the information is neither timely, accurate, nor adequate. The reasons for this vary. First, the production and distribution of these products are carried on by a mix of private and public enterprises, sometimes within the same country. Some countries, for their own reasons, do not divulge their most recent statistics on current status or plans, even though they presumably have them. The private firms involved often are reluctant to disclose information which they believe may affect their competitive position. . . .

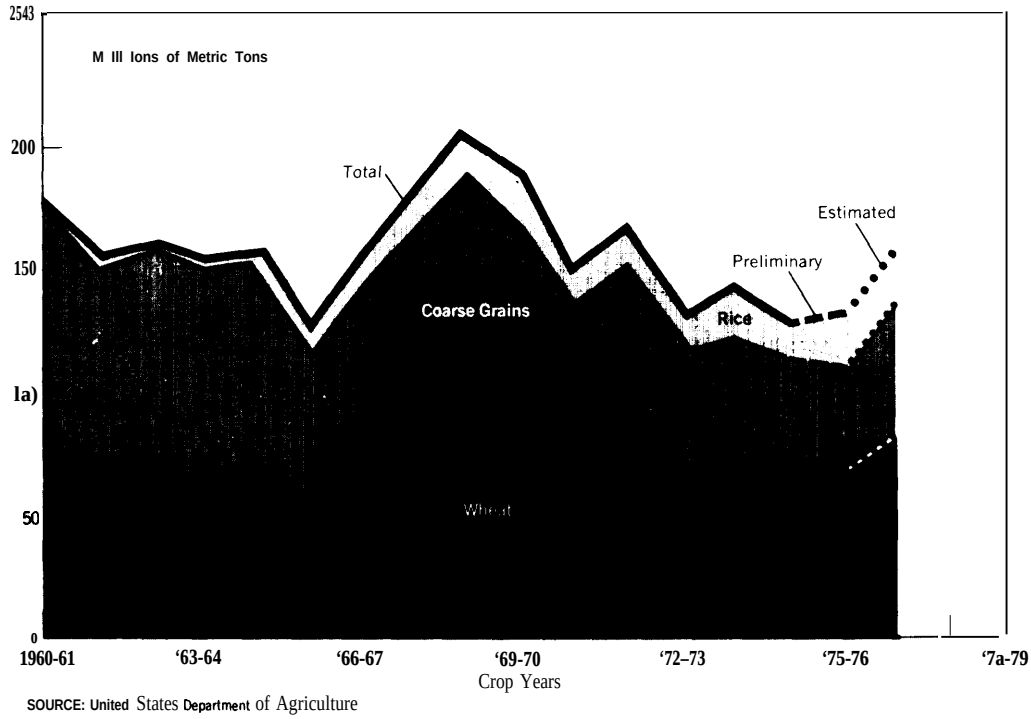
During the course of this study, recommendations for correcting the deficiencies in the existing food information systems were

