~~22133~~
118643

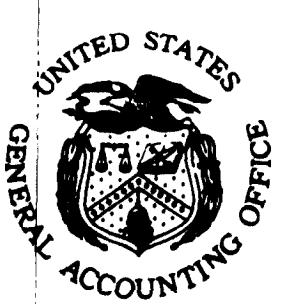
REPORT BY THE

Comptroller General

OF THE UNITED STATES

TVA's Computer Needs Are Valid And ADP Management Is Improving

The Tennessee Valley Authority (TVA) has made substantial progress toward achieving sound management of its automatic data processing (ADP) resources. Its requirements analysis approach correlates ADP costs with missions and objectives. Requirements now reflect validated workloads. However, some areas of control still require management attention. Also, TVA needs to integrate ADP requirements planning and validation into its business planning and budgeting process.



GAO/AFMD-82-24
JUNE 9, 1982

022364

Request for copies of GAO reports should be sent to:

U.S. General Accounting Office
Document Handling and Information
Services Facility
P.O. Box 6015
Gaithersburg, Md. 20760

Telephone (202) 275-6241

The first five copies of individual reports are free of charge. Additional copies of bound audit reports are $3.25 each. Additional copies of unbound report (i.e., letter reports) and most other publications are $1.00 each. There will be a 25% discount on all orders for 100 or more copies mailed to a single address. Sales orders must be prepaid on a cash, check, or money order basis. Check should be made out to the "Superintendent of Documents".

COMPTROLLER GENERAL OF THE UNITED STATES
WASHINGTON D.C. 20548

B-207385

The Honorable Tom Bevill
Chairman, Subcommittee on Energy
and Water Development
Committee on Appropriations
House of Representatives

Dear Mr. Chairman:

As requested in your September 2, 1980, letter (app. I) and in subsequent discussions with your office, we have reviewed the Tennessee Valley Authority's (TVA's) efforts in the area of computer acquisition planning and requirements analysis and validation, specifically with regard to the ongoing general purpose equipment procurement and proposed acquisition of scientific processing support and minicomputers. You also requested that we work with TVA on a definitive requirements analysis and validation methodology. On December 16, 1980, and February 11, June 25, and December 18, 1981, we briefed your office on the results of our review and, as requested, are providing this written report.

Overall, TVA has made substantial progress toward achieving improved management of its automatic data processing (ADP) resources. However, some problems remain and we are making several recommendations in this report on the improvements TVA should undertake or emphasize.

OBJECTIVES, SCOPE, AND METHODOLOGY

In our review, we evaluated TVA's prior studies of its ADP requirements and assisted TVA in developing and applying a better methodology for requirements analysis and validation. We also reviewed TVA's general business planning and budget process, ADP planning policies and procedures, current management initiatives, and all major ADP procurement actions in process.

Our work was performed in accordance with GAO's current "Standards for Audit of Governmental Organizations, Programs, Activities, and Functions." The validation work involved extensive interviews and analysis of TVA's offices of power, engineering design and construction, natural resources, and management services, located in Knoxville and Chattanooga, Tennessee. We also discussed pertinent procurement and technical issues with officials of the automated data and telecommunications service in the General Services Administration, the International Business Machines Corporation, and the Amdahl Corporation.

(913661)

BACKGROUND

A series of TVA procurement actions to acquire computer equipment and a projected demand for more capacity that was increasing dramatically raised the concern of congressional committees that TVA was not properly managing its ADP resources. In your September 2, 1980, letter to the TVA Chairman, you requested TVA to work with us on a definitive computer requirements analysis and validation methodology. (See app. I.) Specifically, you asked us to address the current TVA acquisition of general purpose computers and proposed acquisitions of scientific processing support and minicomputers.

TVA, THE LARGEST PRODUCER OF ELECTRICITY IN THE NATION, IS HEAVILY DEPENDENT ON COMPUTERS TO PERFORM ITS MISSION

TVA was created by the Congress as an independent Federal corporation in May 1933. TVA has since evolved into the Nation's largest producer of electricity. In the early seventies, based on forecasted energy needs, TVA embarked on an extensive nuclear power plant program and became one of the largest nuclear power engineering, design, and construction forces in the country, today employing over 45,000 people. Recent reductions in projected long term energy requirements for the Tennessee Valley, soaring interest rates, and pressure to hold down additional electricity rate increases have forced TVA to scale down its original goal of 17 nuclear power units. 1/ TVA's 1981 plan to eventually have nine nuclear power units still represents a costly and difficult undertaking. TVA estimated that the construction cost beyond the operational Browns Ferry Plant would be over $17 billion and would be financed by future power revenues.

To support the nuclear program, TVA has become dependent on the use of computers in project planning, engineering design, construction activities, and power operations. Federal regulations in the nuclear power area and the requirements to recalculate or reanalyze large quantities of design data in reaction to such situations as the Three Mile Island accident could not be handled without computers.

