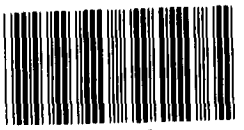
Report To The President And The Congress



Activities Of The Energy Information Administration

Department of Energy

By The Professional Audit Review Team

NOVEMBER 13, 1980

PROFESSIONAL AUDIT REVIEW TEAM
441 G Street N.W.
Washington, D.C. 20548

To the President of the United States,
the President of the Senate, and the
Speaker of the House of Representatives

This report describes the results of the Professional Audit Review Team's (PART's) evaluation of significant aspects of the energy data collection and analysis activities of the Department of Energy's Energy Information Administration (EIA). EIA was created pursuant to the Department of Energy Organization Act (Public Law 95-91, dated Aug. 4, 1977). In accordance with the act, PART's responsibility was transferred from reporting on the Federal Energy Administration's Office of Energy Information and Analysis to reporting on EIA.

In accordance with the act, PART consists of a Chairman designated by the Comptroller General of the United States, and five members designated by the heads of the following Federal agencies: Bureau of the Census, Bureau of Labor Statistics, Council of Economic Advisors, Federal Trade Commission, and Securities and Exchange Commission.

This report describes the status of EIA's actions to (1) maintain its independence from the energy policy function, (2) determine the validity of energy information, (3) improve the credibility of energy models, and (4) develop a National Energy Information System. In commenting on a draft of the report, the EIA Acting Administrator said that the report's recommendations are constructive and reflective of actions now underway within EIA. He disagrees with PART's statements regarding progress in validating EIA information collection programs.

Contents

Copies of this report are being sent to the Department of Energy, the Office of Management and Budget, the chairmen of energy-related congressional committees, and to the PART member agencies.

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ABBREVIATIONS

DOE	Department of Energy
EIA	Energy Information Administration
FERC	Federal Energy Regulatory Commission
OEIV	Office of Energy Information Validation
PART	Professional Audit Review Team

EXECUTIVE SUMMARY

This report describes the results of an evaluation of the Energy Information Administration (EIA), Department of Energy (DOE), by the Professional Audit Review Team (PART). EIA was created by the Department of Energy Organization Act (Public Law 95-91, Aug. 4, 1977), which brought together the energy information systems previously situated in the Federal Power Commission, the Bureau of Mines, and the Federal Energy Administration.

In providing for the creation of EIA, the Congress emphasized the need for a separate organization capable of providing unbiased energy data and independent and objective analysis. Therefore, the Congress provided EIA with a measure of statutory independence by specifically stating that the Administrator of EIA need not obtain the approval of DOE officials in connection with the collection, analysis, or publication of any reports prepared in accordance with the law. Further, the Congress provided that EIA be headed by a professionally qualified administrator who is appointed by the President and confirmed by the Senate. In so specifying, the Congress wanted to create an organization capable of providing the credible energy data and analyses needed for sound decisions on national energy policy.

PART was created pursuant to the Energy Conservation and Production Act (Public Law 94-385, Aug. 14, 1976) to independently evaluate the data collection, analysis, and dissemination activities of the Federal Energy Administration's Office of Energy Information and Analysis. This office was merged into EIA when the Department of Energy was established on October 1, 1977, and, under the Department of Energy Organization Act, is subject to an annual review by PART. PART has issued two reports thus far to the President and the Congress reporting the results of its evaluations. 1/ This third report covers the period April 1979 through June 1980.

OVERALL ASSESSMENT

This third annual report should be read in light of PART's review objectives for 1979. In the period covered,

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1/"Activities of the Office of Energy Information and Analysis, Federal Energy Administration," Dec. 5, 1977, and "Activities of the Energy Information Administration, Department of Energy," May 7, 1979.

we concentrated primarily on EIA's efforts to validate data systems, document energy models, and develop a national energy information system. While we are somewhat critical of current efforts in these areas we also recognize that EIA is making progress. PART recognizes that EIA has had several major accomplishments during the past few years.

Foremost among its accomplishments is the fact that EIA has remained independent in its energy data collection and applied analysis function from the formulation and advocacy of national energy policy. EIA has also established several major programs which recently bore fruit. Especially noteworthy are the development of:

--A system for reporting the size of oil and natural gas reserves in the United States.

--A collection and estimation system to report weekly the oil industry's petroleum production, imports, and stocks.

--A financial reporting system which completed the collection of comprehensive financial data from 26 major energy companies for 1977. The system's first report was published in January 1980. Collection and reporting of additional data on the 26 companies for the 1974-79 time series is planned for 1980.

EIA INDEPENDENT OF ENERGY POLICY FUNCTION

PART found no reason to question EIA's independence from DOE's energy policy function during the period covered by the current review. The responsibility for formulating and advocating national energy policy was separated from the energy data collection and applied analysis function by the Energy Conservation and Production Act. This continued separation of functions has strengthened EIA's position as an independent source of energy data and analysis. Further, EIA has been organized and administered in a manner designed to promote its credibility as a neutral source of energy data and energy analyses.

NEED TO PLACE MORE EMPHASIS ON VALIDATING ENERGY INFORMATION

As PART previously reported, EIA officials recognized that a strong energy information validation function is a key to the accuracy and credibility of energy information collected by the Federal Government. EIA established an Office of Energy Information Validation and developed a

program plan for the Office in February 1979 which laid out its overall mission and a strategy for accomplishing eight preliminary tasks. However, PART found that as of the time of this review no priorities have been assigned to these tasks and the Validation Office has produced only limited validation efforts.

The three studies completed by the Office and examined at the time of PART's fieldwork do not go far enough to address all of the issues which in PART's judgment form the basis of a thorough validation study. The studies are useful in calling attention to problem areas, but they provide only limited quantification of the level of error.

PART believes that because of limited validation efforts conducted thus far, the accuracy of most energy information is undetermined.

In commenting on a draft of this report, EIA agreed with our recommendations but disagreed with our analyses of the three issued studies. PART still believes that the three studies do not go far enough to provide a basis to be labeled validation studies.

PART recommends that the Administrator, EIA:

--Establish priorities for the eight primary tasks enumerated in OEIV's program plan to ensure that, with the limited resources available, attention is directed to the most important tasks so that the energy information being published is as accurate as possible.

--Adjust the time frames in the program plan to more realistically reflect what can be accomplished given the expected level of staff resources.

--Improve the quality of validation studies by requiring, to the extent practicable, that the studies provide a framework and better quantification of results and by providing a section in each validation report which presents quantification of results.

--Decide which group should develop model validation standards.

EIA MOVES TO IMPROVE THE CREDIBILITY OF ENERGY MODELS

PART's review of the program plan prepared for the Office of Applied Analysis--the EIA office responsible for all

energy models and forecasts--and its evaluation of the Office's activities in relation to objectives set forth in the plan showed the plan to be unrealistic and overly ambitious. Since model documentation is a prerequisite for virtually all quality control activities, including model validation, verification, and sensitivity testing, we are concerned that none of EIA's models, scheduled to be completely documented by December 1979 according to EIA's own standards as called for by their program plan, were completed.

As a result of this lack of documentation, the preliminary standards, procedures, and guidelines for validation scheduled for completion in 1979 fell behind schedule and were not completed. We found that as of April 1980 EIA had archived--made available for public access--8 of the 26 models used for preparing the 1978 EIA Administrator's Annual Report to the Congress. EIA has decided against an outside repository for models but it will make them available to the public on request through Applied Analysis. We would expect that next year EIA should be in a position to archive the models used in preparing the current annual report to the Congress.

PART recommends that the Administrator expeditiously move toward documenting the current versions of EIA's models since most quality control activities rely on model documentation. We also recommend that the Administrator address the problem of the backlog of models to be documented and develop a plan to deal with it. We further recommend that the Administrator after issuing the EIA Annual Report to the Congress make available to the public in a timely manner EIA's models used in preparing the report.

In commenting on a draft of this report, the EIA Acting Administrator agreed with our recommendations and acknowledged that work needs to be undertaken to make energy models more credible. He said that the Office of Applied Analysis is starting to concentrate on documenting the current version of EIA's models within the limits of their resources. Also, the Applied Analysis program plan will emphasize documenting the models used for the Annual Report and other important models. (See app. I.) PART has not yet seen any evidence that EIA has stepped up its activities to document its models. In the coming year, PART will thoroughly review EIA's progress to document, validate, and archive its energy models.

EFFORTS TO DEVELOP A NATIONAL ENERGY INFORMATION SYSTEM

EIA and its predecessor agency have had the responsibility for establishing a National Energy Information System since

August 1976. The System was intended to be an authoritative source of adequate, accurate, comparable, coordinated, and credible energy information within the Government. Only limited progress has been made in developing the System in the nearly 4 years that have passed since the legislation setting forth the requirements of such a system was enacted. Three conceptual design and implementation plans which were proposed have been found to be inadequate by EIA. EIA formally established the Office of the National Energy Information System in July 1979 to design and implement a system.

A conceptual design was approved by the Administrator in June 1980 and is in the process of being printed. The Office is currently developing a program plan based on that design.

EIA believes that the Congress, through legislation, has established the initial priorities for the System, and therefore EIA did not prepare a user's survey to determine what their requirements would be.

We believe that in developing the System EIA should, in addition to recognizing legislative requirements, also solicit comments from the System's potential primary users to obtain input on their data needs.

In commenting on a draft of this report, the Acting Administrator of EIA said that EIA has solicited potential users of the System's data, both formally and informally, with regard to their data needs. (See app. I.)

PART disagrees. Our review found that EIA has only held discussions to identify particular data needs with potential users of the Financial Reporting System, the Oil and Gas Information System, and the Consumption Data System. These systems have not yet been brought into the National Energy Information System. We found no evidence that the Office of National Energy Information conducted any user surveys to determine that the petroleum data presently in the System was entered on a priority basis. Three EIA staff members with knowledge of petroleum information made the determination of what information to incorporate into the System. PART still believes EIA should conduct user surveys to determine what information they would hope to obtain from the System.

PART recommends that EIA issue a statement of the concepts and obtain public comments on it, and survey the potential primary users of the System to determine what data should be incorporated into the System on a priority basis.

EIA MOVES TO DEVELOP PLANNING PRIORITIES

As of January 1980 EIA did not have an overall planning process to prioritize its missions. It developed program plans for some of its major offices--Energy Information Validation, Applied Analysis, and Energy Information Services. Two other offices established in 1979--Energy Systems and Support and Energy Data Operations--are in the process of developing program plans. The Office of Program Development completed plans for some specific systems which were already underway. However, program plans written to date have been developed by the Offices and subsequently reviewed by the Administrator of EIA.

In February 1980, EIA began an overall planning process to prioritize its missions by holding a planning retreat to discuss goals and priorities of the entire organization. In March 1980, EIA developed a 5-year program plan (fiscal years 1982-86) for DOE's Planning, Programming, and Budgeting System. The EIA Administrator assigned a priority to each program during the preparation of this plan. PART has not yet evaluated EIA's submission to DOE's Planning, Programming and Budgeting System; therefore, we cannot make a judgment on its contribution to EIA's planning process. We plan to examine this portion of EIA's planning process in the coming year.

CHAPTER 1

BACKGROUND

The Department of Energy (DOE) Organization Act 1/ established the Energy Information Administration (EIA), bringing together the energy information systems previously situated in the Federal Power Commission, the Bureau of Mines, and the Federal Energy Administration. EIA came into existence on October 1, 1977, when DOE was established. EIA was created to alleviate the fragmentation of data responsibilities which had been blamed for increasing the energy industry's reporting burden and for contributing to a general lack of understanding of the energy problem.

The responsibilities of EIA's predecessor agency, the Office of Energy Information and Analysis, established by the Energy Conservation and Production Act, 2/ were transferred to EIA by the Department of Energy Organization Act. 3/ EIA is responsible for carrying out a central, comprehensive, and unified data and information program to collect, evaluate, assemble, analyze, and disseminate data and information relevant to energy resource reserves, energy production, demand, technology, and related economic and statistical information. 4/ EIA is required to develop a National Energy Information System containing adequate, accurate, coordinated, comparable, and credible energy information. Such information is needed for energy-related policy decisionmaking by DOE, other Government agencies, the Congress, the President, and the public. 5/ EIA is also responsible for operating a national reserves system to determine the best estimates of fuel reserves and a financial reporting system for the energy-producing companies. 6/

ORGANIZATION OF EIA

The act provides that EIA be organized as a separate entity within DOE, insulated from DOE's role in formulating and advocating national energy policy. It also provides that EIA be headed by a professionally qualified administrator who is appointed by the President with the advice and consent of the Senate. 7/ In specifying the character of EIA and in describing some of the statistical and forecasting capabilities and reports desired, the Congress attempted to generate the energy data and analysis necessary for sound decisions on national energy policy.

EIA has continued to grow both in staffing levels and budget amount. Its authorized staffing levels were increased from a total of 744 for fiscal year 1978 to 773 for fiscal

year 1979 and 906 for fiscal year 1980. Its operating expenses were also increased from $50.7 million for fiscal year 1978 to $65.6 million for fiscal year 1979 and $89.2 million for fiscal year 1980. EIA reorganized its Office of Energy Data, which was responsible for the collection and interpretation of energy data, in 1979. That Office was divided into the Office of Energy Systems and Support and the Office of Energy Data Operations. (See app. II.) EIA's major offices currently are:

1. Energy Systems and Support--Responsible for developing energy data systems and providing automatic data processing services to EIA and other DOE offices including the Federal Energy Regulatory Commission and the Energy Regulatory Administration. It must also develop and enforce statistical and other data standards and procedures which will ensure the quality of energy data.

2. Energy Data Operations--Responsible for the ongoing collection of data and for producing and publishing regularly scheduled energy data and interpretive reports--about 496 annually. It must also maintain and provide a capacity for ready access to data elements and data bases it has in its possession, which are not generally published but are of interest to analysts, policymakers, and other users.

3. Energy Information Validation--Responsible for developing the procedures, techniques, and methodologies necessary to validate energy information and the processes used to collect and analyze it, make forecasts, and conduct validation studies.

4. Applied Analysis--Responsible for making energy analysis and forecasts for DOE, other Federal Government agencies, and the Congress; and for developing, evaluating, and maintaining energy flow and accounting models describing the production, distribution, and consumption of energy by various sections of the economy and lines of commerce in the energy industry.