World production and stocks of major grains 1960-76

World Grain Production

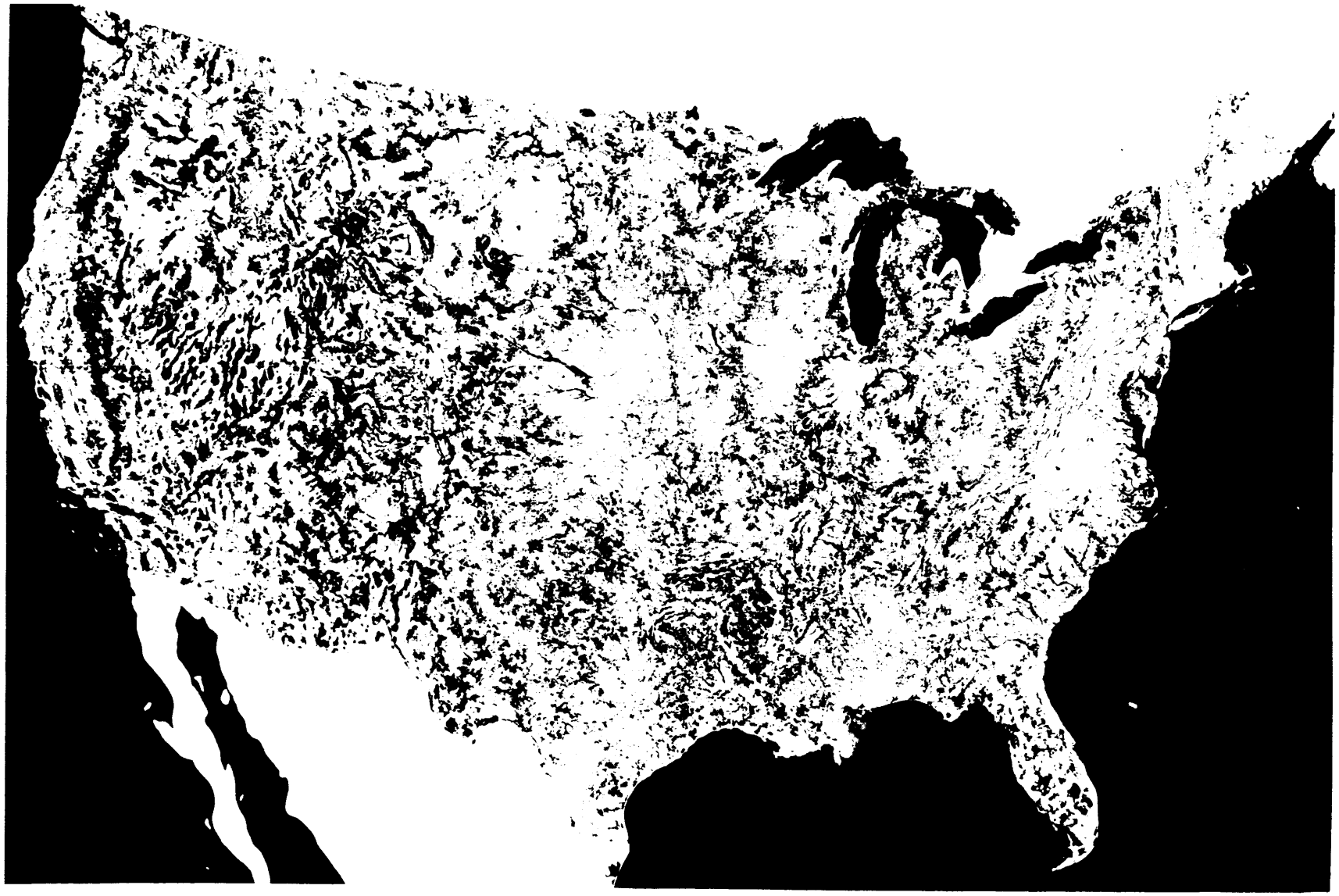


World Inventory of Grain—End of Crop Years



SOURCE: United States Department of Agriculture

irst photo map of the 48 contiguous States of the United States ever assembled from satellite images was produced for NASA by the USDA's Soil Conservation Service. The map was produced from 595 black and white cloud-free images returned from ERTS-1 at an altitude of 560 miles.



NASA Photo.

made to OTA. These recommendations helped OTA develop three options for congressional consideration: relying on existing agencies to initiate improvements; developing a single, integrated world food information system; and improving existing systems.

Relying on existing agencies implies that the events of 1972–73 were unique, and that countries and organizations are rapidly adjusting to them. However, events exacerbating the world food situation have continued to occur. The margin of error in the world's food supply is now less than 5 percent, reserve stocks have been reduced to less than a 30-day supply, and the number of "Most Seriously Affected" countries has increased from 33 to 44. , . ,

Developing a single, integrated world food information system would require a worldwide system in which a congressional unit, linked to a quasi-independent unit within USDA, would serve as the point of contact for the United States, with both tied to a world food information system.

The advantage of this approach is that a "system" would be idealized. However, this option has several disadvantages: the impracticality of its implementation in the near future, the political sensitivities to be encountered in getting such major participants as the Union of Soviet Socialist Republics and the People's Republic of China into the system, and the expected enormous cost of correcting deficiencies in order to make the system effective and efficient.

Due to the fragmented nature of the system, it seems more practical to make improvements in the key existing systems than to try to create a new system. Likewise, suggested improvements to subordinate systems will, in the long run, improve the world food information flow.

OTA found five major areas where improvements might be considered. Within each of these, several specific opportunities exist for action. Some of these improvements would require legislation; others do not. The five areas are: improving the accuracy and timeliness of U.S. food and agriculture information systems; strengthening the U.S. role in a world food information system; increasing congressional staff capabilities; increasing the integration of nutrition information; and accelerating the use of advanced technologies.

Automatic Train Control in Rail Rapid Transit

Rail rapid transit is an old and established part of the national transportation system. It carries large numbers of people at high speeds within central business districts and to and from outlying areas. , . , In cities where there is an existing rail rapid transit system, it is difficult to conceive of how the residents could function properly, or at all, without this mode of transportation. . .

Along with the new attention to rail rapid transit has come an increased concern with technology. The basic technology of rail rapid transit, which derives largely from railway engineering, is quite old. While this technology has been refined and improved over years of operational experience, many transit system planners and engineers believe that new and more sophisticated forms of technology need to be applied in order to achieve systems of. higher safety, performance, and efficiency.

Generally, two avenues of technological innovation are proposed for rail rapid transit: substitution of electronic for electromechanical components and more extensive use of automation. One such application of new technology is in the area of train control. The replacement of men with electronic monitoring and control mechanisms is thought to offer several advantages—greater consistency of performance, safeguarding against human error, more extensive and precise control of train operations, and reduced labor costs in operating the system.

However, some transit engineers have misgivings about the ability of the newer automatic train control systems to perform as safely and efficiently as manual systems. There is also some doubt about the cost/benefit of automation. Automated control systems are more expensive to design and produce, and their complexity may make them less reliable and more costly to maintain. . . .

Complete removal of man from control of transit system operations—even removing him from the central control point—is probably not technically feasible or desirable. For safety and continuity of operation, it will always be necessary to have someone to monitor the system, intervene to restore operations, or assist passengers in an emergency. The number of such supervisors would be only a handful, and it is doubtful they could ever conduct normal operations manually as a backup to automatic systems. . . .

The record of collisions and derailments in Chicago from 1965 to 1974 illustrates the consequences of operating under incomplete signal protection or by manual and procedural methods alone. There were 35 collisions and 52 derailments in this period, an average of about one accident every **6** weeks. Most were minor accidents, but two involved fatalities. An analysis of accident causes shows that human error was a contributing factor in every collision and in almost two-thirds of the derailments. Collisions typically resulted from the train operator misjudging stopping distance or following too closely, Derailments were most often caused by overspeed on curves or by the operator entering an improperly aligned switch while proceeding on hand signals,

Development of Medical Technology

New medical technologies have transformed medical practice in the past several decades by making effective preventive, diagnostic, and therapeutic tools available to the medical care system. Modest, unexamined investments in biomedical research and development can sometimes lead to large, unexpected costs, both human and financial, in the medical care system. . . Some diseases can now be effectively prevented, and medical innovations such as antibiotics have provided effective therapies for a number of other diseases. New diagnostic techniques have frequently made it possible to detect disease in time to apply an appropriate therapy, and even in cases of diseases for which no effective preventive or therapeutic measures are available, relief of pain, amelioration of symptoms, and rehabilitation of individuals affected by chronic conditions have been increasingly feasible.