While electricity production now dominates its budget, TVA has many other statutory missions such as regional agriculture and community development, navigation and flood control, and national fertilizer research. TVA is also dependent on computers in achieving these missions. Environmental regulations applicable to many TVA production facilities also require heavy use of computers.

1/In March 1982, TVA deferred three additional units (two of which were slowed in 1981). An assessment of the ADP impact of these deferrals is underway by TVA.

Current ADP expenditures reflect this growing dependence. TVA reported that ADP-related costs in fiscal 1981 were about $76 million in support of an overall budget of almost $6 billion.

TVA HAS CORRELATED ADP COSTS WITH MISSIONS AND OBJECTIVES

Over the years a continuing series of concerns have been expressed by us and by congressional committees over the adequacy of the procedures TVA used to define and validate its ADP needs. The biggest concern dealt with TVA's projection of a sharply and continuously increasing workload that had not been validated; that is, the need for computer support had not been correlated to a specific mission or objective for both new and old applications.

In May 1981, TVA successfully completed a definitive requirements analysis based on the validation of its ADP workload for the period 1981 through 1987. We joined TVA in developing a methodology that required user management to confirm the value of the ADP objectives. We assisted TVA in defining some 600 basic systems out of the work processed on the general purpose computers, commercial scientific timesharing service, and minicomputers. These had been previously identified by over 10,000 job accounts. In May 1981, as a result of our joint efforts in developing and applying the validation methodology, TVA successfully completed a definitive requirements analysis of its current workload and its expected growth through 1987. The workload validation methodology and the results of the analysis are discussed in appendix II.

TVA has integrated the results of the workload validation effort into two major ADP procurement actions. The computer capacity requirements for the competitive procurement to replace the central site computer system were revised using the new validated workload projections. As a result of using these new projections, it appears that TVA will avoid over $21 million in buying its general purpose computers. Projections of TVA scientific processing support requirements were also modified as a result of the validation effort. TVA has recently completed a competitive procurement for these services with additional estimated savings of over $20 million.

TVA's efforts, with our assistance, have resolved the immediate problem of defining and validating TVA's requirements for the current major procurements of general purpose computers and scientific support services. To avoid major validation efforts such as this one in the future, TVA management needs to maintain sound control over its information processing activities and resources. TVA management has made progress on a number of our suggestions and on their own initiatives.

To assure continuing validity of its workload requirements, TVA needs to incorporate the workload validation discipline into

its information systems planning procedures and, in turn, to interrelate the information systems planning into the corporate business planning process. Corporate business planning should provide the future business direction(s), priorities, and constraints for effective information systems planning. For a variety of reasons, this has not occurred to a great enough extent in the past. Information needs that are essential for future business objectives should be identified within the business planning. The subsequent information systems plan can then, with the workload validation discipline, reflect the correlation of new and old systems with specific missions and provide the justification for ADP capital investments and operating budget requests.

At present, TVA's knowledge of its application software assets is incomplete and sketchy. To properly plan, TVA management must have a full appreciation of all the resources to be employed. The proper allocation and ranking of resources to support existing systems and to modernize others, while building new systems, depends on knowledge of the existing assets and capabilities.

Finally, TVA needs a more systematic method of controlling its development of systems. It also needs a policy that balances the opportunities to exploit low-cost computer technology with the need for management controls over the types of technology acquired and the related software development and maintenance costs. We believe TVA needs to fully develop and implement its application inventory system and the procedures for review and approval of development projects based on clearly defined thresholds of cost, schedule, and scope. Control over minicomputer acquisitions and their attendant applications should be within the formal and systematic system development methodology. TVA, like other Federal agencies, needs to develop a policy for the control of minicomputers so that both incompatibilities and the cost of developing and maintaining applications are minimized.

In appendix III, we discuss both TVA's progress in installing management controls and the several areas needing improvement or emphasis.

CONCLUSION

TVA should incorporate the workload validation methodology into its business and ADP planning process. Further, TVA needs to complete its cost accounting and reporting system and application software inventory system and to provide for a direct relationship between corporate business planning and information systems planning activities. The full implementation of a formal information system development methodology is also needed.

RECOMMENDATIONS TO THE BOARD OF DIRECTORS, TVA

To achieve more efficient and effective use of ADP resources, we recommend that TVA:

--Incorporate the workload validation discipline in its information systems planning process and formally integrate its information systems planning into its business planning.

--Develop and maintain an inventory of its application software. The effective performance of information systems planning requires the full appreciation of all resources used.

--Emphasize the systematic management control of its ADP resources by implementing and enforcing a formalized systems development methodology. Procedures should specify the management level at which reviews and approvals are required, based on clearly defined thresholds of cost, schedule, and scope.

--Develop a policy that will balance the opportunities for using low cost computers with the need for maintaining control of them.