5. Energy Information Services--Responsible for preparing and distributing EIA publications and other information. It operates the National Energy Information Center which provides information and referral assistance to Federal, State, and local governments and the public, responding to about 38,000 inquiries in 1979. It also operates the Energy Information Administration Clearinghouse, which edits and coordinates publication and distribution of all EIA publications.

6. Program Development--Responsible for the design and development of major energy information systems. These programs include the National Energy Information System, the

Financial Reporting System, the Oil and Gas Information System, the Consumption Data System, and the Energy Emergency Management Information System. 8/

EIA MOVES TO DEVELOP PLANNING PRIORITIES

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ROLE OF PROFESSIONAL AUDIT REVIEW TEAM

PART was formed to review and evaluate EIA's work and to determine whether data collection and analysis activities are being performed in an objective and professional manner consistent with the intent of the Congress. 9/ In accordance with the authorizing legislation, members of PART are drawn from the following Federal offices or agencies. 10/

--Bureau of the Census.
--Bureau of Labor Statistics.
--Council of Economic Advisers.
--Federal Trade Commission.
--General Accounting Office.
--Securities and Exchange Commission.

The DOE Organization Act provides that PART make an annual professional audit of EIA. 11/ PART has issued two

reports thus far to the President and the Congress, reporting the results of its evaluations. The first, issued on December 5, 1977, was entitled "Activities of the Office of Energy Information and Analysis, Federal Energy Administration." The second, issued on May 7, 1979, was entitled "Activities of the Energy Information Administration, Department of Energy."

The PART staff members during the period covered by this report were:

Mr. Vincent T. Arostegui, General Accounting Office
Mr. Frank J. Gross, General Accounting Office
Mr. Frank Bowers, General Accounting Office
Ms. Jeanne Fox, General Accounting Office

SCOPE AND METHODOLODY OF REVIEW

This report describes the results of our evaluation from April 1979 through June 1980. During this period, our staff, located at EIA headquarters, interviewed DOE and EIA officials, examined laws relating to EIA, and reviewed EIA's records, policies, procedures, studies, reports, and other documentation pertaining to our review areas. Moreover, while attending conferences and symposiums the staff discussed energy modeling with energy officials from business, research firms, and educational institutions to obtain the widest possible range of information upon which to base our evaluation of EIA.

The statistical and mathematical expertise of our Bureau of the Census representative was used to evaluate EIA's three completed energy information validation studies. The evaluation concentrated on whether procedures used to perform the studies conformed to PART's standards for validating information.

Background material on EIA and PART along with a discussion on the progress EIA has made in prioritizing its work is presented in chapter 1. Chapter 2 gives an assessment of EIA's independence from the energy policy function. Chapter 3 describes the Office of Energy Information Validation's procedures to validate energy information. Chapter 4 presents our observations on the integrity of mathematical and statistical modeling activities of the Office of Applied Analysis. EIA's efforts to develop a National Energy Information System are described in chapter 5.

In keeping with the scope of work agreed upon by the PART members, the staff this year did not undertake to evaluate

--EIA's model documentation and model validation reports and studies,

--the progress of integrating the Bureau of Mines and Federal Power Commission personnel into EIA,

--the relevancy of data collected and published by EIA, and

--EIA's contracting procedures and practices.

NOTES

1/Public Law 95-91, Aug. 4, 1977.

2/Public Law 94-385, Aug. 14, 1976.

3/Public Law 95-91, Aug. 4, 1977 (sec. 205(c)).

4/Public Law 95-91, Aug. 4, 1977 (sec. 205(a)(2)).

5/Public Law 94-385, Aug. 14, 1976 (part C, secs. 141 and 52).

6/Public Law 95-91, Aug. 4, 1977 (sec. 205).

7/Public Law 95-91, Aug. 4, 1977 (sec. 205).

8/EIA organizational charts and mission and function statements.

9/Elmer B. Staats, Comptroller General, U.S. General Accounting Office, letters to Julius Shiskin, Commissioner, Bureau of Labor Statistics; to Juanita Kreps, Secretary of Commerce; to Charles L. Schultze, Chairman, Council of Economic Advisers; to Roderick M. Hills, Chairman, Securities and Exchange Commission; and to Calvin J. Collier, Chairman, Federal Trade Commission, explaining their responsibilities to appoint representatives to PART and announcing the appointment of the Chairman, Feb. 16, 1977.

10/Public Law 94-385, Aug. 14, 1976 (secs. 142 and 55(b)).

11/Public Law 95-91, Aug. 4, 1977.

CHAPTER 2

EIA ACTIVITIES INDEPENDENT OF ENERGY POLICY FUNCTION

PART found no reason to question EIA's independence from the energy policy function during the period covered by the current review (Apr. 1979 to June 1980). Upon creation of DOE, the responsibility for formulating and advocating national energy policy was separated from the energy data collection and applied analysis function, as originally mandated by the Energy Conservation and Production Act. This continued separation of functions has strengthened EIA's position as an independent source of energy data and analysis. Further, EIA was organized and administered in a manner designed to promote its credibility as a neutral source of energy data and energy analyses.

OFFICE OF APPLIED ANALYSIS FORECASTS AND ANALYSES

The EIA operation most susceptible to policy influence is the Office of Applied Analysis. This Office makes detailed forecasts and analyses of the impact of energy policy alternatives on energy supplies, demand, costs, and prices through the use of energy models and independent professional judgment. By adjusting certain input variables, alternative forecasts can be produced to evaluate a wide range of policy alternatives. The Office of Applied Analysis makes independent forecasts and analyses published in the EIA Annual Report to the Congress. It also responds to requests for special forecasts and analyses from legislators, regulators, program managers and analysts, decisionmakers, and the general public. The Office of Applied Analysis has established procedures to record the assumptions that requestors want incorporated into their forecasts and analyses and to assure that the resulting products are clearly described as having been prepared at a client's request. Also, a public record is maintained of all requests for analytical services, the products furnished, and the assumptions on which the products were based. 1/

In 1979 the Office of Applied Analysis published the results of 39 analysis reports. PART analyzed 10 of the 39 analysis reports published during the year. We randomly selected one report published during each of the first 10 calendar months of the year. In addition to analyzing the reports for obvious external policy bias, PART assured itself that procedures had been established by EIA to guard against external influences. In this regard, EIA has established procedures to record the assumptions each requester external to EIA wants incorporated into particular forecasts and

analyses. The resulting products are clearly described as having been prepared at a client's request. In addition, EIA maintains a public record of all requests for analytical services, the products furnished, and the assumptions on which the products were based. These procedures apply to all requests from sources external to EIA.

OBJECTIVITY OF 1978 EIA ANNUAL REPORT TO THE CONGRESS

Volume three of the 1978 EIA Annual Report to the Congress contains projections of energy production, consumption, and prices, in addition to their economic and other related consequence. The report meets the requirements of the legislation which specifically calls for such projections, including short-, medium-, and long-term energy consumption and supply trends and forecasts under various assumptions. The report contains five basic energy supply and demand scenarios which indicate the uncertainty in preparing projections for the future. 2/ Volume three of the 1978 Annual Report to the Congress is a straightforward presentation of the types of information needed for decisionmaking.

EIA sponsored a symposium conducted by the University of Maryland on November 7-8, 1979, to obtain a critique of volume three of the 1978 Annual Report. The purpose of the symposium was to obtain a third-party review of the energy forecasts and forecasting methodologies used in the Annual Report. The subject matter discussed at the symposium included short-, mid-, and long-term energy supply and demand and oil, natural gas, coal, electricity, and nuclear energy sources. The symposium speakers represented academia, energy consulting firms, local, State, and Federal Governments, trade associations, financial institutions, and oil companies.

The participants attending the conference included experts from the above groups as well as DOE personnel and PART representatives. EIA considered the symposium a success and plans to make it an annual occurrence. PART believes the symposium provided EIA with valuable expert review and comment on the techniques and methodologies used to produce volume three of the Annual Report. Public exposure and discussion of EIA methods by professional peers is a good approach to the improvement of energy models and data systems.

NOTES

1/EIA Order No. EI-5910.1, May 2, 1978, Requests for Analytical Services of EIA.

2/EIA, Annual Report to Congress, Vol. III, 1978, Forecasts, pp. xvii-xxiii.

CHAPTER 3

NEED TO PLACE MORE EMPHASIS ON VALIDATING ENERGY INFORMATION

Proper control and documentation of the quality of EIA's statistical and analytical information are critical to EIA's mission. A separate office to perform this task, headed by an Assistant Administrator, was established in October 1977. Called the Office of Energy Information Validation (OEIV), it has the responsibility to assist the Administrator, EIA, in ensuring that EIA provides sufficient, meaningful, accurate information. The establishment of this separate unit reporting directly to the Administrator was an effort PART had encouraged and endorsed.

OEIV developed a program plan which discusses the principal tasks to be accomplished. PART's review of this plan and OEIV's accomplishments during 1979 form the basis for this chapter. The program plan lists eight major tasks to be accomplished, in no order of priority. 2/ PART believes that, because of OEIV's limited resources, priorities should be set for the eight tasks and sufficient resources devoted to the more important ones.

PART also believes that validation of systems should have a higher priority. As of June 1980 OEIV has issued reports on only 4 of its 55 existing systems. 3/ OEIV has programmed about 5 out of a total of 37 available staff-years for validating systems. 4/ PART believes the three studies available to be examined at the time of its fieldwork do not go far enough to address all of the issues which, in PART's judgment, form the basis of a thorough validation study. The studies are useful in calling attention to problem areas, but they provide only limited quantification of the level of error.

In particular it would seem advisable to PART that limited resources be devoted initially to a quantitative assessment of differences between the survey under review and what might be described as the most operationally effective measure. If this quick assessment provides a conclusion that the survey was probably within a generally acceptable range of accuracy, a full scale validation study should be undertaken. (The range may vary with each survey.) If not, the survey should be dropped, completely redesigned or restructured, and no further validation undertaken at this time.

A survey mandated by law must, of course, be continued even if an initial review indicates major problems with a system, but the review could at least provide guidelines for changing the system.

Furthermore, PART found that requirements reviews--determinations for specific subject areas of the information needed to meet statutory and regulatory needs--did not always precede system validation efforts for the original 14 studies outlined in appendix III. PART believes they should.

ORGANIZATION OF OEIV

OEIV has three principal offices. They are the Offices of Validation Resources, Validation Analysis, and Systems Validation. 5/

The Office of Validation Resources is responsible for assuring that the required information, means, support services, and resources are available to carry out OEIV's responsibilities. This Office is also responsible for assisting in the editorial preparation, review, and coordination of OEIV's products, keeping account of energy projections made by the Office of the Assistant Administrator for Applied Analysis, and reviewing EIA publications for appropriate statements regarding the quality of energy information. 6/

The Office of Validation Analysis is responsible for:

--Developing concepts and methodology for data validation and for reviews of requirements for information in broad subject areas. The methodology and knowledge developed are applied to specific validations, in order to assist in analyzing their results, and to provide general technical support to the rest of OEIV.

--Reviewing the verification work of the Office of Applied Analysis and evaluating the requirements for model output, for examining the logical, mathematical, and statistical structure of the model, for evaluating input data and parameter values, and for assessing the meaningfulness and accuracy of the model output in terms of its use and whether or not it satisfies the users' requirements.

--Examining the consistency among data series and duplication among data collection instruments, and conducting special studies for data quality. 7/

The Office of Systems Validation acts as the primary operating arm of OEIV. This Office reviews proposed data collection systems, conducts field validation, and completes system validation reports. 8/

As of June 17, 1980, OEIV had 37 full-time professionals: An Assistant and a Deputy Assistant Administrator, 7 personnel in Validation Resources, 15 in Validation Analysis, 12 in Systems Validation, and a Senior Technical Advisor to the Assistant Administrator. 9/ The total fiscal year 1980 budget for OEIV is $13.3 million, of which $10.3 million is for contracting services. 10/ The contracts represent about 77 percent of OEIV's total budget.

OEIV PROGRAM PLAN

EIA developed a program plan for OEIV in February 1979. OEIV intends to use its program plan as a management tool for planning the direction of program objectives and projects, keeping abreast of estimated time frames, and managing resources. The plan lays out OEIV's overall mission, goals, objectives, and strategy for carrying out the plan through 1986.

The plan's goal is to

> "obtain and maintain current knowledge of the quality of EIA's information base, develop recommendations for improving the meaningfulness and accuracy of EIA's information products, and communicate both."

To accomplish this goal, OEIV officials developed principal tasks and estimated milestones. (See table 1, p. 13). Also shown in the table is a breakdown of the number of professional staff-years assigned to each task for fiscal year 1980.)

As of June 1980 there have been no major revisions to the time frames in the program plan. However, as discussed in the following sections, OEIV will probably not meet many of its goals. A revised version of the plan is expected in November.

SYSTEMS VALIDATION

OEIV's program plan calls for completion of initial validation of all 55 EIA energy systems by 1986, with periodic review thereafter assuming availability of adequate funding. Thus far, OEIV has issued "validation" studies for four systems--two completed in 1979 and two in 1980. Fifty-one systems remain to be validated, and unless they receive increased emphasis, it appears doubtful that they will be completed by 1986 as planned. Thus, the proposed quick assessment proposed by PART should provide a useful guide to OEIV to differentiate between systems for which a full-scale

Table 1

OEIV Program Plan Major Tasks, Estimated Milestones, and Staff-Years for Fiscal Year 1980

Task	Milestone	Staff years
Systems validation	Validate all 55 existing systems by 1986 and a rolling review of all systems on a periodic 5-year basis.	4.7
Review of requirements	Complete and integrate reviews for about 26 subject areas by 1983.	4.4
Special studies	Complete six to eight studies per year.	3.3
Preliminary reviews (note a)	Conduct full reviews of all proposed forms (about 180-200 per year).	3.2
Field validation	Complete field work for those systems specified by the Administrator, EIA.	10.1
Model validation	Validate all Applied Analysis models by 1986 and rolling reviews of all models.	3.0
Tracking of projections (note a)	Monitor projections published by EIA and compare them with actual events.	0.0
Review of publications (note a)	Review all EIA publications to ensure they provide accurate descriptions of the quality of the published information.	0.3
Total staff-years (note b)		29.0

a/OEIV has done little or no work on these tasks.

b/The remaining 8.0 staff-years deal with developing standards and procedures for data collection systems and models and administrative operations of OEIV.

validation is needed and those systems for which no further work would be cost effective because the system will be discontinued or because full validation will be postponed until the system is redesigned.