On the other hand, the accelerating pace of medical technology development has raised a number of troubling issues. Are current R&D efforts directed at developing the most desirable technologies? Does adequate planning precede the introduction of new technologies into the medical care delivery system? Does the introduction of some new medical technologies have indirect or unanticipated social implications?. . . .

The economic burdens imposed by the use of medical technologies cause problems for the patient, for the family, and for society. . . Some require large capital investments. The CAT scanner costs from $350,000 to $700,000, and a modern automated blood chemistry analyzer costs $250,000. Costly followup care is made possible—or even required—by some new technologies. For example, fetal monitoring during labor has led to intervention in the birth process by caesarean section. . . .

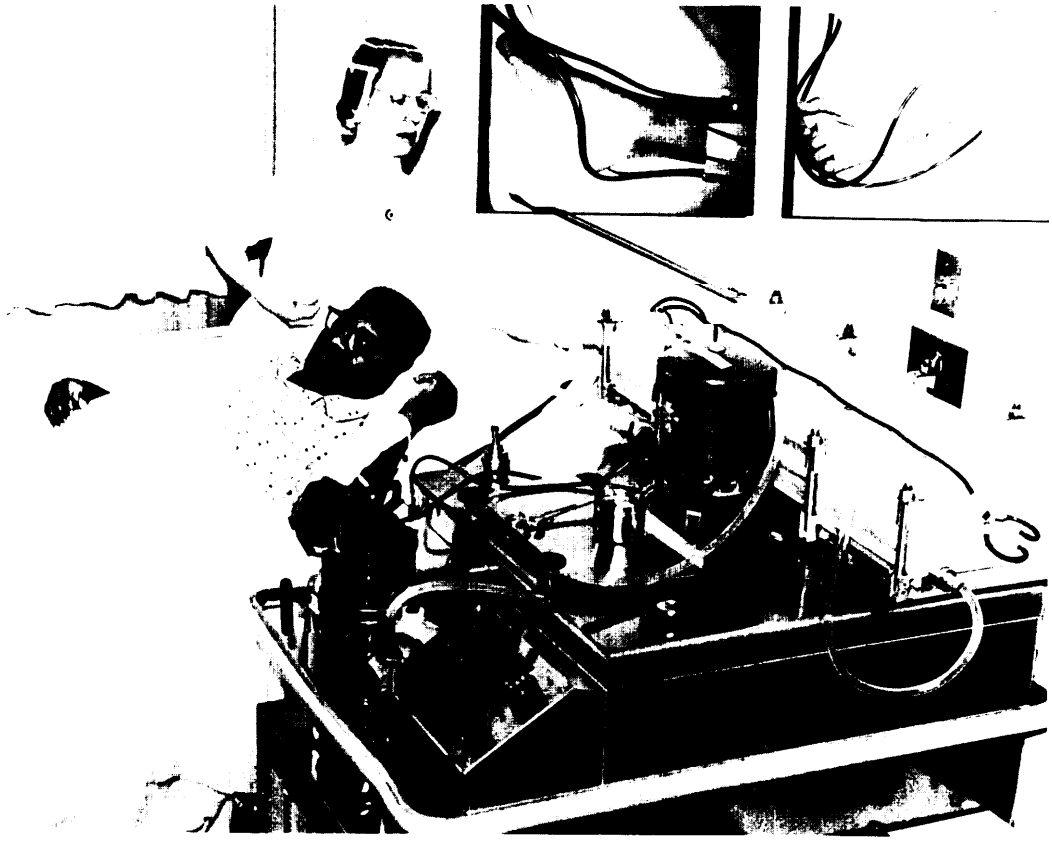
Initial proof of efficacy and reliability of new technologies may lead to overuse. Utilization rates for automated clinical laboratories and CAT scanners are rising rapidly without a documented benefit to the health of either individuals or groups in society. This problem is exacerbated by malpractice suits against doctors, which foster protective ordering of tests. . . .

Medical technologies can also raise troubling social issues unrelated to economic considerations. For example, modern technology has challenged society's traditional view of death and dying. Although these issues are not new, they have been given added significance by new life-extending technologies such as artificial hearts. Modern technology can dehumanize the individual, affect the way people view themselves and others, and give awesome powers to physicians, . . .

Implantation of an artificial heart will permit survival of the patient, and the benefits to the rest of the family will be numerous. On the other hand, unless the cost of implantation of the heart is covered by some third-party payer (a health insurance service), the enormous financial burdens could impoverish the patient's entire family and strain intrafamily relationships. . . .

This artificial heart kept a calf alive for a record 145½ days. The inflow valve of the right heart is removed to show the dark surface of the rubber diaphragm.

Nuclear-powered cardiac packmaker (left) and heart electrode. The electrode normally is in contact with the left ventricle of the heart.



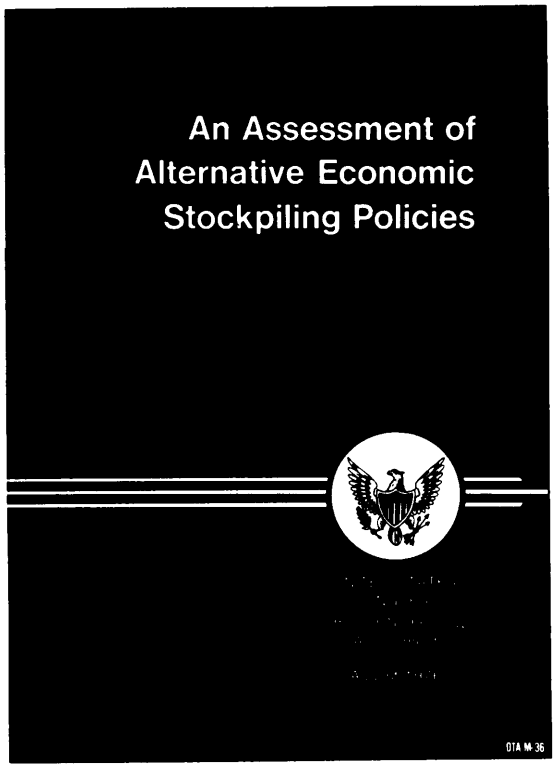
This renal dialysis machine purifies blood through an artificial kidney.