AGENCY COMMENTS

The TVA Board agrees with our recommendations to further improve its ADP management and states that work is in process to implement those recommendations. (See app. V.)

- - - - -

As arranged with your office, we are sending copies of this report to the Chairman of the TVA Board of Directors, the Director of the Office of Management and Budget, and the Administrator of General Services. Copies will also be made available to other interested parties.

Sincerely yours,

Charles A. Bowsher

Comptroller General
of the United States

Contents

ABBREVIATIONS

ADP	automatic data processing
CDC	Control Data Corporation
CPU	central processing unit
TVA	Tennessee Valley Authority

APPENDIX I

MAJORITY MEMBERS
JAMIE L. WHITTEN, MISS., CHAIRMAN
EDWARD P. BOLAND, MASS.
WILLIAM H. NATCHER, KY.
TOM STEED, OKLA.
JOHN M. SLACK, W. VA.
NEAL SMITH, IOWA
ROBERT N. GIAIMO, CONN.
JOSEPH P. ADDABBO, N.Y.
EDWARD J. PATTEN, N.J.
CLARENCE D. LONG, MD.
SIDNEY R. YATES, ILL.
DAVID R. OBEY, WIS.
EDWARD R. ROYBAL, CALIF.
LOUIS STOKES, OHIO
GUNN MC KAY, UTAH
TOM BEVILL, ALA.
BILL CHAPPELL, JR., FLA.
BILL D. BURLISON, MO.
BILL ALEXANDER, ARK.
JOHN P. MURTHA, PA.
BOB TRAXLER, MICH.
ROBERT B. DUNCAN, OREG.
JOSEPH D. EARLY, MASS.
CHARLES WILSON, TEX.
LINDY (MRS. HALE) BOGGS, LA.
ADAM BENJAMIN, JR., IND.
NORMAN D. DICKS, WASH.
MATTHEW F. MC HUGH, N.Y.
BO GINN, GA.
WILLIAM LEHMAN, FLA.
JACK HIGHTOWER, TEX.
JOHN W. JENRETTE, JR., S.C.
MARTIN OLAV SABO, MINN.
JULIAN C. DIXON, CALIF.
BENNETT M. STEWART, ILL.
VIC FAZIO, CALIF.

Congress of the United States
House of Representatives
Committee on Appropriations
Washington, D.C. 20515

MINORITY MEMBERS
SILVIO O. CONTE, MASS.
ROBERT H. MICHEL, ILL.
JOSEPH M. MC DADE, PA.
MARK ANDREWS, N. DAK.
JACK EDWARDS, ALA.
ROBERT C. MC EWEN, N.Y.
JOHN T. MYERS, IND.
J. KENNETH ROBINSON, VA.
CLARENCE E. MILLER, OHIO
LAWRENCE COUGHLIN, PA.
C. W. BILL YOUNG, FLA.
JACK F. KEMP, N.Y.
RALPH S. REGULA, OHIO
CLAIR W. BURGENER, CALIF.
GEORGE M. O'BRIEN, ILL.
VIRGINIA SMITH, NEBR.
BLOOM RUDD, ARIZ.
CARL D. PURSELL, MICH.

CLERK AND STAFF DIRECTOR
KEITH F. MAINLAND

TELEPHONE:
(202) 225-2771

September 2, 1980

Honorable Elmer B. Staats
Comptroller General of the United States
U.S. General Accounting Office
Washington, DC 20548

Dear Mr. Staats:

The Committee has been and continues to be concerned about the validation of requirements associated with acquisition of electronic computing equipment by the Tennessee Valley Authority.

Since your staff is already involved in this effort, I request your assistance in reviewing TVA's effort in the area of computer acquisition planning and requirements analysis and validation, specifically with regard to the ongoing general purpose equipment procurement and proposed acquisitions of scientific processing support and minicomputers. Consideration should be given by your staff to prior and ongoing Committee and General Accounting Office reviews.

It would be most helpful if your staff could provide current results in time for the Committee's review of the TVA's current procurement action and for the fiscal year 1982 appropriation process. Thus, we request briefings in December 1980 and February-March 1981.