Before discussing our analyses of three of the four "validation" studies which OEIV has issued--one study was issued subsequent to completion of our field work--we present what PART considers to be purposes which a validation study should strive to meet. As noted earlier, for some systems this will be a full-scale review. However, for other systems a preliminary assessment should provide enough quantitative evidence to foreclose the need for a full-scale review of the system because it will be discontinued or substantially redesigned.

Purposes of validation

The primary purposes of validating survey information are (1) to assure that the data collected are meeting the needs for which the collection system was created, (2) to help producers of survey data reduce and control error in the survey data, and (3) to help users in interpreting the survey data. The data needs validating from several standpoints. For example:

--Were the survey objectives translated into clear operational terms?

--Were concepts translated into consistent operational definitions?

--Were sampling methods used whenever appropriate to reduce respondent burden and increase timeliness?

--Was the survey questionnaire pretested and revised to take into account respondent difficulties?

--Were data collection techniques tested?

--Were respondents able to understand and respond to what was requested?

--Were definitions applied uniformly?

--What was the level of nonresponse?

--What effect did nonresponse have on the survey data?

--Was there verification of coding, keying, and editing in the data processing?

--Did edit routines use past data to help in gaining consistency?

--Were statements made on the basis of the survey justified by survey data?

A validation study that addresses these issues can be used by survey data producers to improve the entire survey operation. A validation study that quantitatively gives relative magnitudes of error can help the individuals who are responsible for conducting the survey to focus on the areas where improvement would have the largest payoff or could point toward discontinuing surveys in some instances. The same kind of study would provide users with valuable information.

Structure of validation

Validation goes far beyond investigating respondents' replies to a questionnaire. It implies a validation of the entire operation of conceptualization of the survey goals, data collection, data processing, and data interpretation. It is one thing to list potential sources of error, but then sources of error should be grouped into some structure. A mathematical model should underlie the structure, permitting potential sources of error to be identified as contributing to variance or biases. The relative magnitudes of these components of error should be a goal of the validation process. Only then can emphasis be given to reducing and controlling the errors.

In addition to studying sources of error and their relative contributions to total error, one should also examine the system for timeliness of reports and the amount of respondent burden. A statistical system that produces data with small mean-square errors, and then only months or years after the data are needed, is not an acceptable system. A system that has the potential of producing accurate data but only at an enormous burden to the respondents is also not acceptable. All of these questions need to be answered to provide a logical basis for making decisions based on the data. Also, the need is very crucial for establishing priorities for validations involving a large number of complex systems.

Participants in validation

A need exists for a variety of backgrounds to be represented in validating statistical systems. Some of the principal participants should be:

--Those who set the goals of the survey.

--Subject matter specialists.

--Questionnaire specialists.

--Mathematical statisticians.

--Data processing people.

--Data users.

Those who set the goals of the survey need to specify what those goals were. They need to identify how those goals were conceptualized. What definitions were given? How were definitions translated into questions? Were pretests conducted to evaluate alternative ways of gathering data?

Subject matter specialists are also involved in the translation of objectives into definitions and questions. They understand the ambiguities in responses, based on their experience. They also help formulate alternative questions. They frequently specify reasonable imputation procedures.

Questionnaire specialists go beyond the subject matter specialists in identifying ambiguous questions. They help phrase questions in language that is understandable to a wide range of respondents. They caution on use of words that may have regional or localized meanings. They follow principles of questionnaire wording that lead to less biased results. For example, questions that require respondents to make a choice should make the alternatives clear. In designing a validation study, questionnaire specialists will work with the original questions and instructions in order to design a series of probing questions that will come closer to the operational definition.

Mathematical statisticians lay out the model that is the foundation of the validation. For example, the model may specify that the mean-square error of a total, a mean, or a proportion can be expressed in terms of a sampling variance, a simple response variance, a correlated component of coding variance, a simple coding variance, an interaction between response and sampling variance, an imputation variance, the square of the nonresponse bias, the square of the response bias, and the square of residual biases. The model may also include undercoverage bias. The mathematical statistician will design studies that will permit the estimation of the parameters of the model.

Data processing people are involved because of coding, editing, and machine processing. All of these functions can lead to variances and biases in data. They can make known

the specifications for these functions and any malfunctioning of systems.

Data users are involved in validation through specifying the needs they have, whether accuracy or consistency is of major importance, and how much error can be tolerated before a statistic is not useful.

In any validation study, all of the above disciplines play important roles. OEIV does employ staff with these backgrounds, with the exception of questionnaire specialists, who are consultants. PART deems this an important enough skill in validations so that OEIV should work toward developing that skill on its staff.

Institutional framework of validation

If validation is to be an ongoing part of EIA's mission, PART believes that validation must be built into every new system. At present, the majority of OEIV's validation work is contracted out. OEIV needs to be more involved in setting the framework or model for validation. Also, to the greatest extent consistent with resources, the skills and experience to do validation work should be developed within OEIV.

As new studies of systems begin, validation should be a part of them from the beginning. If other agencies collect data for EIA, they should be asked to build validation into the system.

STATUS OF OEIV VALIDATION EFFORTS

In a report dated May 7, 1979, PART reported that OEIV officials recognized that a strong energy information validation function was integral in assuring the credibility of all energy information. PART further reported that OEIV officials were concerned with improving the quality of energy data and were in the process of developing validation techniques and methodologies and validating 14 energy data systems. OEIV had contracted out validation work on these 14 systems. The contracts called for developing energy data validation methodology and validating the 14 systems. 11/ (See app. III for current status of each system). As previously stated, as of June 1980, "validation" reports have been issued on four systems.

PART believes that a major problem related to the slow progress being made in validating data systems is OEIV's allocation of its professional staff of 37. OEIV has programmed only about 5 staff-years to the effort and actually

only 3 staff members have been assigned to validation work on a full-time basis, although requirement reviews and field validation are closely related tasks and have over 14 staff years assigned. PART believes that unless additional staff resources are devoted for systems validation work, validating all 55 systems by 1986 as called for by the program plan is an unrealistic goal although the quick assessment approach may be helpful in reviewing some portion of these systems.

COMPLETED VALIDATION STUDIES DO NOT MEET ALL OBJECTIVES

PART's review of three of the completed studies, all by contractors, disclosed that they lacked in some major way of meeting reasonable goals for determining the validity of the system under review. There is limited quantitative assessment provided in the studies. There is no result from the studies that permit a user to say that a specific statistic is unbiased or has an error of a certain amount. There is no system that evaluates biases, variances, coverage, or processing errors in terms of an overall model so that the relative components of error can be assessed. The "validations" conducted so far are really in the nature of preliminary pretests of validation studies.

Respondents in a nonrandom sample were queried about how they filled in the form. Difficulties with the questionnaire, the processing, the timing, and the respondent burden were all interpreted through a nonrandom sample of users and respondents.

Only limited quantification is provided. Though the information is useful, it does not constitute as useful a validation as we feel is possible given the resources used.

Clearly OEIV cannot undertake thorough validation on each of its 55 systems immediately. However, with the resources used it would seem possible to quantify--even if based on a relatively small sample--the relative error in the current system. PART did not review the contracts for these studies; however, we did note that OEIV limited the amount and depth of the contractor's work.

Because of the limited validation work by OEIV thus far, we believe the accuracy of most energy information is undetermined. Our analysis of the three studies follows.

Industrial energy efficiency improvement program and voluntary business energy conservation program

These programs collect data to (1) measure progress towards conservation goals, (2) recommend improvements in the collection process, in order to improve the statistical quality of the data, (3) suggest changes in the publication frequency, precision, and information reported, and (4) make explanatory notes. 12/

This study was conducted under contract by the Evaluation Research Corporation at a cost of $62,000. 13/ The methodology was described in an appendix to the report. The methodology consisted of doing background research to understand the data collection system, planning and implementing investigations of the system, and documenting the analyses. No model for validation was presented. The report states that "data accuracy" was an issue which was not cost/beneficial to investigate at the present time. As part of the study, respondents and data users were contacted to discuss the survey. The results of the study mentioned

--the multiple, and not mutually attainable, purposes for the systems;

--the mixture of mandatory responses from large, energy-consuming industries, with voluntary responses from smaller businesses and industries;

--the lack of common reporting formats;

--the lack of use of the data for any regulatory decisions, or as an input to any models or analyses;

--the lack of timeliness in publishing the data; and

--the possibilities of measurement error being present.

These findings are useful, but none of them are what PART would expect from an initial validation effort, and all of them could have been produced by OEIV by simply reviewing the data collection process. There is no discussion of the use of sampling, or measures of measurement error, or possible impacts of errors on the data collection system. The results are extremely limited.

EIA advised us that no quantification was made because the collection system was so bad that it was not worth the effort.

Capacity of petroleum refiners system

This system collects data annually on the operable capacity of all U.S. refineries. The system is DOE's principal source of direct information about individual refining facilities. The validation effort resulted in revision of the data collection form, faster data collection and processing, expanded data editing with consistency checks, and changes in publications. 14/ This study was also carried out by the Evaluation Research Corporation, at a cost of $62,000. 15/

The study highlighted definitional problems, inconsistent measurement practices, data processing problems, and publication timing difficulties. The methodology used was exactly that of the previous validation effort. Only limited efforts were made to quantify any findings about data accuracy or reliability. The recommendations focused on

--inadequate definitions,

--revisions to the questionnaire,

--expanding the frame,

--improving the timeliness of processing, and

--improving the format of the publication.

Again, all of the findings were useful but represent an incomplete validation. The study provides limited answers about the accuracy of the data or the relative contributions of the sources of error.

Natural gas curtailments system

This system collects data on projected natural gas deliveries, curtailments, and alternate fuel use. 16/ This study was carried out under contract by the Institute of Energy Analysis at a cost of $241,000. 17/

The study was the same type as the previous two. The definition of "curtailment" was found to be a major problem since it was not standardized, which prohibited the data gathered from being accurate or consistent. Improvements in the questionnaire were recommended. Indeed, it was stated that they might need to survey an additional universe. Processing problems were discussed.

If inadequate definitions were a major problem, it would have been extremely useful to query a sample not only on how they did report but on how they would have reported with

standard definitions. Such quantification helps in highlighting the importance of the problem.

This study is somewhat better than the other two discussed, because some statistical techniques were used to measure the extent of agreement between predicted and actual events. However, the use of statistical techniques was very limited.

The major results of this study centered on recommending uniform definitions and changes to the reporting form. No indication of the effect of these changes on the data was provided.

OEIV TASKS--OTHER THAN SYSTEMS VALIDATION

For fiscal year 1980 OEIV planned to spend about 32 of its total 37 staff-years on tasks other than systems validation. These tasks include: review of requirements, special studies, preliminary reviews, and model validation.

Review of requirements

PART believes the information developed in requirements reviews is useful to EIA in planning which systems and forms to validate without duplicating work already done. To realize this benefit, the requirements reviews should precede the corresponding validation review. This was not done in about half of the original 14 validation studies. Specifications resulting from such reviews are planned to enable EIA to focus new and revised data collection efforts precisely on the information required by EIA's users.

In 1979, OEIV performed reviews of requirements for six major energy information areas which had been started in 1978 or early 1979. The six areas are:

--FERC natural gas data systems.

--Residential energy consumption.

--The Financial Reporting System.

--The Oil and Gas Information System.

--Crude oil flow.

--The Natural Gas Policy Act of 1978. 18/

OEIV plans reviews of requirements in the following areas for 1980: coal, consumption in the commercial sector, emergency fuel switching, and other natural gas. 19/ However, to date no reviews have been completed in 1980.

Special studies

When events of public importance call for specific energy information, OEIV has investigated these events as directed by the Administrator, EIA. OEIV conducted 12 special studies at the request of the Administrator, DOE officials, and Members of Congress during 1979 and has started or completed 8 to date in 1980. Appendix IV on p. 67 lists these studies. Uses made of these special studies include termination of unneeded forms and systems, revisions in regulations, requirements review, systems validation, and reduction in collection burden. 20/ Some of these special studies have been of some use in validating data systems. However, they have also had the effect of delaying the validation efforts because staff assigned to validating the systems have been detailed to work on these special studies.

Preliminary reviews

During 1979 EIA had two groups that reviewed data collection systems. Besides OEIV, the Office of Statistical Design and Analysis, under the Assistant Administrator for Energy Systems and Support, maintained an inventory. This Office was set up specifically for forms clearance in EIA. OEIV has recently eliminated its effort to maintain a similar inventory and is now working with the Office to ensure that the reviews of data collection systems are complete.

In 1979, OEIV reviewed 201 proposed or revised data collection forms and systems by focusing on the requirements for each system and examining how those requirements had been translated into a specific design for a data collection instrument or system. This review, made prior to implementation of the system, evaluated the system's statistical soundness and provided a detailed evaluation of the design of the form(s). This review of new forms and systems is continuous. Old forms and systems would not be reviewed unless their clearance had expired or a change was requested.

Model validation

The Office of the Assistant Administrator for Applied Analysis has been assigned to document and verify all its

models by 1986. OEIV must ensure the accuracy and credibility of energy information, including models. OEIV is developing standards for model evaluations through work on a series of pilot studies at the same time that the Office of Applied Analysis is undertaking similar work.

Model evaluations include rigorous evaluation of requirements for the model; explicit examination of the model's logical, mathematical, and statistical structure; evaluation of the assumptions underlying the model, and their effect on its output; and establishment of a critical "audit trail" of the data from the primary sources to model input and parameter values.

In 1979, OEIV worked on two models, the Short-term Integrated Forecasting Systems and the Long-term Energy Analysis Package. 22/ The former model projects energy supply and demand over the short term (1 to 2 years). The latter model simulates the long-term (through 2020) energy-economic activities for the United States. PART has not evaluated the results of OEIV's work on these two models. OEIV has also awarded about $1 million to various universities to do research into model evaluation techniques in 1980.