Photos courtesy, Cleveland Clinic, NIH

If the artificial heart works well, the demand for it may be so great that society will find it difficult to supply the device to all who want it. Even assuming an adequate supply, society may be unwilling to supply the device at public expense to all needy patients. Any process of rationing life on the basis of social worth would have a major impact on public values. . . .

As the leading Federal agency involved in biomedical research and the development of medical technology, the National Institutes of Health (NIH) might be considered as a site for assessment programs of medical technologies. The collective administrative and intramural staffs have a wide range of expertise in matters pertaining to medical technologies. This expertise often extends to areas in which NIH is not directing or conducting supporting programs of technology development.

In many cases, NIH supports research on, and thus has knowledge of, new medical technologies that are being developed in clinically useful forms elsewhere. Even if development is occurring exclusively in other agencies or in the private sector, NIH could serve as a central repository of knowledge and informed judgment. Thus, groups at, or supported by, NIH could assess both technologies being developed at NIH or elsewhere with NIH support through the extramural grants and contracts programs, and technologies whose development is supported by other sources of funds.



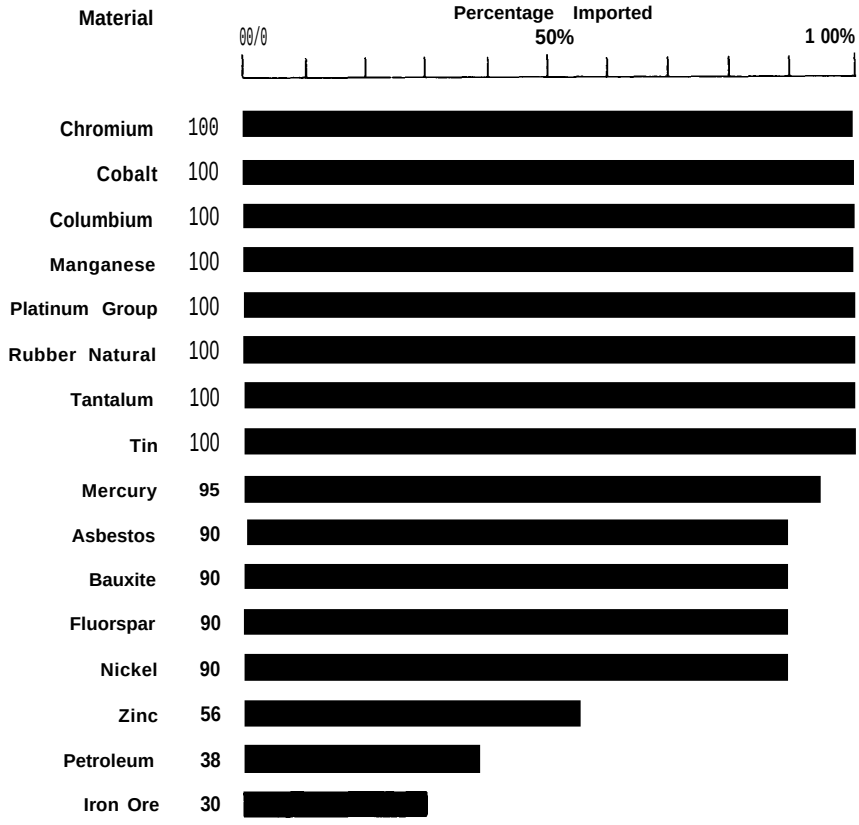
An Assessment of Alternative Economic Stockpiling Policies

There is a real possibility that shortages of materials critical to the U.S. economy will occur suddenly and unexpectedly. This stems largely from the increasing degree of U.S. dependence upon imported materials, as well as from the increasing international competition for materials. Shortages could occur from: 1) cartel or unilateral political actions affecting price or supply, 2) nonpolitical import disruptions, 3) dwindling U.S. sources of scarce materials, 4) fluctuating domestic markets, and 5) fluctuating international markets. . . .

Stockpiling critical materials has long been practiced by the United States to ensure a minimal supply in the event of war, with the marketplace being relied upon as the primary means of correcting temporary shortages and price fluctuations. However, increasing U.S. dependence on materials imports, together with increasing competition among other nations for materials, pose few dangers to the supply required by a healthy economy—dangers which neither the strategic stockpile nor the normal operations of the marketplace have effectively averted or counteracted. . . .

An economic stockpile is similar to insurance in that acquisition and holding costs are paid in anticipation of reducing the costs of possible future problems. A decision to establish an economic stockpile depends on the belief that there will be eventual net benefits, either through deterrence of a problem or through relief if a problem occurs. Because it necessarily involves some marketplace intervention,

U.S. Import Dependence for Selected Materials



Source: Derived by comparison between U.S. imports and usage over a number of years. (Import data from Department of Commerce; usage data from Bureau of Mines and Rubber Manufacturers Association.)

the benefits and costs of economic stockpiles should be delineated to the highest extent possible. . . .

Economic stockpiling will create social and political impacts which must be considered with the economic impact. The implementation of an economic stockpile will also create legal and institutional impacts which are contingent upon the nature of any stockpiling agency established and the oversight mechanisms exercised by Congress.