Sincerely,

Tom Bevill

Tom Bevill, Chairman
Subcommittee on Energy
and Water Development

APPENDIX I

MAJORITY MEMBERS
JAMIE L. WHITTEN, MISS., CHAIRMAN
EDWARD P. BOLAND, MASS.
WILLIAM H. NATCHER, KY.
TOM STEED, OKLA.
JOHN M. SLACK, W. VA.
NEAL SMITH, IOWA
ROBERT N. GIAIMO, CONN.
JOSEPH P. ADDABBO, N.Y.
EDWARD J. PATTEN, N.J.
CLARENCE D. LONG, MD.
SIDNEY R. YATES, ILL.
DAVID R. OBEY, WIS.
EDWARD R. ROYBAL, CALIF.
LOUIS STOKES, OHIO
GUNN MC KAY, UTAH
TOM BEVILL, ALA.
BILL CHAPPELL, JR., FLA.
BILL D. BURLISON, MO.
BILL ALEXANDER, ARK.
JOHN P. MURTHA, PA.
BOB TRAXLER, MICH.
ROBERT S. DUNCAN, OREG.
JOSEPH D. EARLY, MASS.
CHARLES WILSON, TEX.
LINDY (MRS. HALE) BOGGS, LA.
ADAM BENJAMIN, JR., IND.
NORMAN D. DICKS, WASH.
MATTHEW F. MC HUGH, N.Y.
BO GINN, GA.
WILLIAM LEHMAN, FLA.
JACK HIGHTOWER, TEX.
JOHN W. JENRETTE, JR., S.C.
MARTIN OLAV SABO, MINN.
JULIAN C. DIXON, CALIF.
BENNETT M. STEWART, ILL.
VIC FAZIO, CALIF.

Congress of the United States
House of Representatives
Committee on Appropriations
Washington, D.C. 20515

MINORITY MEMBERS
SILVIO O. CONTE, MASS.
ROBERT H. MICHEL, ILL.
JOSEPH M. MC DADE, PA.
MARK ANDREWS, N. DAK.
JACK EDWARDS, ALA.
ROBERT C. MC EWEN, N.Y.
JOHN T. MYERS, IND.
J. KENNETH ROBINSON, VA.
CLARENCE E. MILLER, OHIO
LAWRENCE COUGHLIN, PA.
C. W. BILL YOUNG, FLA.
JACK F. KEMP, N.Y.
RALPH S. REGULA, OHIO
CLAIR W. BURGENER, CALIF.
GEORGE M. O'BRIEN, ILL.
VIRGINIA SMITH, NEBR.
ELDON RUDD, ARIZ.
CARL D. PURSELL, MICH.

CLERK AND STAFF DIRECTOR
KEITH F. MAINLAND

TELEPHONE:
(202) 225-2771

September 2, 1980

Honorable S. David Freeman
Chairman
Tennessee Valley Authority
Knoxville, Tennessee 37902

Dear Mr. Chairman:

As you know, the Report on the Fiscal Year 1981 Energy and Water Development Appropriation Bill (H. Rept. 96-1093) directed the Tennessee Valley Authority to prepare a thoroughly documented requirements study prior to acquiring any additional electronic computing equipment.

Recently, the Committee has worked with TVA on the specific elements of such a study, and TVA has demonstrated that it has successfully completed work on these elements. Further, TVA has briefed the Committee and the General Accounting Office on features of the long-range computer procurement that allow great flexibility in the amount of computer hardware to be acquired both initially, and later during the six-year life of the contract. Thus, the Committee now feels that the justification for the general purpose long-range computer procurement is now complete, and that safeguards exist against acquiring greater capacity than needed.

In order to ensure that the action acquisition of equipment closely conforms with actual requirements, the Committee will ask the General Accounting Office to work with TVA on a definitive requirements analysis and validation methodology. Future acquisition of equipment should be based on the results of this methodology.

APPENDIX I

The Committee, therefore, has no objection to you proceeding with the acquisition of general purpose computer equipment under the long-range procurement. Please keep the Committee informed of your progress on this project, and, periodically, on the relationship between available capacity, projected requirements, and actual use.

Sincerely,

Tom Bevill, Chairman
Subcommittee on Energy
and Water Development

TVA WORKLOAD VALIDATION METHODOLOGY--

ITS APPLICATION AND ANALYSIS

TVA'S REQUIREMENTS ANALYSIS APPROACH NOW CORRELATES ADP COSTS WITH MISSIONS AND OBJECTIVES

In May 1981, TVA successfully completed a requirements analysis based on the validation of its ADP workload. In our opinion, TVA has confirmed its requirements for processing all identified applications, and thus, has validated the need for general purpose computers, scientific processing support, and minicomputers. TVA managers were instructed to evaluate the value of the ADP support provided to missions and objectives. TVA identified the need to process over 600 systems currently operating on central site computers, smaller remote computers, and commercial timesharing services. TVA reported that it had spent about $76 million in fiscal 1981 in ADP-related activities.

CONCERNS HAD BEEN RAISED ABOUT TVA'S IDENTIFICATION OF ADP NEEDS

A series of three interim computer acquisitions focused attention on TVA's lack of an ADP planning process to identify future needs. Two congressional committees voiced concern about the apparent disproportionate rate of growth (actual and projected) of TVA's ADP resources compared to its overall budget growth and justification for additional ADP equipment.

We criticized TVA's management and use of ADP resources in a September 1979 report. 1/ Among our findings, we reported that

--TVA did not have a formal planning process that provided for top management involvement and

--long range central processing unit (CPU) requirements were questionable because the need for applications, upon which workload projections were based, were not validated.