Since OEIV has only just begun to validate models, it is doubtful the target date of 1986 to review all of the Office of Applied Analysis' models will be met as defined in the program plan.

PART believes that the Administrator, EIA, should give responsibility for the development of validation standards for models to one group and eliminate the potentially duplicative and ineffective situation of two groups assuming responsibility for validation standards. (See pp. 40-41 for a discussion of Applied Analysis' model validation functions.)

CONCLUSIONS

EIA established OEIV in October 1977 to assist the Administrator, EIA, in ensuring that meaningful and accurate information was provided to those who shape energy policy.

OEIV developed a program plan in February 1979 which discussed the principal tasks to be accomplished. These tasks, including system validation, requirements reviews, special studies, and preliminary reviews, have not been prioritized.

OEIV's program plan calls for completion of initial validation of all 55 EIA energy data systems by 1986. Based on experience to date--reports issued on four systems as of June 1980--it appears doubtful that all 55 systems will be validated by 1986 as planned. PART believes that one cause for delay in issuing validation studies is that an insufficient number of staff--only three full-time professionals--have been assigned to monitor and complete validation studies.

PART believes the information developed in requirements reviews is useful to EIA in planning which systems and forms to validate without duplicating work already done. Specifications resulting from such reviews are planned to enable EIA to focus new and revised data collection efforts precisely on the information required by EIA's users. However, the requirements reviews should precede the corresponding validation review.

OEIV has issued four "validation" reports. PART's review of three of the "validations" completed at the time of our fieldwork, all by contractors, indicated that they do not go far enough to address all of the issues which in PART's judgment form the basis of a thorough validation study. The "validations" conducted so far are really in the nature of preliminary studies or pretests of validation studies. PART believes that because of the limited validation efforts conducted thus far the accuracy of most energy information is undetermined.

AGENCY COMMENTS

In commenting on a draft of our report (see app. I), EIA disagreed that the accuracy of most energy information is undetermined. EIA further stated that PART had neither supported this statement nor quantified the problem. EIA also said that because of two data collection system reports and a special study, all dealing with petroleum, that EIA has determined the accuracy of its important petroleum data.

PART, in its draft report to EIA, stated that

> "PART believes that because of the limited validation efforts conducted thus far the accuracy of most energy information is undetermined."

This statement was made based on our analyses of three of the four final "validation" studies issued by EIA. Our analyses of these studies appeared in the draft report and the same analysis is on pages 18 to 21 of this final report.

The two data collection system reports and the special study on petroleum were not provided to PART in time for our review. Furthermore, while information on petroleum is important it represents only one segment of all energy information. It should also be remembered that EIA has 55 existing systems and reports have only been issued on 4 to date.

EIA agreed in its comments on our draft report (see app. I) that limited quantification was provided in the three studies and said that OEIV will in the future present a summary of the sources of error (quantification) in each validation study after the Monthly Power Plant Report.

EIA in commenting on our draft report (see app. I) said

> "OEIV is responsible for developing guidelines and standards for model validation (assessing the degrees of uncertainty in the entire analytical program), based on the model's documentation and verification, completed by OAA (Office of Applied Analysis)."

As stated earlier it appears that both groups are doing similar work and we believe that only one group should develop model validation standards.

EIA, in its comments (see app. I), disagreed with our analyses of the first three studies. In addition to specific comments on PART's review results, EIA provided comments it requested from three mathematical statistical experts. In preparing this report PART considered all of the information furnished by EIA but still believes that the studies are limited. Specific comments by EIA and our analysis begins below.

EIA took exception to our statement that there is no result from the studies that permit a user to say that a specific statistic is unbiased or has an error of a certain amount. In its comments, (see app. I) EIA stated:

> "This statement is false. OEIV's validation report on the Capacity of Petroleum Refineries System (CPRS) states on page 2 that: "OEIV's analysis suggests that CPRS operable capacity estimates are overstated by 5 to 10 percent... storage capacity information overstates actual capacity by approximately 15 percent. a/

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a/Validation of Capacity of Petroleum Refineries System (CPRS), memorandum from Charles S. Smith, Assistant Administrator, Energy Information Validation, to Albert H. Linden, Assistant Administrator, Office of Energy Data, Mar. 21, 1979, p. 2.

> OEIV's validation report on the Natural Gas Curtailments Systems states that: "Monthly data on Individual's natural gas deliveries from the previous year are subject to errors as high as 15 percent due to cycle billing variations, meter reading accuracy, and temperature variation. Aggregated annual distributor natural gas data are probably accurate within about 5 percent...on a State-by-State basis, the 1977 EIA-50 submission predicted the gas volume reported as being used the next year in 36 of 51 states (including Washington, D.C.) within + 4 percent. a/
>
> No quantification was done in the case of the validation of the Voluntary Business Energy Conservation Program and the Industrial Energy Efficiency Improvement Program (VBEC/IEEIP) because it would not have been worth the cost."

On the basis of our review, PART found no indication as to how these figures were derived. They were not based on any model in the "validation" studies.

EIA disagreed in it comments (see app. I) on our draft report that there is no system that evaluates biases, variances, coverage, or processing errors in terms of an overall model so that the relative components of error can be assessed stating:

> "Error components that are part of an overall model as discussed by PART are insignificant in most OEIV studies. For example, in CPRS, sampling errors are zero because a census of the target universe is taken; coding errors are insignificant because of the extensive edits; imputation errors are zero because no imputation is required; nonresponse errors are near zero because only 1.4 percent of capacity is represented by nonrespondents and their data were estimated from other sources; and undercoverage errors are zero because the target universe, refiners, is

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a/Validation of the Natural Gas Curtailments System (NGCS), memorandum from Charles S. Smith, Assistant Administrator, Energy Information Validation, to Jimmie L. Peterson, Director, Office of Energy Data and Interpretation, July 18, 1979, Attachment II, Part II, "Quality of the Collected Data."

well known. Therefore, the only important error is that of response which was estimated as a 5-10 percent downward bias."

PART believes that all components of errors from a model base design are not present for every survey but there are many components which OEIV did not examine, for example, processing errors that were correlated were not mentioned.

In our draft report, PART said the "validations" conducted so far are really in the nature of preliminary pretests of validation studies. EIA in its comments on our draft report (see app. I) disagreed stating:

"The studies provided quantification of the accuracy of the data, were appropriate, and provided recommendations for improvement of the collection systems. They made significant contributions to improving EIA's data collection. As was mentioned previously, highly qualified reviewers of our validation studies have arrived at significantly different conclusions than the PART."

In addition to the shortcomings outlined in our analyses of the three studies, PART believes that OEIV could have obtained this information from a requirements review done in-house instead of under contract.

In our draft report we also said that a nonrandom sample of respondents were queried about how they filled in the form. Difficulties with the questionnaire, the processing, the timing, and the respondent burden were all interpreted through a nonrandom sample of users and respondents. EIA took exception to these statements in its comments (see app. I). EIA stated:

"Except for VBEC/IEEIP (for which it was impossible), a random selection was drawn from each stratum of the frame. The frame was stratified to ensure that all major hypothesized sources of variations were accounted for in the sample. For user surveys, an expert panel of knowledgeable users is needed--not an random sample."

PART believes that if validation reports are going to provide estimates of the error in statistics then they must be based on a probability sample.

In its comments on our draft report (see app. I), EIA said that requirements reviews would proceed systems validations for all new studies.

EIA, in commenting on our draft report (see app. I), stated that 22.9 of the 29 available staff-years outlined in the table on page 12 of the draft that was sent were devoted toward validating systems. The breakdown of staff years that EIA provides in its comments is the same breakdown that appears on page 13 of this final report. EIA, as stated in this report and in its comments, programmed only 4.7 staff-years for systems validation. PART agrees but believes additional staff-years should be allocated for this priority task. EIA in its comments said that the Acting Administrator has worked with OEIV "...to prioritize its work to ensure that its limited resources are directed to the most important tasks. The schedules in the OEIV program plan will be adjusted when it is revised this fall."

RECOMMENDATIONS

PART recommends that the Administrator, EIA:

--Establish priorities for the eight primary tasks enumerated in OEIV's program plan to ensure that, with the limited resources available, attention is directed to the most important tasks so that the energy information being published is as accurate as possible.

--Adjust the time frames in the program plan to more realistically reflect what can be accomplished given the expected level of staff resources.

--Improve the quality of validation studies by requiring, to the extent practicable, that the studies provide a framework and better quantification of results and by providing a section in each validation report which presents quantification of results.

--Decide which group should develop model validation standards.

NOTES

1/Office of Energy Information Validation Program Plan, EIA Feb. 23, 1979.

2/Ibid.

3/EIA, Validation of the Capacity of Petroleum Refineries System, Apr. 1979.
EIA, Data Validation of the Industrial Energy Efficiency Improvement Program and the Voluntary Business Energy Conservation Program, May 1979.
EIA, Validation of the Natural Gas Curtailments System, Aug. 1979.
EIA, Data Validation Study of the Prime Suppliers Monthly Report, Apr. 1980.

4/Office of Energy Information Validation Personnel Detail in FY 80 by Task Products, Feb. 15, 1980.

5/EIA organizational charts and mission and function statements.

6/Ibid.

7/Ibid.

8/Ibid.

9/Office of Energy Information Validation organizational charts, June 17, 1980.

10/Office of Energy Information Validation Personnel/Funds Summary, Feb. 15, 1980.

11/PART, Activities of the Energy Information Administration, Wash. D.C., May 7, 1979, pp. 11-22.

12/EIA, Data Validation of the Industrial Energy Efficiency Improvement Program and the Voluntary Business Energy Conservation Program, May 1979.

13/Statement of an official, Office of Energy Information Validation, EIA, telephone interview, Apr. 14, 1980.

14/EIA, Validation of the Capacity of Petroleum Refineries System, Apr. 1979.

NOTES

15/Statement of an official, Office of Energy Information Validation, EIA, telephone interview, Apr. 4, 1980.

16/EIA, Validation of the Natural Gas Curtailments System, Aug. 1979.

17/Statement of an official, Office of Energy Information Validation, EIA, telephone interview, Apr. 4, 1980.

18/EIA, Annual Report to Congress, Washington, D.C., Vol. I, 1979, pp. 19-20.

19/Oak Ridge National Laboratory, Contract No. 01-80EI10816, for FY 1980, Comprehensive Validation Studies of Selected Energy Data Collection Systems.

20/Office of Energy Information Validation listing of special studies for 1979 and 1980.

21/EIA, Annual Report to Congress, Washington, D.C., Vol. I, 1979, p. 20.

22/Ibid., p. 21.

CHAPTER 4

IMPROVEMENTS IN ENERGY MODEL CREDIBILITY

EIA has taken several actions to improve the credibility of energy models. It has established control over model changes, prepared final guidelines for model documentation, and established a formal process for approval of model documentation. EIA is also sponsoring a program for model assessment and public access to its energy models.

Although EIA is involved in these ongoing efforts, we are concerned that, to date, EIA has not completely documented any of its approximately 60 models according to its own documentation standards. PART believes it is important for EIA to complete documentation of current models since model documentation is a prerequisite for virtually all quality control activities including model validation, verification, and sensitivity testing. Although EIA has archived eight models used for preparing the 1978 EIA Administrator's Annual Report to the Congress, no models have yet been made generally available to the public. PART's review of the Office of Applied Analysis' program plan and evaluation of the Office's activities in relation to the overall objectives set forth in the plan revealed that the plan was unrealistic and overly ambitious.

EIA'S LEGISLATIVE MANDATE FOR ENERGY FORECASTING

The Energy Conservation and Production Act of 1976 1/ and the Department of Energy Organization Act of 1977 2/ require that EIA develop and maintain a capability for forecasting and analyzing short- and long-term relationships between energy supply and consumption and appropriate variables. EIA must also develop, evaluate, and maintain energy flow and accounting models. These models describe the production, distribution, and consumption of energy by the various sectors of the economy and lines of commerce in the energy industry. They are used to forecast and analyze (1) energy supply and consumption under various sets of assumptions, (2) changing patterns of energy production, use, and prices and their impacts on the economy, (3) the institutional structure of the energy system, (4) the relationships between the evolving U.S. energy situation and developments abroad, and (5) the impacts of Government actions on energy markets and the economy. 3/

PROGRAM PLAN FOR OFFICE OF APPLIED ANALYSIS

The Office of Applied Analysis--the EIA office responsible for all energy models and forecasts--initially prepared its program plan for fiscal years 1978-1981 in August 1978. The program plan was updated in March 1979 and extended to include fiscal year 1982. 4/

The plan lays out, in detailed fashion, the overall mission, ongoing functions, and management objectives of the Office for fiscal years 1978 through 1982. The Office of Applied Analysis intended to use this plan as a management tool for planning the direction of program objectives and projects, tracking estimated time frames, and managing resources. PART, in reviewing the plan and evaluating the Office's activities in relation to objectives set forth in the plan, found that it was based on the assumption that the fiscal year 1979 and 1980 budget requests of $14.1 million and $13.9 million would be approved. The amounts actually approved for the budgets were $9.2 million and $11.4 million, respectively.

The plan has proved to be unrealistic and overly ambitious. The plan called for fully documenting 39 models by December 1979. As of December 1979, no models were fully documented. The plan called for contractors to prepare the documentation for existing models. Applied Analysis officials informed us that the $5 million cut from the fiscal year 1979 budget request was earmarked for contracting out model development and documentation. The in-house staff's major emphasis was on preparing analysis reports and the 1979 Annual Report to the Congress, as called for in the program plan.

In March 1980, Applied Analysis prepared a revised program plan. 5/ This plan looks at areas in a much broader perspective than the previous plan since it was developed for DOE's Planning, Programming, and Budgeting System. Currently the Applied Analysis staff is using this broad plan to prepare a more detailed program plan. An Applied Analysis official said that this plan will be more realistic and conservative than the previous one. 6/

RESPONSIBILITY OF THE OFFICE OF ANALYSIS OVERSIGHT AND ACCESS, OFFICE OF APPLIED ANALYSIS

The Office of Analysis Oversight and Access, under the Assistant Administrator of Applied Analysis, has the responsibility to develop all standards and procedures for documentation, access, verification, and validation of models and analyses. In conjunction with this, it must monitor

program compliance with these standards and procedures. It also has the responsibility to initiate a program of model verification and validation. 7/

To date the Office of Analysis Oversight and Access has

--established final guidelines for model documentation,

--initiated model validation and verification activities,

--started a program for model access, and

--monitored program compliance with the standards and procedures they developed for model documentation.