The benefits and cost of an economic stockpile depend upon specific future actions outside the control of the United States. If undertaken, economic stockpiling should therefore be done on the basis of trend forecasts and possible events, but in a manner flexible enough to permit adjustments to changes. . . .

Alternatives exist which may offer benefits equal to or greater than those of economic stockpiling. These alternatives may require either more or less intervention in the marketplace and many have been used for some time. This experience should be drawn upon in assessing their possible usefulness. Several of the alternatives to economic stockpiling are long-term solutions to materials problems, and as such could be implemented in conjunction with a short-term economic stockpile as an overall strategy of combating such problems. . . .

Labor, business, or other groups will be concerned with the eventual or potential use of the stockpile, regardless of its announced purpose. For labor, stockpiles could blunt the threat of strikes. For business, stockpiles represent intervention in the marketplace.

Alternatives to economic stockpiling policies

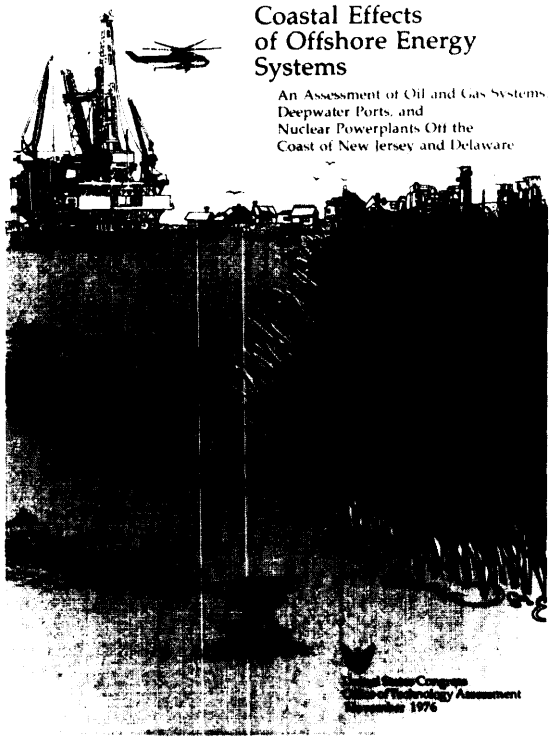
ALTERNATIVES	SP 1—Discourage or Counteract Cartel or Unilateral Political Actions Affecting Price or Supply	SP 2—Cushion the Impact of Non-political Import Disruptions	SP 3—Assist in International Materials Market Stabilization	SP 4—Conserve Scarce Domestic Materials by Reducing Current Consumption	SP 5—Provide a Market for Temporary Surplus and Ease Temporary Shortages
Direct Subsidy	X*	. . .	. . .	X	
Tax Incentives for Capital Investment & Production	X*	. . .	. . .	X	
Research & Development	X*	. . .	. . .	X	
Loans and Investment Guarantees	X*	. . .	X		
Tariff concessions	X*				
Recycling	X*				
Production from Public Lands	X*				
Tax Incentives **for** Inventory Maintenance	X	X	X	. . .	X
Extended Futures Markets	X	X			
Standby Capacity	X	X	. . .	. . .	X
International Commodity Agreements	X	. . .	X	. . .	X
Conservation	X*				
Substitution	X*	X			
Export Controls	X	X			

● These are long-term alternatives which are not effective in the short run, **but which may be effective** in the long run

Table VII–2.—Sectors impacted by alternatives to economic stockpiling

Sectors	Sets of alternatives		
	Increase supply	Stabilise supply and price	Redirect distribution
Government	**x**	×	*x*
Consumers	**x**	×	*x*
Producers—primary materials	*x*	×	*x*
Processors-primary materials.	**x**	×	*x*
Processors—secondary materials	*x*	×	*x*
Scrap collectors.	*x*	×	. . .
University labs	*x*	. . .	*x*
Research labs,	*x*	. . .	*x*
Private R&D **groups**	**x**	. . .	*x*
Resource investors	*x*	. . .	. .
Traders	. . .	×	
Importers.	. . .	×	
Exporters	. . .	×	.

Source: OTA



Coastal Effects of Offshore Energy Systems

No significant damage to the environment or changes in patterns of life in either New Jersey or Delaware is anticipated during operation of the three energy systems [offshore oil and gas exploration, deepwater ports, and floating nuclear powerplants] at presently projected levels. However, careful planning, engineering, and strict operation monitoring are required for each of these complex systems. To a large extent, such planning and monitoring will depend on the quality of oversight by the responsible Federal agency.

Future deployment of ocean technologies on a scale larger than that anticipated at the present time could create serious conflicts among users and impose excessive burdens on ocean and coastal environments. No formal mechanism exists or is planned for resolving conflicts or directing research to discover the cumulative social and environmental consequences of vastly expanded uses of the oceans.

Changes in Federal practices are necessary to reduce the delays in determining offshore oil and gas resources, to provide full attention to State and local needs and potential impacts, and to assure strict enforcement of operating standards to minimize ocean and coastal pollution. Consolidation of authority within the Department of the Interior is essential to supervision of offshore development and coordination of operations with State and local governments.