The problem

In February 1979, TVA users provided computer resource requirement estimates in aggregate fiscal year projections. These projections covered general computer needs for a 5-year period. Users were provided with historical usage data and a statistical linear projection. Users were requested to review the usage data and the projections and alter the projections where necessary.

1/"Improvements Needed in the Tennessee Valley Authority's Management and Use of Its Automatic Data Processing Resources," EMD-79-102, Sept. 6, 1979.

Using this information, the central computing organization adjusted the last 2 years of the users' projections, assuming a 25-percent annual growth rate, and extended the projection horizon by 3 more years using the same method.

TVA attributed these adjustments to

--the lack of established business trends,

--the central computing organization's view that ADP organizations historically underestimated growth, and

--the requirement to project its resource needs beyond the original 5-year horizon due to procurement delays.

We reported that TVA's projection procedure was questionable for two reasons. First, the applications upon which these projections are based were not validated. Validation refers to the confirmation by user management of the need to process an identified application on ADP resources to satisfy specific missions. Second, the time period used for these projections was characterized by a high rate of new application development. Thus, the usage data from this period--if used to linearly forecast the future--will compound the projected high rate of growth and overstate future CPU requirements.

We reviewed TVA studies that were made subsequent to our September 1979 report and found that they did not justify the acquisition of new resources. We also found that Federal regulations in effect at the time of those studies 1/ were not followed. TVA's studies were inadequate because they

--failed to assess how well each existing and planned application met agency needs,

--did not actively solicit participation of management personnel who had knowledge of future organizational direction and plans,

--did not perform adequate cost/benefit analyses on a system-level basis, and

--did not consider the effects of planned minicomputer acquisitions on the central site workload requirements.

Specific congressional concerns

The Subcommittee on Energy and Water Development, House Committee on Appropriations, voiced its concern in the House Report

---

1/FPMR 101-35.206.

accompanying the 1981 Appropriation Bill, 1/ agreeing with us that TVA was deficient both in its method of assessing future user needs and in not considering the impact of minicomputers on the acquisition of central site equipment. The House Report directed TVA to

> "* * * prepare, prior to acquiring any additional electronic computing equipment, a thoroughly documented requirements study justifying the proposed acquisition."

This was followed with individual letters on September 2, 1980, to us and to TVA from the Subcommittee Chairman. (See app. I.)

As directed by the Chairman, Subcommittee on Energy and Water Development, House Committee on Appropriations, we assisted TVA in developing a workload validation methodology to assist in identifying ADP needs. We believe that the methodology does not introduce new concepts in computer usage forecasting techniques, but rather, is designed to be the foundation of a structured management discipline integral to TVA's annual ADP planning process.

In our opinion, workload validation methodology must address the following questions:

--Do existing and planned ADP systems meet TVA needs?

--What is the level of resource usage in each organization?

--Is the resource commitment to each system commensurate with its contribution to the successful performance of the organization's mission?

--Who is responsible and accountable for the resource commitment? Does he or she agree with the above assessments?

--Have alternatives to the ADP solution been investigated?

--Are other ADP opportunities available that would provide TVA with more efficient and cost-effective operations?

We believe that these decisions, as a whole, form the backbone of a justification for computer acquisition. A manager's conscious decision to confirm the continuation, development, or termination of an ADP system--that is, validation--should be made only after the aforementioned questions are addressed. The manager's accountability is an integral part of the validation process and thus, must be emphasized in the management control system.

1/Energy and Water Development Appropriation Bill, 1981, House Rept. No. 96-1093.

The forms used in the workload validation process are included in appendix IV. They are tailored to TVA's operating environment of three sources--central site, scientific processing support, and decentralized computers--and incorporate internal requirements needed by the computing operations branch. TVA users were requested to provide projections based on two scenarios. In the first, called "current budget level," the users were asked to assume current (fiscal 1981) funding levels and business direction. In the second, called "enhanced budget level," users were asked to assume that budgetary restrictions have been lifted, permitting users to assume that the deferred construction of four nuclear power units had been resumed. TVA considered this situation as the upper limit of their general purpose computer usage. The difference between the current and enhanced levels was used to quantify the "optional quantity" clause in the general purpose computer solicitation. In August 1981, TVA deferred construction indefinitely on one nuclear unit and slowed the construction on two others. This occurred after the workload validation effort, but before the central site computer contract was awarded. TVA investigated the effect of these new construction plans on the general purpose computer workload. Impact on the initial configuration was found to be minimal and no change was made to the validated requirements. 1/

Our role in the workload validation data collection effort

We observed TVA's data collection efforts in key organizations, which, in total, accounted for over 95 percent of TVA's 1981 ADP workload. We supplemented the quantitative information included in the data collection forms with extensive interviews. The purpose of our monitoring effort was to ascertain how well the project was proceeding and if the workload validation process was being followed. We wanted to alert TVA of any deviations that would necessitate redirection of effort. We did not verify individual ADP system requirements that user management had specified as necessary.