PART RECOMMENDED PROCEDURES AND PRACTICES FOR MODEL BUILDING

To fulfill congressional intent, we believe that EIA must establish the credibility of its mathematical and statistical models. Although EIA is working towards this goal, it has a long way to go. In the 1977 8/ and 1978 9/ PART reports, we recommended the following procedures and practices as being essential to building an acceptable level of credibility into EIA modeling activities.

1. Public participation and professional review--Outside professionals should be involved in the development and maintenance of a model, thus guaranteeing its widespread acceptance and credibility. Such involvement should include procedures that allow (1) internal and outside experts to participate in determining, updating, and refining major changes in assumptions and structure and (2) the general public to review and comment on the model's assumptions and structure.

2. Control over model changes--A systematic procedure should exist which specifies what, when, and why changes should be made to the model and who should make them. This should take the form of a timetable for selected changes, a public list of individuals responsible for making changes, and a schedule of regular and planned uses of the model.

3. Documentation--During the design, development, and maintenance of a computer model, its purpose, methodology, assumptions, capabilities, and limitations must be recorded and explained. An adequately documented model

permits outside parties to use and understand it, evaluate its credibility, and participate in its development.

4. Validation--A model's predictions should be compared with actual data to determine the indicators of forecasting uncertainty in forecasts. This should be done on a regular basis, with the results made available to the public.

5. Verification--To achieve credibility, a model's mathematical calculations should be checked for accuracy. Also, its structure and relationships should be verified against the system it is trying to represent.

6. Sensitivity testing--The extent that a model responds to changes in assumptions, specifications, and data should be measured. Again, the results of such tests should be made public.

EIA has implemented, to some degree, all of these practices and procedures. The following sections will elaborate on EIA's progress in meeting PART's suggested practices that we believe are essential to building an acceptable level of credibility into EIA's modeling activities.

STEPS TOWARD PUBLIC PARTICIPATION AND PROFESSIONAL REVIEW

PART previously recommended the formulation of a group of experts to review and monitor the basic premises of and proposed changes to energy models. A group consisting of energy, economic, and modeling experts from other Federal agencies, State agencies, industry, and academia could pass on the overall integrity of models, the appropriateness of changes, and the adequacy of the documentation, verification, validation, and testing practices employed by the Energy Information Administration. The work of such a group would not only enhance the credibility of the models to the professionals who use them, but would also increase the public's confidence in the products generated by the models. 10/

PART, in its 1977 Annual Report on the Office of Energy Information and Analysis, EIA's predecessor, recommended the creation of a group of experts to review and monitor the basic premises of and proposed changes to energy models. As a result, EIA started work in November 1977 to establish advisory committees on (1) data systems design, (2) data validation, and (3) modeling. When EIA submitted the proposal to establish three committees to the Secretary in March 1978,

he rejected it and suggested EIA form one committee with three subcommittees--one for each area of expertise. Under the Advisory Committee Act, this actually meant the setting up of four committees instead of the original three intended.

In May 1978, EIA proposed only one committee, called an Advisory Council. It was to consist of 36 members and be informally split into at least three committees. This was subsequently withdrawn from active consideration. The Administrator of EIA chose instead to propose a Government-established advisory committee to be made up of representatives of the American Statistical Association. His view was that, since EIA is a statistical agency like the Bureau of Census, it should follow the advisory committee structure that Census uses. This proposal was forwarded to the DOE General Counsel on July 3, 1978. The General Counsel disapproved this proposal because the committee did not appear to be balanced, that is, consist of representatives of State Governments, consumer groups, utilities, etc.

The Administrator of EIA, in October 1978, suggested that EIA find a committee already established and utilize the services of that committee. EIA decided to use the Ad Hoc Committee on Energy Statistics formed in August 1978 by the American Statistical Association. The committee consisted of 17 members from the Federal Government, academia, and private industry, with expertise in data collection and systems development, data validation, and energy modeling and forecasting. This committee was chosen because the members were well qualified to offer advice to EIA about its programs. The committee agreed to assist EIA.

The Ad Hoc Committee on Energy Statistics was formally established by the executive board of the American Statistical Association. It was established for a 3-year trial period, with its subsequent status to be determined by the American Statistical Association's Board of Directors in 1981. The committee provides ongoing technical advice to EIA. 11/

The committee held its first meeting on May 4, 1979. Other meetings held during the period covered by our review included those of September 21, 1979, January 25, 1980, and May 16, 1980. The committee gave EIA suggestions and recommendations on energy models, on energy data collection and systems development, and data validation. Areas the committee reviewed and commented upon relating to models included (1) the use of proprietary models and model components, (2) the integration and relationship of the data and modeling groups within EIA, (3) the short-term energy models

and the forecasts they produce, and (4) the Long-Term Energy Analysis Package Model.

The committee members are not paid for the amount of time they spend preparing for committee meetings or for attending the meetings. Working under these constraints the committee members have not undertaken any lengthy, time-consuming tasks.

PART staff attended the committee meetings as observers. At the first meeting, organizational problems existed. The committee scheduled too many topics for discussion in the time allotted for the meeting and it was not able to give sufficient attention to each topic. This problem was subsequently corrected and not repeated in the following meetings. PART believes that the committee has been and should continue to be beneficial to EIA. In addition to the Ad Hoc Committee on Energy Statistics, EIA solicits advice on its energy models and forecasts from groups of experts and the public, through conferences and symposiums.

CONTROL OVER MODEL CHANGES

PART did not find any weaknesses in EIA's procedures to control changes made to its energy models.

EIA generally makes model changes to

--enable the model to be used for a purpose not currently within its capabilities;

--enhance, refine, or improve existing parts of the model; or

--add new parts to the model.

EIA officials stated that changes of the first type are made in response to specific requests for model uses. The particular model changes arise out of negotiations between the division director responsible for the model and those making the request as to how a scenario should be represented. These types of changes do not remain in the permanent version of the model. The second and third type are for general model development and remain in the permanent version of a model. Such changes are the initiative and responsibility of the division director in charge of the model. EIA has prepared a list of 13 division directors responsible for making changes to models and upon request makes this list available to the public. 12/

In 1979 EIA used its energy models to prepare 110 special reports or studies for the Congress, DOE, and other Federal agencies. EIA's regular and planned model uses are for the Annual Report to the Congress and the quarterly short-term forecasts.

MODEL DOCUMENTATION

EIA developed interim model documentation standards in December 1978. In September 1979, EIA initiated a review of these standards and completed it in February 1980. The review resulted in preparation of revised standards which became EIA's final guidelines for model documentation. While these standards seem reasonable, PART will reserve judgment of these standards until we review reports on model documentation being prepared under contract for EIA. Contractors are evaluating the model documentation against EIA's standards.

EIA intends to document all of its models in accordance with these guidelines. The goal of EIA's documentation program is to communicate to others the basis of the published results of analyses. Its first priority is to document all models used for the development of forecasts and analyses published in the Annual Report to the Congress. Ideally, EIA would like to have the documentation program advanced to the point that study results can be reproduced based upon the documentation. 13/ However, EIA has not yet accomplished this.

EIA final guidelines for model documentation

The guidelines for model documentation identify five categories of information which summarize EIA's current understanding of documentation requirements. These categories organize concepts which appear in the literature, were proposed to Applied Analysis staff by contractors who studied the documentation issue, or were proposed by Applied Analysis staff. The five categories (documents) are:

1. Model overview--The document is intended to inform a broad, nontechnical audience of the purpose and potential uses of the model. Included in this document are general descriptions of the problem, the model structure, the assumptions and limitations, and the capabilities. The description of the problem includes sufficient background information and definitions of key terms for a general reader to understand the subject matter of the model. The discussion of the limitations and capabilities should enable the reader to understand the

applications for which the model can reasonably be used. This also includes a discussion of the input data required to specify alternative scenarios.

2. Model description--This is a description of the formal, rigorous structure of the model and all processes within it. The level of detail of this description should be sufficient for the model to be reproduced, in principle.

3. Data base description--This document is a complete description of the external data and internal parameters required by the model. Included as part of this description are the data sources. The reference to a source is specific enough to enable the reader to trace the data to particular numbers in the original source document or to identify it as a particular element in another EIA data base or model output.

4. User's guide--This document is intended to serve as a guide for operating the model. It includes a description of the flow of software, including flow charts, if required, for a complex modeling system.

5. Software description--This is a programmer-level description of the code and its algorithms, designed to aid those persons responsible for program modification and enhancement. Included are discussions of the program and subprogram flow, the internal program control, and the interaction of the model programs with the input and output files and parameters. The document uses any verbal descriptions, flow charts, diagrams, or examples necessary to completely describe how the mathematical description of the model translates to the code. 14/

The aforementioned documentation guidelines address only the status of completed, working models whereas documentation procedures usually require documents to be written throughout the entire cycle of model development from the initial drafting of the functions of the proposed model through to the validation and assessment of the complete model. 15/

The completed documents compose a model documentation report. EIA plans for a third-party reviewer outside of EIA to review all reports completed after October 1, 1979. Due to the frequent complexity and detail of model documentation reports, and the time required to perform a review, EIA determined during fiscal year 1979 that reviews of sufficient quality by professionals outside of EIA could not be arranged

simply on the basis of professional courtesy. EIA could not obtain a quality review of documentation without payment of a fee; therefore, reviews of model documentation reports were incorporated in the fiscal year 1980 contract list in the amount of $100,000. EIA, through May 1980, has awarded 13 contracts for initial third-party review of model documentation.

Status of model documentation program

The Applied Analysis program plan had scheduled 39 of its approximately 60 models to be completely documented by December 1979. For a model to be considered completely documented, it must have all five documents completed according to the standards, have undergone a third-party review, and be approved by the Assistant Administrator of Applied Analysis. None of the 39 models were completely documented by December 1979; however, some documentation had been prepared for all 39 models. Five model documents had been approved by the Assistant Administrator of Applied Analysis on the Alaska Hydrocarbon Supply Model and the Short-Term Natural Gas Distribution Model. However, documentation of these two models was still incomplete as of June 1980. Thirteen model documents are in the third-party review process as of June 1980.

Priorities for documenting models

EIA has developed these categories for prioritizing the documentation of its models. These are:

1. For all published analysis results released after June 1, 1980, basic model overviews will be drafted. (Guideline 1.)

2. For the Mid-term Energy Forecasting System and the integrated long-term and short-term systems and for those other models used in the Administrator's 1979 Report to the Congress descriptions will be drafted of their methodology and underlying data by September 1, 1980. (Guidelines 2 and 3.)

3. By November 1, 1980, at a secondary priority to item 2 above, materials describing a model's computer implementation will be available as otherwise dictated by the model archiving program. (Guidelines 4 and 5.)

EIA has not yet scheduled the models to be documented according to the above categories.

MODEL VALIDATION

PART believes that energy models should be validated in order to establish their credibility. EIA established a goal of completing preliminary validation standards, procedures, and guidelines in 1979. Final standards were scheduled for completion in 1980. However, EIA has failed to reach its goal and has revised its schedule for completing final standards.

The Office of Analysis Oversight and Access under the Assistant Administrator for Applied Analysis is sponsoring a program to develop standards and procedures for the assessment and validation of energy models. These standards and procedures are to be applied to the latest version of each model to determine their current validity and to suggest ways in which the models can be improved. EIA had contracted this program to the National Bureau of Standards, the Virginia Polytechnic Institute, and the Massachusetts Institute of Technology Energy Laboratory and expects that model validation standards will be established by the end of fiscal year 1981. These model contracts are structured around tasks that include:

--Operating versions of the models examined will be established for the project's use.

--Operating and conceptual documentation will be evaluated and deficiencies identified (if documentation deficiencies exist, remedies should be undertaken; the remaining tasks are contingent upon successful completion of this task).

--Systems attributes will be evaluated, including the completeness and accuracy of the underlying data, the adequacy of the particular mathematical forms adopted for the model, the adequacy of the statistical procedures utilized to derive the parameter values embodied in the models' mathematical representation, the sensitivity of model results, and the systems' performance compared to known outcomes.

--Report on the systems' strengths and weaknesses.

The EIA contracts with the National Bureau of Standards are to validate forecasting systems. The studies are focusing on (1) validating the Short-Term Integrated Forecasting System, (2) extended validating of the Mid-Term Oil and Gas Model, (3) conducting a symposium on oil and gas supply model alternatives, (4) validating of the Regional Demand

Forecasting Model and other midterm demand models, and (5) conducting a symposium on model assessment methodologies. This effort is being performed under a $248,000 contract in fiscal year 1979 and $350,000 in fiscal year 1980.

The EIA contract with the Virginia Polytechnic Institute is to evaluate the role of uncertainty in electric utility capacity planning. This study will include formal integration of uncertainty in load curve approximations, load curve uncertainty impacts on the marginal value of incremental capacity, accommodation of dynamic feedback, and supply side uncertainty in cost and technology. The effort will cost about $69,000.

The EIA contract with the Massachusetts Institute of Technology Energy Laboratory is to evaluate coal and electric utilities projections. This study will address the quality and usefulness of coal production projections for the years 1985, 1990, and 1995 in the 1978 Annual Report to the Congress and the rationalization of the Midterm Energy Market Model's electricity supply parameters with alternative formulations. The effort is being performed under a $100,000 contract in fiscal year 1979 and a $50,000 contract in fiscal year 1980. 16/

In previous years, Lawrence Berkeley Laboratory, Systemetrics, and Los Alamos Scientific Laboratory performed various validation studies. (See app. VI for results of contracts.)

According to EIA officials, all model validation projects should be considered prototypical and potentially the source of a continuing set of validation procedures. Some of the efforts to be included in the validation projects have been delayed due to inadequate or unusable model documentation.