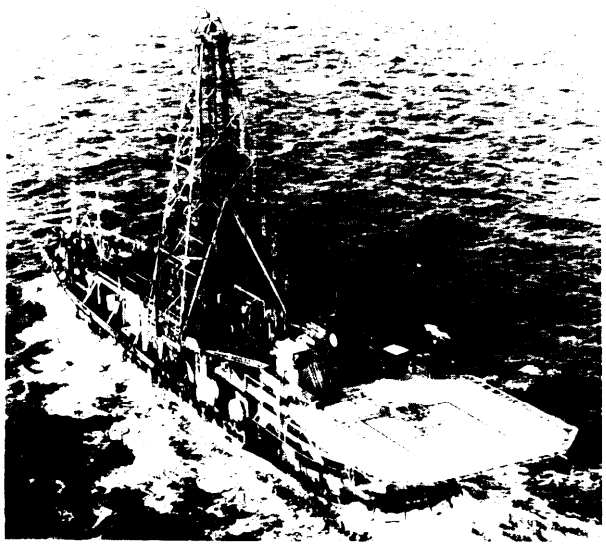
The siting of floating nuclear powerplants, which may offer economic and environmental advantages over land-based nuclear plants, may present unique risks for accidents which have not yet been comprehensively assessed by the Nuclear Regulatory Commission. . . As many as 59 floating nuclear powerplants could be built by a single manufacturer by the year 2000, but no policy analysis of the impacts of deploying that many plants in coastal waters has been done or is contemplated.

Tankers using deepwater ports off New Jersey and Delaware pose a greater pollution and safety threat than the ports themselves. Confining tanker operations to a port several miles from the coast may offer environmental and safety advantages, provided that the tankers using the facility are strictly regulated.

There are specific alternatives which, if substituted for each of the proposed offshore projects, could supply equivalent amounts of energy to the mid-Atlantic region. None, however, offers clear social, environmental, or economic advantages, Increased imports are an alternative to offshore oil and gas development. Onshore nuclear plants and coal-fired plants are alternatives to floating nuclear powerplants. Greater reliance on small tankers is an alternative to deepwater ports. Reduction of energy consumption could offer long-term advantages, but there are no specific plans at the State or national level for an energy conservation program that might eliminate the need for the energy supplies which would come from one or more of the proposed offshore systems. . . .

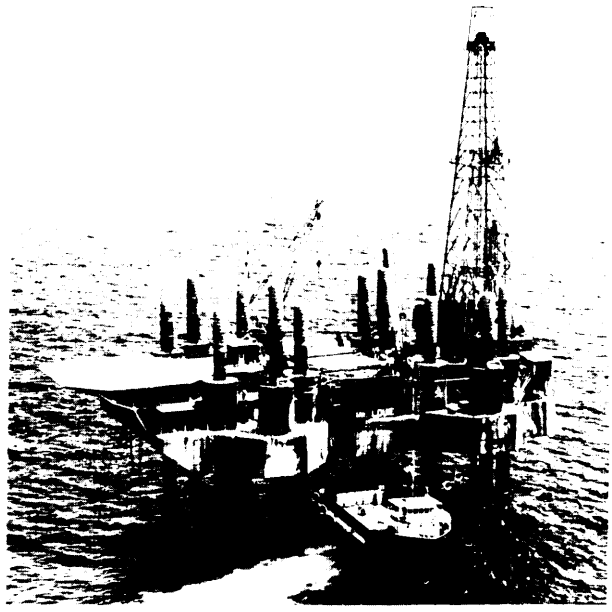
Drastic changes in regional energy prices will not result from offshore development in the mid-Atlantic. . . . A net fiscal benefit to

Three exploratory rigs for possible use in the mid-Atlantic



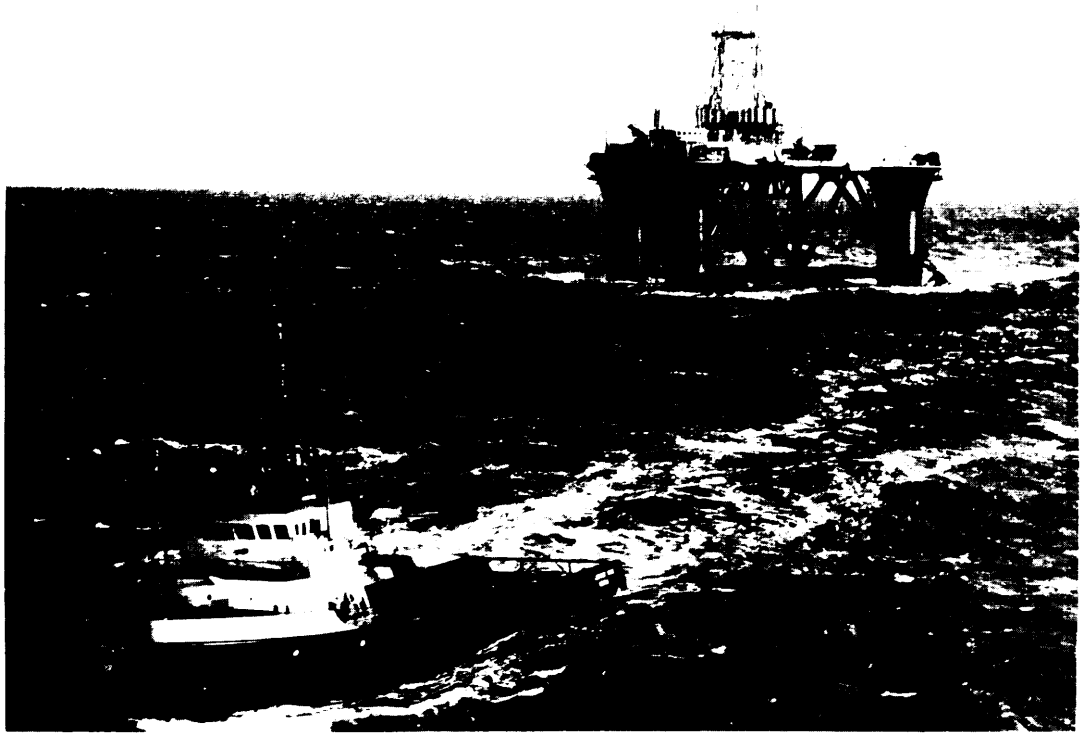
Drill ship

Source Exxon 011 Company,



Jack-up rig

Source Mobil 011 Corporation



Semi-submersible rig

Source: Marine Engineering/Log

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mid-Atlantic State governments probably will result from onshore facilities related to offshore development, but there may be local fiscal problems. The advantage would not occur until after the first 3 years of offshore activity. . . Discovery of offshore oil would not necessarily lead to construction of new onshore refineries in the mid-Atlantic area. In fact, current air quality regulations might prevent construction of new refineries in New Jersey and Delaware. . . .