In our monitoring, we found that many user organizations were initially reluctant to participate in the the effort sponsored by the central ADP organization. TVA management was immediately notified and, as a result, the general manager issued a directive to office managers enlisting their support and cooperation.

Results of TVA's workload validation effort

TVA provided us with the results of the workload validation effort in May 1981. It identified a total of over 600 systems

---

1/In March 1982, TVA deferred three additional units (two of which were slowed in 1981). TVA is currently assessing the ADP impact of these deferrals.

composed of about 3,000 applications operational on central site computers, commercial scientific time-sharing vendors, and decentralized computers.

The central site general purpose workload accounts for the largest portion of TVA's processing requirements. Long term annual user projections are lower than those made in February 1979. A comparison of projections is provided in the table below.

TVA Central Site Annual
User CPU Requirements

(In Amdahl 470/V8 CPU Hours)

Fiscal year	February 1979 projection	Validated workload	
		Current budget level	Enhanced budget level
1981	5,546	5,136	5,398
1982	6,932	6,177	6,784
1983	8,665	6,852	7,973
1984	10,831	7,207	8,600
1985	13,539	7,578	9,295
1986	16,924	7,974	9,986
1987	Not projected	8,165	10,473

The figures above represent annual user forecasts and must be translated for use in computer capacity and sizing analysis. (See p. 10.)

We believe that the slower growth in central site usage in the validated workload results from the combined effects of several factors, including

--revisions in the rate of growth assumed by the central computing organization in its February 1979 adjustment of user projections,

--a reduction in the nuclear power plant program,

--improved ADP management controls implemented since February 1979, such as the use of different cost charge-out rates for period or priority of use, and

--the influence of the general manager's directive to cut costs to minimize power rate increases.

TVA projects the scientific processing support workload to peak in fiscal 1982 and then diminish as the engineering and design of nuclear reactors are completed at each site. (Further discussion of the scientific processing requirement is included on page 13.) Minicomputer acquisitions are not projected to rise substantially.

Overall, ADP costs can be used as an indicator of the future direction of ADP in TVA. TVA estimates total fiscal 1981 ADP costs at over $76 million while fiscal 1985 expenditures are projected to exceed $100 million. Under the enhanced budget level scenario, TVA could reach the $100 million level as early as fiscal 1983.

The following table identifies the total TVA ADP costs users anticipated.

Fiscal year	Current budget level	Enhanced budget level
	----------(millions)----------	
1981	$ 76.0	$ 80.8
1982	$ 88.1	$ 98.5
1983	$ 93.7	$107.2
1984	$ 97.6	$114.4
1985	$103.5	$120.5
1986	$109.7	$131.0
1987	$114.8	$137.7

Evaluation of the results of TVA's workload validation effort

After analyzing the information TVA provided, we believe that the aggregate agencywide usage projection totals for the central site computer and commercial services are reasonable. Results were consistent with the information we collected. Although documentation of the relationship between mission objectives and computer-based information processing systems was not as detailed as anticipated, we believe that TVA managers did conscientiously assess the cost and value of each system. As a result of this effort, we believe TVA has greatly improved its decisionmaking information base.

REQUIREMENTS NOW REFLECT VALIDATED WORKLOAD

TVA has integrated the results of the workload validation effort into two major ADP procurement actions. The computer capacity requirements for the new central site computer system were revised using the validated workload projections. Also, the increased use of scientific processing support has been reflected in TVA's recompetition effort.

General purpose computer replacement

The workload validation effort produced general purpose computer requirements in terms of annual billable computing units, which were translated into terms suitable for computer capacity sizing. To minimize delays in the ongoing competitive replacement procurement for the general purpose computers, we agreed to review TVA's translation methodology as it was developed, and as a result, several improvements were made to it. Improved historical usage information was developed because new software tools were available. We assisted TVA by reviewing the reasonableness of assumptions and suggesting alternative approaches.

The methodology TVA developed to translate annual user forecasts into terms conducive to vendor demonstration requirements (benchmark specifications) considers

--the addition of nonbillable, problem program CPU time to user forecasts of billable time;

--the effective capacity of a facility; and

--the historical high usage patterns during the prime shift period.

The results of this method and those derived in 1979 are compared in the table below.