VERIFICATION AND SENSITIVITY TESTING OF MODELS

To establish the credibility of energy models used in analyses and forecasts, EIA must perform verification and sensitivity tests of each model. Presently, automated analysis procedures, whether at their initial installation or during their subsequent amendment, are being reviewed by the analysts responsible for the computational accuracy. This process generally involves running test cases, reviewing results, and auditing the relevant portions of the computer code as appropriate to the outcome of the tests. Establishing formalized procedures for such reviews, particularly where EIA accepts models from contractors, is under review by the Office of

Analysis Oversight and Access. Further, as part of an analysis report clearance procedure, an analyst other than the report's author verifies all computations embodied in the report and signs off on the report if such computations are correct.

Audits of model computer code were conducted during the early stages of model verification projects for the electricity, coal, oil, and gas supply models. Supporting these efforts are initiatives underway to develop standards for computer code documentation by the National Bureau of Standards and the Institute of Computer Science Technology.

A program designed to develop computer-assisted analysis was started in fiscal year 1979 by the Office of Analysis Oversight and Access. The goal of this program was to develop procedures, and associated software, that enable analysts to expeditiously and comprehensively audit model results. Audit capabilities are to include tests for consistency with structural, qualitative, and other model characteristics as well as computational accuracy. An important purpose of the computer-assisted analysis project is to render model results more easily understandable. EIA's three model verification contracts also call for model sensitivity tests with respect to underlying data and logical, mathematical, statistical, and computational model characteristics. However, due to the delays experienced in documenting models, these tests are just now being started. 17/

PUBLIC ACCESS TO EIA MODELS

The Office of Analysis Oversight and Access, under the Assistant Administrator of Applied Analysis, in January 1980 developed and is now implementing interim model-archiving procedures designed to make models available to the public.

The Office has established two objectives for preparing portable archive copies of EIA models. The first and most important of these objectives is reproducibility. Upon completion of a major analytical effort which is released outside of EIA, it is EIA's professional responsibility to ensure that work is reproducible so that if a need is found to later reproduce the analysis exactly as before with slight modifications, EIA can meet this need.

The second objective of the archival process is to make it possible to transfer EIA's models to the public upon request. EIA is legislatively required to make the details of its analytical techniques available to the public.

Currently, the Office of Analysis Oversight and Access is processing 22 model-archiving packages. The model version

were those utilized for the EIA 1978 Annual Report to the Congress. Although 26 models were used for the 1978 Annual Report to the Congress, as of April 4, 1980, only 22 were submitted for archiving. The remaining four were not in a form that was sufficiently related to the published analysis results, because some model results were subjected to substantial non-model-related manipulations.

As of April 4, 1980, eight archiving packages associated with the 1978 Annual Report to the Congress were archived. Models used for preparation of the 1979 Annual Report to the Congress, which was issued in July 1980, are scheduled for archiving by October 1980. 18/ (See app. V for model archiving status).

There is no history of requests for archived models; therefore, EIA has decided against an outside repository for models. EIA will make the models available to the public on request through Applied Analysis.

CONCLUSIONS

As of June 1980, EIA had not completely documented any of its energy models according to the standards it developed in December 1978. As a result of this lack of documentation, preliminary standards, procedures, and guidelines for validation scheduled for completion in 1979 also were not completed. Final standards originally scheduled for completion in 1980 will not be completed until the end of fiscal year 1981. The lack of model documentation also caused delays in model validation. PART believes that EIA will not be able to validate its energy models adequately until they are properly documented. EIA plans to document all of its energy models--about 60. PART, however, believes that because of the backlog of undocumented models EIA should initially concentrate on documenting only the current versions of its models.

PART endorses EIA's use of the American Statistical Association Ad Hoc Committee on Energy Statistics as a technical advisory committee on its energy models. This committee is an acknowledged group of experts and its input has been and should continue to be beneficial.

EIA is currently archiving models used for the EIA Annual Report to the Congress, which was released in July 1979. Over a year after this report was published, these models are still not available for general public use. Apart from startup problems, it is unreasonable to make available models underlying the Annual Report a year or more after it is issued.

AGENCY COMMENTS

In commenting on a draft of this report, the EIA Acting Administrator agreed with our recommendations and acknowledged that work needs to be undertaken to make energy models more credible. He said that the Office of Applied Analysis is starting to concentrate on documenting the current version of EIA's models within the limits of their resources. Also, that the Applied Analysis program plan will emphasize documenting the models used for the Annual Report and other important models. (See app. I.) PART has not yet seen any evidence that EIA has stepped up its activities to document its models. In the coming year, PART will thoroughly review EIA's progress to document, validate, and archive its energy models.

RECOMMENDATIONS

In view of the total number of EIA models requiring documentation and EIA's progress to date in improving the credibility of its energy models used in forecasts, PART recommends that EIA

--address the problem of how to deal with the backlog of models to be documented and develop a plan to eliminate the backlog, and initially concentrate on documenting the current versions of its energy models.

--review the documentation available on a model to determine whether it is adequate before starting validation work on the model, and

--make available to the public in a timely manner the archived models after each EIA Annual Report to the Congress is issued.

NOTES

1/Public Law 94-385, Aug. 14, 1976.

2/Public Law 95-91, Aug. 4, 1977.

3/EIA organizational charts and mission and function statements.

4/U.S. Department of Energy, Multiyear Program Plan for the Office of Applied Analysis, Washington, D.C., Mar. 1979.

5/Memo from Lincoln E. Moses, Administrator, EIA to the Secretary of Energy transmitting the Program Memorandum for the Energy Information Administration for FY 82-86, Mar. 10, 1980.

6/Statement of an official, Office of Applied Analysis, EIA, personal interview, Jan. 28, 1980.

7/EIA organizational charts and mission and function statements.

8/PART, Activities of the Office of Energy Information and Analysis, Washington, D.C., Dec. 5, 1977, pp. 33-34.

9/PART, Activities of the Energy Information Administration, Washington, D.C., May 7, 1979, p. 33.

10/PART, Activities of the Office of Energy Information and Analysis, Washington, D.C., Dec. 5, 1977, pp. 42-43.

11/Statement of an official, Office of Planning and Evaluation.

12/Memo from George M. Lady, Director, Office of Analysis Oversight and Access, EIA, to PART, responding to questions asked by PART, Jan. 17, 1980.

13/Ibid.

14/Memo from George M. Lady, Director, Office of Analysis Oversight and Access, EIA, thru C. Roger Glassey, Assistant Administrator, Office of Applied Analysis, EIA, and Kenneth L. Kincel, Deputy Assistant Administrator, Office of Applied Analysis, EIA, to Applied Analysis Senior Staff on model documentation reports, Feb. 6, 1980.

NOTES

15/Ibid.

16/Memo from George M. Lady, Director, Office of Analysis Oversight and Access, EIA, to PART, responding to questions asked by PART, Jan. 12, 1980.

17/Ibid.

18/Memo from William I. Weinig, Office of Analysis Oversight and Access, EIA, through George M. Lady, Director, Office of Analysis Oversight and Access, EIA, to the record responding to questions asked by PART, Apr. 7, 1980.

CHAPTER 5

EFFORTS TO DEVELOP A NATIONAL ENERGY INFORMATION SYSTEM

The Energy Conservation and Production Act of August 1976 required EIA to develop a National Energy Information System which would provide credible energy information within the Government. 1/ EIA made its first concentrated effort to establish a formal system in July 1979 when it established the Office of the National Energy Information System. The Office is the System's planning arm for the Administrator, EIA. The Office has focused on the development of system concepts and a Data Resources Directory, which will function as the System's accessing mechanism. The concepts have been developed and approved by the Administrator in June 1980 and are in the process of being printed. The Directory has not yet been developed. The Office is presently developing a program plan. EIA anticipates that information from the system will be used by EIA program offices, DOE, energy policy decisionmakers, Federal, State, and regional governmental agencies, and the general public. However, in developing the system, EIA has not surveyed these future users to determine what information they would hope to obtain from the system.

EIA'S VIEW OF LEGISLATION MANDATING A SYSTEM

The legislation states that the System should help describe and analyze energy supply and consumption according to geographic and economic sectors. It adds that, as a minimum, the System shall contain such energy information as is necessary to carry out the Administration's statistical and forecasting activities. The legislation further states that the System should include, at the earliest date and to the maximum extent practical, such energy information as is required to define and permit analysis of:

--The institutional structure of the energy supply system.

--The consumption of mineral fuels, nonmineral energy resources, and electricity.

--The sensitivity of energy resource reserves exploration, development, production, transportation, and consumption to economic factors, environmental constraints, technological improvements, and substitutability of alternative energy sources.

--The comparability of energy information and statistics that are supplied by different sources.

--Industrial, labor, and regional impacts of changes in patterns of energy supply and consumption.

--International aspects of the evolving energy situation.

--Long-term relationships between energy supply and consumption in the United States and world communities. 2/

EIA has taken a broad view of this legislative mandate. Its view focuses on the quality and the usefulness of the data and involves weighing the need for more detailed information against the increased burden on respondents and higher costs to the Government. This approach also involves eliminating overlapping data collection systems, filling gaps where data are not currently available or useful, redefining energy terms so as to avoid inconsistent sources of information, and developing standardized procedures and automated programs for processing raw data from initial receipt to final publication.

Although no formal organizational focus for the System existed within EIA until July 1979, previous work related to the same general goal had been initiated. Among these efforts were:

--Operation of a forms clearance and review process to minimize respondent burden and ensure a match between surveys and requirements.

--Elimination of many duplicative data collection efforts and modification of others to improve the accuracy and usefulness of the data collected.

--Development of several major new data systems to expand and improve data in important areas. These include the Financial Reporting System, Oil and Gas Information System, Residential Consumption Data System, and Commercial/Industrial Consumption Data System.

--Establishment of an interactive indexing system so that existing published data or information may be located quickly. 3/

EIA believes these efforts are building blocks in development of the System, and that further development will be an evolutionary process requiring several years.

EIA ATTEMPTS TO ESTABLISH A NATIONAL ENERGY INFORMATION SYSTEM

EIA's predecessor agency made no serious attempt to establish a National Energy Information System until July 1977. At that time a contract was awarded to Logistics Management Institute in the amount of $85,000 to develop a conceptual design and implementation plan for the System. Logistics Management Institute completed its work according to the contract requirements and prepared a report in May 1978. 4/ Upon review, EIA officials rejected this plan. EIA's Office of Energy Data--reorganized into the Office of Energy Systems and Support and Energy Data Operations in 1979--developed and submitted two design and implementation plans for a National Energy Information System. The first proposal, submitted on October 11, 1978, was rejected by the Administrator of EIA on October 24, 1978. The second proposal, submitted on November 1, 1978, was also rejected by the Administrator. All three developmental plans were rejected because EIA believed they lacked sufficient scope, focused too much on computer aspects, or failed to provide a mechanism for implementation that was not disruptive to EIA's ongoing information activities.

During this time frame, EIA had only one person assigned on a part-time basis to develop the conceptual design and implementation plan for a National Energy Information System. No further work was performed on a conceptual design or implementation plan until the Office of the National Energy Information System was established.

OFFICE OF THE NATIONAL ENERGY INFORMATION SYSTEM ESTABLISHED IN 1979

The Office of National Energy Information System's mission is to design and develop such an information system to serve the needs of DOE, the Congress, and the public. The Office is responsible to integrate and coordinate all ongoing work on the National Energy Information System's development.

The Office, under the Assistant Administrator for Program Development, was established in July 1979. The Office had a fiscal year 1980 total budget of $1.3 million and a staff of 13 professionals. EIA's program plan indicates that the staff will increase to 26 professionals by fiscal year 1982 and the total budget will increase to $3.8 million by fiscal year 1983.

The major tasks of this Office, specified in its mission and function statement, are to:

1. Analyze requirements for a National Energy Information System through review of relevant legislation and user needs, identify gaps in current data and procedures, and make recommendations for improvement.

2. Integrate the efforts of other parts of EIA in preparing an overall conceptual design for the National Energy Information System and in planning the individual tasks needed to implement a System.

3. Develop appropriate indexes and directories of energy information in the System, including characteristics of survey data, forecasts, data transformations, data systems, reports, and models.

4. Work with relevant offices in EIA to identify duplication and inconsistencies of current information systems and assist in consolidation and elimination of unnecessary overlaps.

5. Review information systems under development for compatibility with the basic concepts of the System and make recommendations as necessary to ensure that new data is integrated into the overall National Energy Information System framework.

6. Review information systems outside of EIA for possible relevance to or incorporation in the National Energy Information System.

7. Work with the Office of Energy Information Validation to develop appropriate procedures for assuring quality and accuracy of components of the System.

8. Serve as a focal point for questions about the overall structure, content, and operation of the System and its relevance for various user needs.

9. Work with the Office of Energy Information Services to develop effective means of access to the information contained in the National Energy Information System. 5/

The Office, as elaborated on in the following sections, is (1) preparing a program plan based on the concepts paper it developed, (2) in the process of contracting out for development of a Data Resources Directory, and (3) participating in a contract to study the data requirements of individual States.

Progress made by the new office

In February 1980, the Office wrote a concepts paper which was distributed to the Administrator and all senior level EIA managers for their comments. 6/ The primary purpose of this paper was to stimulate discussion within EIA and to provide feedback on what the National Energy Information System should be. The concepts paper was not accepted and was revised based on comments prepared by the Administrator and his senior-level managers. This revised version was approved by the Administrator in June 1980 and is in the process of being printed. The Office of the National Energy Information System is currently developing a program plan, based on this concepts paper, which will include startup times and milestones for the Office's tasks.

In addition to developing system concepts, the Office performed an analysis of the legislation to detect priorities for the National Energy Information System. 7/ Based on its analyses of existing legislated requirements, EIA believes that initial priorities for the System's construction have been set by the Congress and EIA has determined that the System will initially contain information on petroleum. Once that information is included EIA will add natural gas, coal, and electric power information.

In developing these priorities EIA did not obtain the opinions of future users of the System to determine their requirements and what information would be most useful to them and should therefore be included in the System. Since the legislation mandating a National Energy Information System leaves EIA substantial freedom in defining the scope of the data base, PART believes that EIA needs to assure itself that the information to be incorporated into the data base is most valuable to the System's users. We are concerned that EIA has not adequately determined what information is needed by the System's users.

During 1979 the Office was also involved in the development of a Data Resources Directory and in assisting States in developing their energy programs. These efforts are discussed in the following sections.