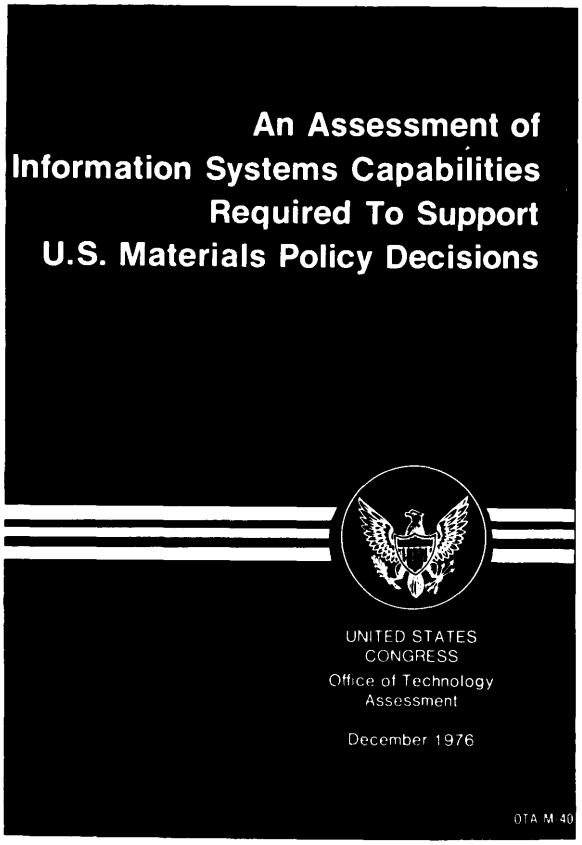
Under some weather conditions, oil spills from a platform as far as 50 miles at sea could reach the New Jersey and Delaware coasts, but predicting the point of impact is not possible at this time. . . Weather, wind, and ocean currents will affect the dispersion, trajectory, chemical composition, and ultimate disposition of oil spills. These conditions vary from season to season, and even from day to day, but research on ocean conditions in OCS areas has a low priority. . . .

Tanker spills are the source of 5 to 15 times as much oil as all offshore drilling and port operations combined, yet pollution-control regulations are far less stringent for tankers than for either deepwater ports or offshore oil and gas operations. . . The use of offshore deepwater ports may reduce the risk of certain oil spills and environmental damage below that of transporting crude oil by small tankers into the congested New York harbor or Delaware Bay. Even the very small risk of a catastrophic spill from a super tanker, however, dictates that stringent pollution control and cleanup systems be used. . . .

A critical review of completed studies of the floating nuclear powerplant discloses little foundation for concluding that either construction or routine operations of the two plants at the Atlantic Generating Station would endanger public health or the environment. . . In the unlikely event of a core-melt accident in a floating plant, the molten core eventually would melt through the bottom of the barge and release radioactive materials directly into the ocean where they could contaminate beaches and be absorbed in the food chain. . . .

The most promising alternatives for stretching out supplies of fossil fuels are programs to improve insulation of homes and offices, changes in automobile design to increase mileage, and use of existing technologies to increase the amount of power generated per unit of fuel. Coal is a potential substitute for every basic fuel in the United States and supplies could last for more than a century even if consumption were to quadruple. However, massive conversion to use of coal would entail major changes in transportation networks, air quality standards, new mining techniques, and new miner-training and safety programs. . . .

No single new technology or change in the way existing" technologies are used is likely to provide more than a small percentage of total energy requirements before the end of the century. Solutions to energy problems will be found in putting together many relatively small conservation and supply programs. Solar energy will not contribute much to energy supplies before the end of the century unless Federal programs to cut solar installation costs and private plans to market solar products are given higher priorities than they now enjoy.



An Assessment of Information Systems Capabilities Required to Support U.S. Materials Policy Decisions

The compatibility of man with his environment is fundamentally linked to his use of materials. Recent materials scarcities, growing concern with environmental degradation, and changing patterns in international supply and demand are among a host of factors creating new materials-related problems for which Congress and the executive branch of Government must fashion effective responses. These factors are inducing a historic shift in national industrial priorities away from energy-intensive, inefficient technologies towards conservation and more efficient use of materials and energy. To accommodate these changes, knowledge of the technological, economic, and social effects of materials management and usage is becoming increasingly important. Achieving a smooth flow of materials information from the laboratory to the designer and manufacturing engineer, developing prudent principles of materials management, establishing sound materials policies in the face of changing priorities—all of these require information services encompassing all functional aspects of the use of materials. . . .