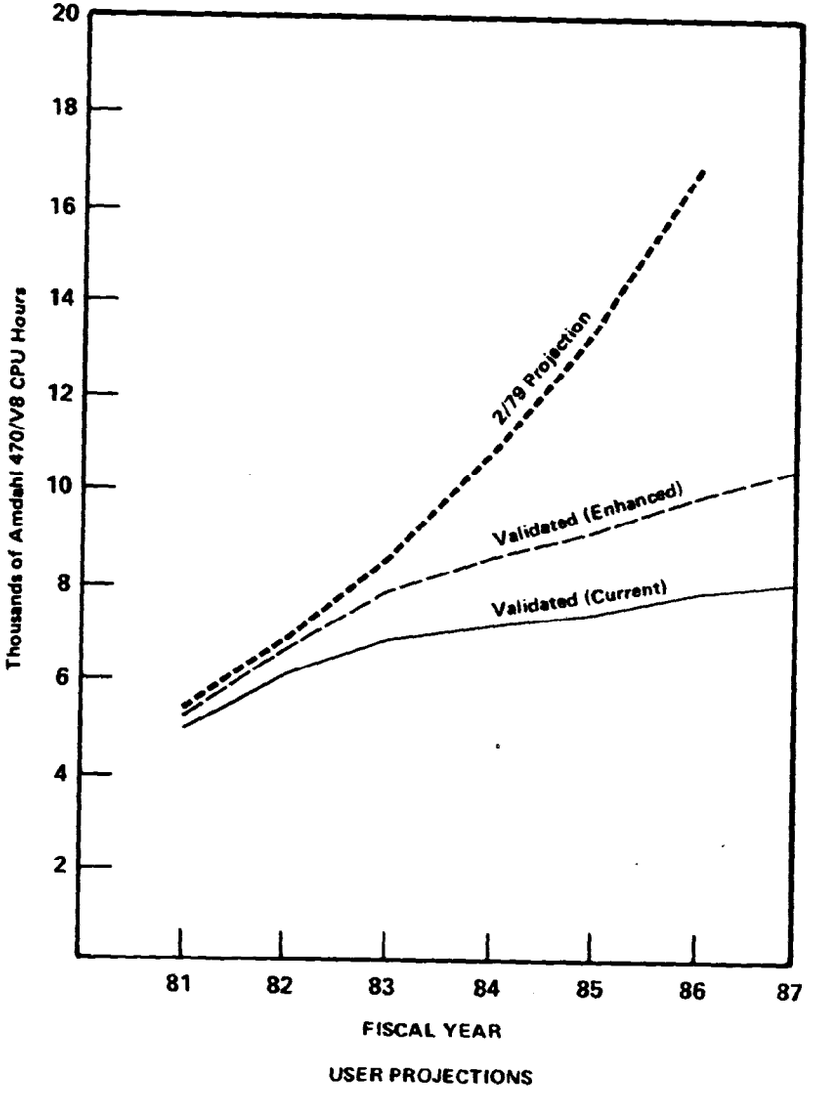
Comparison of General Purpose Computer Benchmark Workload Projections

(in Amdahl 470/V8 CPU seconds)

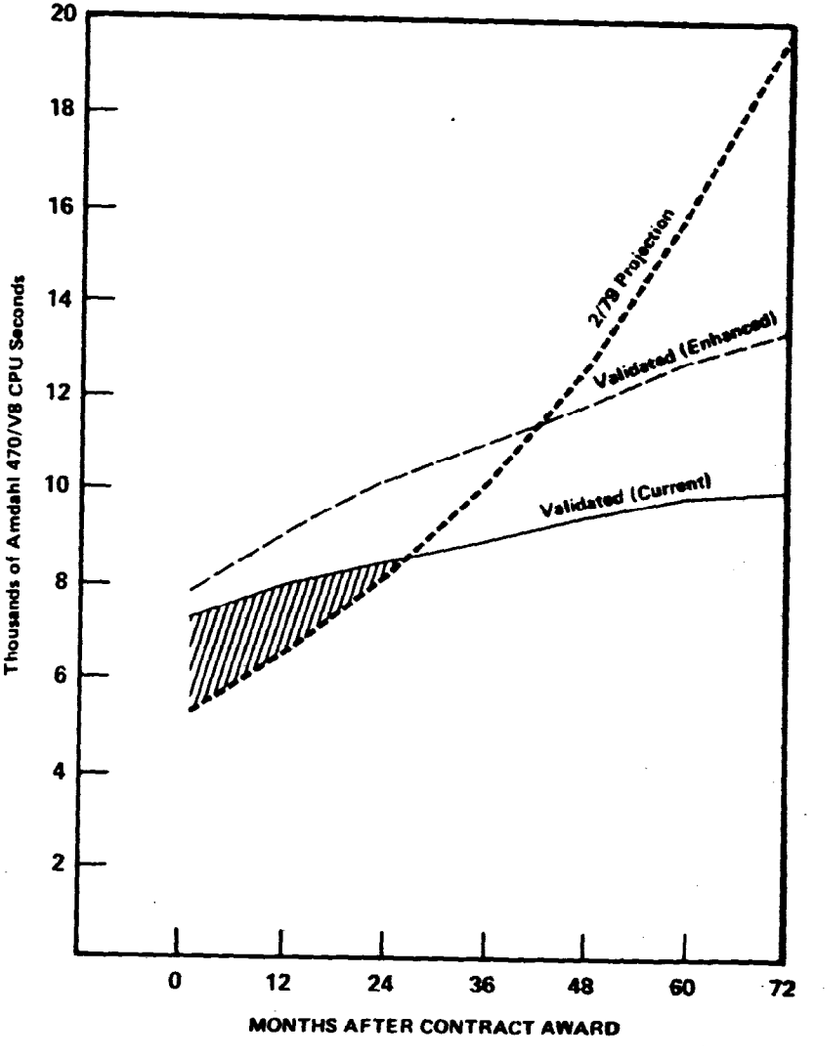
Month after September 1981 contract award	February 1979 projection	Based on validated workload	
		Current budget level	Enhanced budget level
1	5,322	7,337	7,850
12	6,530	8,026	9,113
24	8,162	8,542	10,193
36	10,203	9,020	11,032
48	12,754	9,556	11,979
60	15,943	9,904	12,806
72	19,929	10,090	13,511