Office is developing a Data Resources Directory

The Office has initiated the preparation of a work statement to develop a Directory. 8/ The Directory will serve as the basic classification framework, index, and description for energy-related information in addition to serving as the mechanism for retrieving data from the Directory.

The work statement for the Directory also calls for it to list, classify, index, and describe data currently outside of EIA, wherever such data may exist. The Directory will be EIA's device for locating data which exists in other government agencies, States, universities, and even commercial data bases. 9/

Time frames for developing this Directory are:

--In 1981, the design and development of the Data Resources Directory will be completed for petroleum data.

--In 1982, implementation of an on-line retrieval of certain categories of EIA data using the Directory will be accomplished.

--Over the next several years a full-scale Data Resources Directory will be implemented.

The effort to develop a Data Resources Directory should advance EIA's work toward two major goals:

--To create and maintain a record of what data EIA holds, what forms, files, reports, publications, models, and systems EIA has, how data are handled from the time they enter EIA on a form or otherwise until they are released or archived, and what important relationships exist within EIA's information base.

--To provide an accessing tool to help users locate data in EIA's information base and determine what data EIA and others hold on a particular subject.

Because of a lack of staff resources to do this project in-house, EIA is contracting it out. A Request for Proposal for the design, development, demonstration, implementation, and prototype maintenance of a Data Resource Directory has been written. EIA requested bids on September 7, 1979, and bidding on the proposal was closed on November 5, 1979. Seven firms bid. In the first-round selection, EIA selected three of the seven bidders. These three were given another opportunity to better define their proposals. After receiving the second-round proposals, EIA selected a bidder and on March 3, 1980, sent its selection to the DOE procurement office.

Office is helping States meet their data requirements

The Office of the National Energy Information System is responsible for helping States develop their energy information

programs and discerning what data States need for an effective program. The Office's major project in this area is participation in the Southern States Energy Data Project. The Southern States Energy Board and the Institute for Energy Analysis, Oak Ridge Associated Universities, Oak Ridge, Tennessee, approached EIA in 1979 with a proposal to do the project. EIA accepted the proposal and provided $700,000 in funds over 2 years.

The purposes of the project are

--to identify the energy-related data needs or requirements of the southern States,

--to provide Federal and State energy officials with a better understanding of both the availability of existing primary data generated within specific States and regions, and the potential usefulness of the data to those energy officials, and

--to recommend or highlight methods for making useful data available to State planners and administrators. 10/

The project will be carried out by the Institute for Energy Analysis, Oak Ridge Associated Universities, Oak Ridge, Tennessee, with the assistance of staff from the Southern States Energy Board, the Oak Ridge National Laboratory, the Tennessee Valley Authority, and EIA. The project started on October 1, 1979, and will be carried out over a 24-month period. It will cover all member jurisdictions of the Southern Governors' Association and the Regional Energy Advisory Board of the Southern States. This includes 17 States and 2 territories. 11/

In December 1979 an advisory committee was established to provide the Institute of Energy Analysis with guidance throughout the course of the study and also to review tentative project findings prior to their being set within final reports. The committee consists of individuals from the Institute for Energy Analysis, Oak Ridge National Labratory, Southern States Energy Board, North Carolina Public Utilities Commission, Kentucky Department of Energy, and EIA.

CONCLUSIONS

About 4 years have passed since legislation setting forth the requirements of a National Energy Information System was enacted. EIA made its first concentrated effort to

establish a formal system in July 1979, when it established the Office of the National Energy Information System.

The Office is the System's planning arm for the Administrator and needs his continued support to accomplish its mission--the design and development of a National Energy Information System to serve the needs of DOE, the Congress, and the public. The Office is focusing on the development of a program plan based on the System's concepts and a Data Resources Directory which will be the System's vehicle for providing the identification, description, and accessing capability. The Office is also responsible for State planning and coordination.

The Office performed an analysis of the legislation to detect System priorities. In developing the priorities, EIA did not survey the System's future users to determine their requirements. PART believes that EIA should solicit comments from the major prospective users as to what data they believe should be entered into the System and on what priority.

PART believes now that EIA has developed concepts for the System a statement of these concepts should be made and public comment obtained on it.

AGENCY COMMENTS

In commenting on a draft of this report, the Acting Administrator of EIA said that EIA has solicited potential users of the System's data, both formally and informally, with regard to their data needs. (See app. I.)

PART disagrees. Our review found that EIA has only held discussions to identify particular data needs with potential users of the Financial Reporting System, the Oil and Gas Information System, and the Consumption Data System. These systems have not yet been brought into the National Energy Information System. We found no evidence that the Office of the National Energy Information System conducted any user surveys to determine that the petroleum data presently in the System was entered on a priority basis. Three EIA staff members with knowledge of petroleum information made the determination of what information to incorporate in the System. PART still believes EIA should conduct user surveys to determine what information they would hope to obtain from the System.

RECOMMENDATIONS

Since EIA has established a focal point for establishing a National Energy Information System, we recommend that in developing the System, the Administrator, EIA, have the Office of the National Energy Information System:

--Survey the major users of the System to determine what data they believe should be entered into the System on a priority basis.

--Issue a statement of the concepts and obtain public comments on them.

NOTES

1/Public Law 94-385, (sec 142 and 52(a)(b)), Aug. 14, 1976.

2/Ibid.

3/EIA, Annual Report to Congress, Vol. I, 1979, Activities, pp. 23-24.

4/Logistics Management Institute, National Energy Information System: Detailed Conceptual Design, May 1978.

5/EIA organizational charts and mission and function statements.

6/Memo from Charles G. Everett, Director, Office of the National Energy Information System, EIA, for Lincoln E. Moses, Albert H. Linden, Jr., Elizabeth Chase MacRae discussing National Energy Information System Concepts, Feb. 10, 1980.

7/Ibid., p. 4.

8/EIA, Request for Proposal for the Design, Development, Demonstration, Implementation and Prototype Maintenance of a Data Resources Directory.

9/Memo from Charles G. Everett, Director, Office of the National Energy Information System, EIA, for Lincoln E. Moses, Albert H. Linden, Jr., Elizabeth Chase MacRae discussing National Energy Information System Concepts, Feb. 10, 1980.

10/Tentative Work Plan for the Southern States Energy Data Project (FY 1980), Institute for Energy Analysis, Oak Ridge Associated Universities, Oak Ridge, Tennessee, Dec. 28, 1979.

11/States and territories are: West Virginia, Kentucky, Tennessee, North Carolina, South Carolina, Oklahoma, Texas, Louisiana, Mississippi, Alabama, Georgia, Florida, Arkansas, Puerto Rico, and Virgin Islands.

APPENDIX I

Department of Energy
Washington, D.C. 20461

OCT 3 1980

Mr. Kevin Boland
Chairman, Professional Audit
Review Team
441 G Street, N. W.
Washington, D.C. 20548

Dear Mr. Boland:

We appreciate the opportunity to submit a formal response to Draft of a Proposed Report: Activities of the Energy Information Administration, Department of Energy, prepared by the Professional Audit Review Team (PART). The draft report concentrates on the Energy Information Administration's (EIA) efforts to validate data systems, document energy models, and develop a national energy information system. In general, we believe the PART recommendations to be constructive and reflective of actions now underway within the EIA. However, the EIA disagrees with PART's statements regarding progress in validating EIA information collection programs.

Validating Data Systems

On page v, PART states that "PART believes that...the accuracy of most energy information is undetermined." This statement, to which EIA takes strong exception, is not supported in the text, and no quantification of the alleged problem has been provided. During the past year, EIA has ascertained the accuracy of two of its most important data collection systems -- the Joint Petroleum Reporting System, which collects data on refinery operation and bulk storage of crude oil and petroleum products, and the Prime Suppliers Monthly Report, which collects State level data on sales of petroleum products. In May 1980, we published A Preliminary Assessment of the Accuracy of Energy Information Administration Data Related to Volumes of Petroleum. Thus, EIA has determined the accuracy of its important petroleum data.

With respect to PART's specific recommendations:

> I have worked closely with the Office of Energy Information Validation (OEIV) to prioritize its work to ensure that its limited resources are

APPENDIX I

directed to the most important tasks. The schedules in the OEIV program plan will be adjusted when it is revised this Fall and planned work will be prioritized.

- OEIV is working diligently to improve the quantification of its work, and in all validation studies after the Monthly Power Plant Report, which will be released within two weeks, OEIV will present a quantification summary.

- OEIV is responsible for developing guidelines and standards for model validation (assessing the degree of uncertainty in the entire analytical program), based on a model's documentation completed by the Office of Applied Analysis (OAA).

- When a validation study is published, the Administrator's cover memorandum clearly specifies the organizations responsible for carrying out the study's recommendations. Schedules for completing these tasks are entered into the Project Accountability System, the Administrator's principal project tracking mechanism.

EIA also takes strong exception to PART's evaluation of OEIV's first three validation studies (pages 26-27 of the draft report). The following paragraphs summarize the basis for our objections to the statements made:

PART "PART's review of three of the completed validations, all by contractors, disclosed that they lacked in some major way of meeting reasonable goals for determining the validity of the system under review."

EIA OEIV's validation studies have been reviewed by leading figures in the international mathematical-statistical community. Mr. Gordon Sande, Senior Methodologist, Business Survey Methods, Economic Statistics, Statistics Canada, stated in his review:

"I have found the general approach, emphasis and methods appropriate to the mission of that office (OEIV).... I am particularly pleased by the thoroughness of the examinations and the constructive nature of the recommendations for achieving valid statistical products from the Energy Information Agency."

Dr. Frederick Mosteller, Professor of Mathematical Statistics and Chairman, Department of Biostatistics, Harvard University, and Dr. John W. Tukey, Donner Professor of Science, Princeton University, stated in their review:

"Further difficulties aside, the immediate need is to tackle first things (here usually largest sources of bias) first. It is our clear impression that OEIV has, in each of the reports we were asked to review, recognized this, and has implemented this recognition in guiding the validation studies and selecting its recommendations for implementation."

These reviews have been shared with the PART.

PART "There is no result from the validation that permits a user to say that a specific statistic is unbiased or has an error of a certain amount."

EIA This statement is false. OEIV's validation report on the Capacity of Petroleum Refineries System (CPRS) states on page 2 that: "OEIV's analysis suggests that CPRS operable capacity estimates are overstated by 5 to 10 percent...storage capacity information overstates actual capacity by approximately 15 percent." 1/

OEIV's validation report on the Natural Gas Curtailments System states that: "Monthly data on individual's natural gas deliveries from the previous year are subject to errors as high as 15 percent due to cycle billing variations, meter reading accuracy, and temperature variation. Aggregated annual distributor natural gas data are probably accurate within about 5 percent...on a

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1/ Validation of Capacity of Petroleum Refineries System (CPRS), memorandum from Charles S. Smith, Assistant Administrator, Energy Information Validation, to Albert H. Linden, Assistant Administrator, Office of Energy Data, March 21, 1979, page 2.

APPENDIX I

State-by-State basis, the 1977 EIA-50 submission predicted the gas volume reported as being used the next year in 36 of 51 states (including Washington, D.C.) within ± 4 percent." 2/

No quantification was done in the case of the validation of the Voluntary Business Energy Conservation Program and the Industrial Energy Efficiency Improvement Program (VBEC/IEEIP) because it would not have been worth the cost.

PART "There is no system that evaluates biases, variances, coverage or processing errors in terms of an overall model so that the relative components of error can be assessed."

EIA Error components that are part of an overall model as discussed by PART are insignificant in most OEIV studies. For example, in CPRS, sampling errors are zero because a census of the target universe is taken; coding errors are insignificant because of the extensive edits; imputation errors are zero because no imputation is required; nonresponse errors are near zero because only 1.4 percent of capacity is represented by nonrespondents and their data were estimated from other sources; and undercoverage errors are zero because the target universe, refiners, is well known. Therefore, the only important error is that of response which was estimated as a 5-10 percent downward bias.

PART "The validations conducted so far are really in the nature of preliminary pretests of validation studies."

EIA The studies provided quantification of the accuracy of the data, where appropriate, and provided recommendations for improvement of the collection systems. They made significant contributions to improving EIA's data collection. As was mentioned previously, highly qualified reviewers of our

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2/ Validation of the Natural Gas Curtailments System (NGCS), memorandum from Charles S. Smith, Assistant Administrator, Energy Information Validation, to Jimmie L. Petersen, Director, Office of Energy Data and Interpretation, July 18, 1979, Attachment II, Part II, "Quality of the Collected Data."

APPENDIX I

validation studies have arrived at significantly different conclusions than the PART.

PART — "A nonrandom sample of respondents was queried about how they filled in the form. Difficulties with the questionnaire, the processing, the timing, and the respondent burden were all interpreted through a nonrandom sample of users and respondents."

EIA — Except for VBEC/IEEIP (for which it was impossible), a random selection was drawn from each stratum of the frame. The frame was stratified to ensure that all major hypothesized sources of variations were accounted for in the sample. For user surveys, an expert panel of knowledgeable users is needed -- not a random sample.

In summary, the PART review contains factual errors, and is incomplete and inconsistent as noted above. OEIV's validations can certainly be improved -- we are working to this end, particularly to improve our efforts to quantify the accuracy of the data. As I have said before, OEIV will in the future present a summary of the sources of error in each validation study.

PART recommends on page iv of the draft report that "Such (requirements) reviews should always be conducted before a validation study." This procedure was a lesson learned from the pilot studies and has been done for all studies after that time. On pages 13, 25 and 32, PART states that OEIV has programmed five staff years out of 37 available toward validating systems. In fact, 22.9 of the 29 (or 78 percent) available staff years (eight staff years deal with administrative and supervisory functions) were programmed toward validating systems. Of these 22.9 staff years, 4.7 staff years were programmed for systems validations, and 4.4 for the requirements reviews that PART recommends doing before a very detailed validation study. An additional 10.1 were programmed for field validations, which are the validation studies that closely follow PART's recommended methodology. Another 3.3 staff years were programmed for special studies that have been used to terminate unneeded forms and systems, requirements reviews, and system validations (as PART notes on page 32). These special studies are very similar to the quantitative assessments PART recommends on page 14.

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Energy Model Credibility

As PART recommends, the OAA is concentrating on documenting the current version of EIA's models, within the limits of its resources. The OAA program plan will emphasize documenting the models used for the Annual Report and other important models. The manner in which EIA's models will be made available to the public is being worked out. Computer tapes and existing documentation are, of course, available upon request.