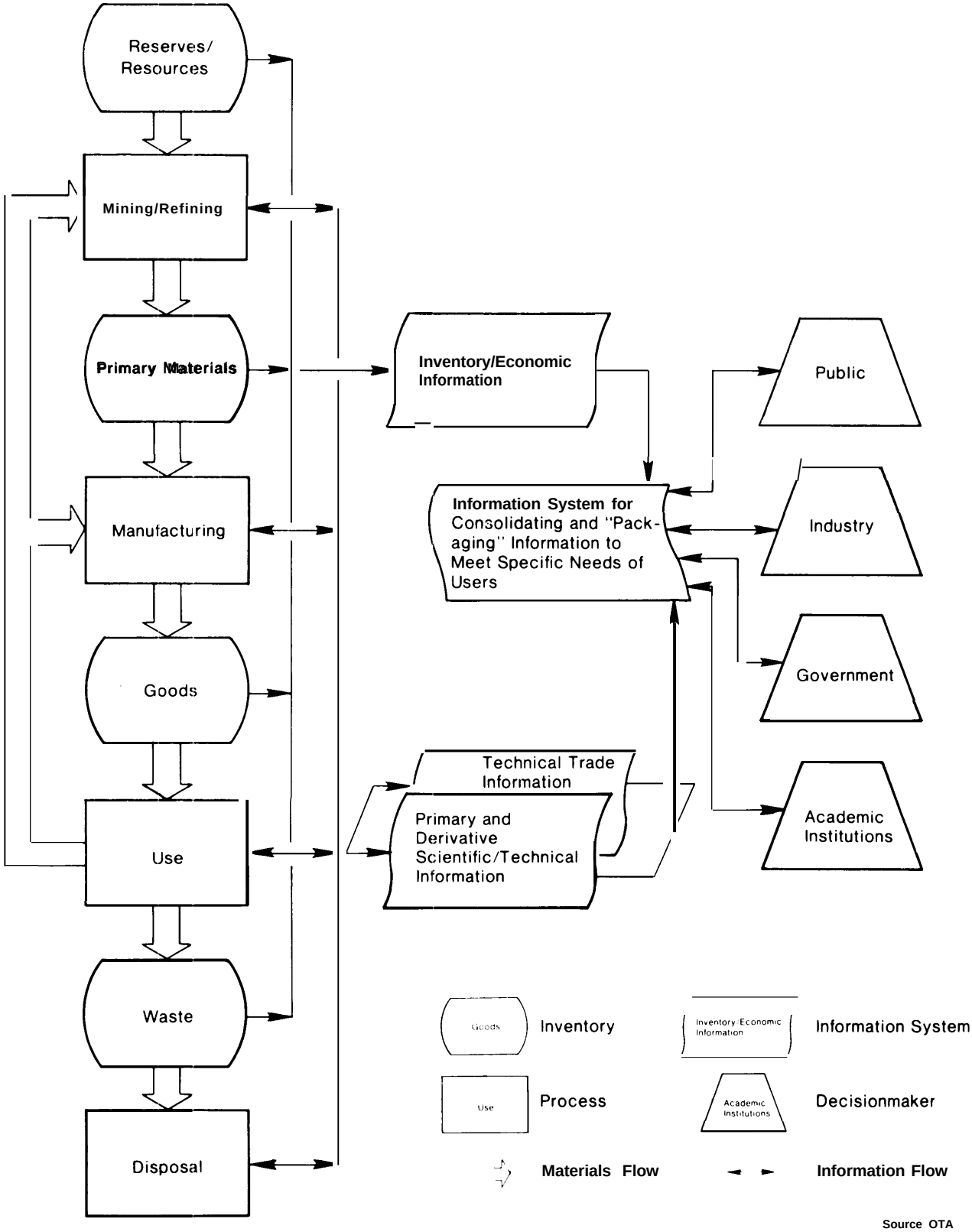
The processing and use of materials accounts for almost 50 percent of the U.S. gross national product, some $576 billion. In 1973, materials-oriented sectors employed more than 34 million workers—45 percent of the full-time work force. In 1973, these sectors consumed more than 80 percent of the total value of all U.S. imports. Significantly, materials imports have been rising since 1967, and there have been periodic scarcity-related situations since the 1950's. But it was not until the 1973 oil embargo that many people realized the United States could, in fact, run short of some vital materials, especially those from foreign sources of supply. , . .

The dominant characteristics of the U.S. materials system is that it is a private system in which supply, demand, and allocations are largely determined by independent decisionmakers working through the market. In the past, Government action to complement the market's response to materials problems was minimal. This condition may be changing; many new pressures on the materials system are national in scope and transcend the decisionmaking capacity of the private sector. For Government materials policy to be effective, it must be based on an up-to-date understanding of the market forces and on timely, accurate information depicting its principal supply and demand parameters.

A wide variety of diffuse and disparate information systems in Government, industry, and academic institutions now guide decisionmakers on all aspects of materials. In contrast to a "national" system—which implies coordination and integration—these separate systems are better regarded as a "nationwide" information resource. . . .

The existing Federal information systems on materials were designed for different purposes, are loosely connected, and do not provide policy makers with adequate information

Flow of information through the materials cycle



Source OTA

to deal with current materials issues. In particular, they cannot be used to forecast possible shortages, judge their impacts and the market's ability to absorb them, or test the effectiveness of alternative policies. More comprehensive and integrated systems capabilities are needed to deal with current materials problems. These capabilities should include techniques for interrelating data regarding the principal supply and demand factors so as to illuminate their effects on the flow of materials. . . .

Review of a limited set of materials information systems currently in use by Federal agencies indicates that they provide a reasonably strong base for developing integrated capabilities. Many of the basic functions are already being performed or are in development, and much of the required data is being generated and collected.

However, since the existing systems were developed by different agencies, for different purposes, and at different times, integrating them to achieve the improved capabilities requires:

- Improving the completeness, currency, and accuracy of their data bases;
- Improving access to them and their ability to interrelate by adopting more uniform usage of terms and developing procedures for ensuring data security; and
- Improving their capabilities for analyzing the data and presenting results to decisionmakers in meaningful formats. . . .

Institutional change is necessary if Congress and the President decide to provide the integrated capabilities. Such capabilities could be located and operated in many institutional settings, including locations within the private and public sectors, and within the legislative and executive branches to support public policymaking.