Developing a National Energy Information System (NEIS)

PART states, on page 63: "However, in developing the (NEIS) system, EIA has not surveyed these future users to determine what information they would hope to obtain from the system."

EIA has solicited potential users of NEIS data, both formally and informally, with regard to their data needs. The selection of EIA data for the initial version of the NEIS was based in part on whether there was a demonstrable need for the data based on actual use. The NEIS concepts paper was approved on June 19, 1980, and is being printed and distributed. Comments will be welcomed.

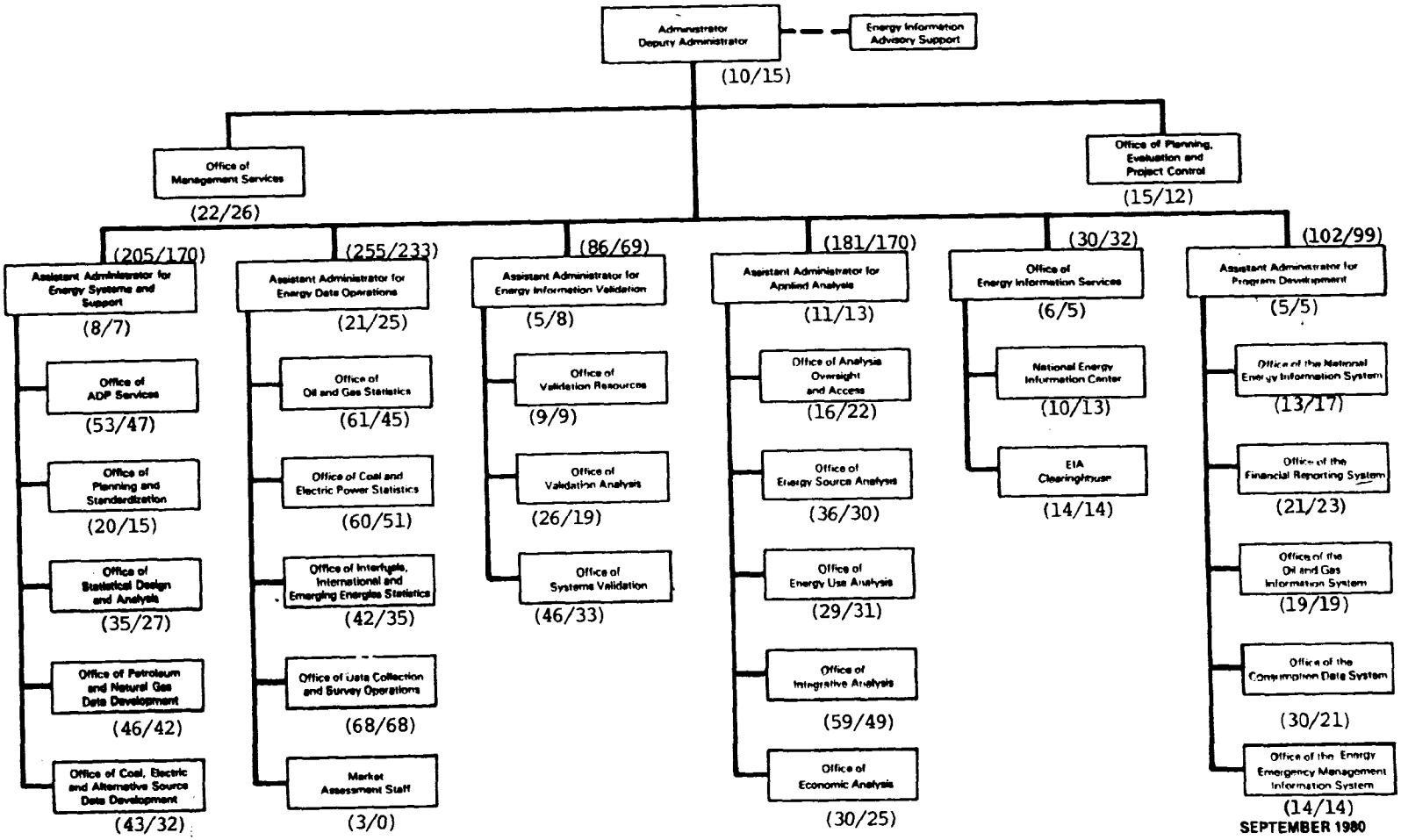
In forwarding this response to you, we are mindful of your conclusion that "EIA is making progress" (page 15). We recognize the value of the PART-EIA dialogue in our efforts to continue to make progress. I need only point to our continued independence from the energy policy function, and the expanding role of the American Statistical Association's Ad Hoc Committee on Energy Statistics, as two areas where your advice and support have been beneficial. Because of the importance of this response, I request that it be made a part of the final PART report.

Sincerely,

Albert H. Linden, Jr.

Albert H. Linden, Jr.
Acting Administrator
Energy Information Administration

Energy Information Administration



NOTE: Numbers in parentheses are staffing totals. The first number is "authorized" and the second is "actual". Total "authorized" is 906; total "actual" is 816.

APPENDIX II

APPENDIX III

STATUS OF ORIGINAL 14 OEIV VALIDATION STUDIES

System And Form	Contractor	Final Report Orig. Est.	Final Report Rev. Est.
1. Joint Petroleum Reporting System (EIA-87, 88, 89, 90)	Kindle Lawrence Berkeley Laboratory Oak Ridge National Laboratory Transportation & Economic Research Associates, Inc.	11/79	11/80
2. Prime Suppliers Monthly Report (EIA-25)	Kindle Oak Ridge National Laboratory Transportation & Economic Research Associates, Inc.	11/79	Issued 6/80
3. Oil Imports System (ERA-60)	Kindle Lawrence Berkeley Laboratory Oak Ridge National Laboratory Evaluation Research Inc.	a/8/79	1/81
4. Natural Gas Production System (secondary source)	Kindle Lawrence Berkeley Laboratory Ketron, Inc.	(b)	12/80
5. Crude Oil Production System (secondary source)	Kindle Lawrence Berkeley Laboratory Ketron, Inc.	a/8/79	12/80
6. Industrial Energy Efficiency Improvement Program and Voluntary Business Energy Conservation Program (FEA-U-524)	Oak Ridge National Laboratory Evaluation Research Corp.	5/79	Issued 8/79

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System And Form	Contractor	Final Report Orig. Est.	Final Report Rev. Est.
7. Natural Gas Curtailments System (EIA-50)	Oak Ridge National Laboratory Institute for Energy Analysis Oak Ridge Associated Universities	7/79	Issued 1/80
8. Capacity of Petroleum Refineries (EIA-177)	Oak Ridge National Laboratory Evaluation Research Corp.	4/79	Issued 8/79
9. Monthly Power Plant Report (FPC-4)	Oak Ridge National Laboratory	9/79	11/80
10. Major Fuel Burning Installation Reporting System (FEA-602) (note c)	Lawrence Berkeley Laboratory Oak Ridge National Laboratory Evaluation Research Corp.	12/79	5/81
11. Monthly Fuel Consumption Report (EIA-3) (note d)	Lawrence Berkeley Laboratory	12/79	Dropped
12. Middle Distillate Price Monitoring System (EIA-9) (note e)	Lawrence Berkeley Laboratory	---	12/81
13. Crude Oil First Purchasers System (FEA-P-124) (note f)	Lawrence Berkeley Laboratory In-house	8/79	5/81
14. Crude Oil Entitlements Program (EIA-49) (note g)	Lawrence Berkeley Laboratory Oak Ridge National Laboratory Transportation & Economic Research Associates, Inc.	8/79	12/80

APPENDIX III

NOTES

a/These Systems were incorporated into a Crude Oil Flow Information requirements study scheduled to be completed in August 1979. A final draft report was completed in December 1979 although the final report has not been completed yet.

b/This System was originally scheduled to be incorporated into the Natural Gas Information requirements study that was started the early part of 1980. A final draft report was completed in December 1979 although the final report has not been issued.

c/This System was incorporated into the Fuel Substitutability requirements study that was scheduled to be completed in December 1979. However, the requirements study just started in January 1980.

d/This System was also incorporated into the Fuel Substitutability requirements study. Additionally, this system was dropped as a separate validation study. OEIV officials attributed this to the need to accomplish higher priority work.

e/This System has been incorporated into a new validation system called Market Shares. This new System had bid closings in January 1980. This new System is scheduled for completion in December 1981.

f/This System was originally a part of the Crude Oil Flow Information requirements study that was scheduled for completion in August 1979. A final draft report of the requirements study was completed in December 1979. No final report has been issued yet. The Crude Oil First Purchasers System will be the first System to be done solely in-house by OEIV.

g/This System was incorporated into the Crude Oil Flow Information requirements study that was scheduled for completion in August 1979. A final draft report of the requirements study was completed in December 1979 although the final report has not been issued. This system is scheduled to be validated and a final report issued in December 1980.

SPECIAL STUDIES CONDUCTED BY OEIV IN 1979 and 1980

Special Study	Requestor	Completed
1. An analysis of the effects of geographic differences in driving patterns for gasoline consumption during shortage periods.	Administrator, EIA	1979
2. Development of an ad hoc procedure to estimate domestic crude oil production.	Congress	1979
3. An evaluation of methods and alternatives for measuring potential energy resources in nonproducing countries.	Under Secretary, DOE	1979
4. A description of the methods used by EIA to verify information collected from the oil industry.	Congress	1979
5. An analysis of the jet fuel supply for spring and summer 1979.	Administrator, EIA	1979
6. An analysis of oil import and export data with recommendations for methods of imputing new imports from preliminary data.	Administrator, EIA	1979
7. A preliminary reconciliation of DOE and the Bureau of Census import data definitions.	Administrator, EIA	1979
8. Evaluation of published EIA gasoline supply estimates.	Congress	1979
9. An examination of the Regulatory Information System.	Administrator, EIA	1979
10. A request for proposal for the design, development, demonstration, implementation, and prototype maintenance of a data resources directory.	Congress	1979
11. A panel report on 1978 state energy savings estimates for the state energy conservation program.	Administrator, EIA	1979
12. The sources of information on gasoline use.	Administrator, EIA	1979

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Special Study	Requestor	Completed
13. A checklist for the preparation of and evaluation of tabular data (draft 1).	Administrator, EIA	1980
14. Review of Bureau of Census secondary stock data.	Administrator, EIA	Underway
15. Progress report on the Petroleum Supply Study.	Administrator, EIA	1980
16. Interim reports of the Federal Highway Administration's state gasoline consumption data.	DOE/Assistant Secretary Conservation & Solar	1980
17. Verification of Petroleum Industry Information.	Congress	1980
18. A preliminary assessment of the accuracy of EIA data related to volumes of petroleum.	Administrator, EIA	1980
19. An analysis of State Heating Oil Data.	Administrator, EIA	1980
20. Frames Task Force Report.	Administrator, EIA	1980

APPENDIX V

1978 ANNUAL REPORT TO THE CONGRESS ON MODEL ARCHIVING STATUS AS OF APRIL 4, 1980

Summary

Models archived	8
Models in process of being archived	14
Models not submitted for archiving	4
Total	26

Detail

Models archived:

- Midterm Oil & Gas Supply Model
- Alaskan Hydrocarbon Supply Model
- Enhanced Oil Recovery
- REGSHARE
- Capital Investment Analysis Model
- Power Plant Fixed Charge Factor Model
- Regional Energy Demand Forecasting Model
- Oil Market Simulation Model

Models in proess of being archived:

- Regional Emissions Projection System
- Levelized Nuclear Fuel Cycle Cost
- Nuclear Fuel Economy
- Spent Nuclear Fuel Storage
- CONCEPT V (Nuclear)
- EUREKA

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Models in process of being archived (cont.):

Midterm Energy Market

National Coal

Long-Term Energy Analysis Package

International Energy Evaluation System

Energy Disaggregated Input/Output

Regional Earnings Impact System

Microanalysis Transfers to Household/Comprehensive Human Resources Data System

Short-Term Electric Utility Generating and Fuel Use Model

Models not submitted for archiving:

Solar Market Development Model

Computer Code for Conceptual Cost Estimates of Steam-Electric Power Plants

Capital Requirements Estimating for Electric Utilities

National Aggregate Refinery Model

APPENDIX VI

STATUS OF ENERGY MODEL VALIDATION STUDIES
APRIL 1, 1980

Contractor	Topic	Report status	Date (1979)
1. Systematrics, Inc.	Project Independence Evaluation System Utility Model Validation	Final	June 30
2. Massachusetts Institute of Technology Energy Laboratory	Recommendations Concerning Energy Information, Model Documentation; Public Access, and Evaluation	Draft	October 1
3. EIA and Virginia Polytechnic Institute	Modeling Electric Utility Behavior	Draft	Undated
4. Massachusetts Institute of Technology Energy Laboratory	An Evaluation of the Coal and Electric Utilities Model Documentation	Draft	September 15
5. Lawrence Berkeley Laboratory	Uncertainties in Model Forecasts	Draft	September 15
6. Lawrence Berkeley Laboratory	The Demand for Energy in the Year 1990: An Assessment of the Regional Demand Forecasting Model	Draft	September 25
7. Lawrence Berkeley Laboratory	An Assessment of the Federal Energy Data System	Draft	September 25
			(1980)
8. National Bureau of Standards	Interim Report on Model Assessment Methodology: Documentation Assessment	Final	January
9. National Bureau of Standards	Investigation of Underlying Data: Midterm Oil and Gas Supply Modeling System	Final	January
10. National Bureau of Standards	Data Extrapolation and Statistical Forecasting	Final	January
11. National Bureau of Standards	System Sensitivity and Stability I: Model Validation, Simulation, and Sensitivity Analysis	Final	January
12. National Bureau of Standards	System Sensitivity and Stability Method for the Assessment of Model Sensitivity to Input Variables	Final	January
13. National Bureau of Standards	The Role of the Statistician in Energy Model Development and Validation	Final	March
14. Carl M. Harris under contract with National Bureau of Standards	A Sensitivity Analysis of DOE Forecasts of Midterm Oil and Gas Supply for the 1978 Annual Report to Congress	Final	April

(001939)

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