The distinction between user forecasts and the projection in the benchmark specifications is seen in the benchmark requirements graphs on the following page. Even though the validated workload in terms of user-perceived computer use is lower than that projected in February 1979 (see table on p. 8) this is not the case when comparing benchmark workload projections above. By including

COMPARISON OF ANNUAL USER PROJECTIONS WITH BENCHMARK REQUIREMENTS



USER PROJECTIONS



BENCHMARK REQUIREMENTS
TRANSLATED FROM USER PROJECTIONS

the additional computer capacity elements previously described, the effect is to increase TVA's capacity requirements. Note that the February 1979 curve in the graph on the right does not incorporate these new factors.

As that same graph indicates (see crosshatched area), TVA would have procured insufficient initial capacity to handle the workload projected over the next 2 years had it continued to use the February 1979 projection in the procurement. We believe that by using the validated workload as a basis for amending the requirements in the ongoing procurement, an early upgrade with attendant service disruption was probably avoided. Also, by using the validated, enhanced level requirements, TVA estimated that the configuration capable of handling this level would cost about 25 percent more than that required to handle the current budget level. Therefore, the original optional quantity requirement of 100 percent was amended to be only 25 percent of final system cost in the procurement solicitation.

The procurement, using the modified requirements, resulted in a contract award to IBM of about $30 million in September 1981. The original TVA estimate, based on the earlier unvalidated February 1979 workload projections, was $51 million.

Recently, based on an economic analysis, TVA has decided to substitute one new model of central processor from the vendor for the three offered in the contract and to continue to use the two existing processors. This decision is expected to (1) save up to $6.5 million in acquisition and operational costs and (2) provide TVA with the most recent technology base in computing. Thus, total cost avoidance on the general purpose computer acquisition will probably exceed $25 million.

Recompetition of scientific processing support services

In addition to using general purpose computers, TVA processes a substantial amount of scientific applications on commercial time-sharing services. Approximately 95 percent of the scientific services workload is attributed to TVA's nuclear plant program, which amounted to about $7 million in 1981.

TVA must develop preliminary safety analysis reports for review by the Nuclear Regulatory Commission. These reports include (1) the names of the computer programs to be used to perform the analyses and (2) examples verifying that results produced by these computer programs are both accurate and adequate. Therefore, although the software that TVA shows in these reports is not certified by the Commision on an application basis, the net effect of the report approval is an indirect approval of the computer program(s). Any deviations from the report, including computer programs, must be reflected in the final safety analysis report which the Commission must approve before issuing an operating license.

TVA planned to meet its immediate and long term scientific processing needs by using a two-phased procurement approach. In the first phase, TVA reopened its Control Data Corporation (CDC) Cybernet services contract for competition. To justify the restriction to CDC-compatible services in the recompetition, TVA cited the extensive use of proprietary software and the impact of converting existing computer programs indirectly approved by the Nuclear Regulatory Commission. Original projections developed by the division of engineering design were based on user surveys of key areas. As a result of the more comprehensive workload validation effort, TVA identified a slightly greater use than originally projected, and the solicitation was subsequently amended. (See graph, p. 14.) TVA has completed its evaluation of seven viable proposals and awarded a contract estimated to cost over $20 million less than projections based on the previous contract prices and validated workload projections.

The second procurement phase was to be a determination of whether scientific services support by commercial contract services is more cost effective than support provided by a dedicated in-house facility. TVA would have solicited equipment proposals from CDC and third-party suppliers of CDC equipment, and then conducted an OMB Circular No. A-76 type cost comparison. TVA would have used the validated scientific workload to size the in-house configuration. This phase was not pursued because the costs of the commercial contract were dramatically lower, and in the face of potential decreases in engineering design workload, the contract has greater flexibility in capacity capabilities than would an in-house facility. TVA is analyzing this alternative.

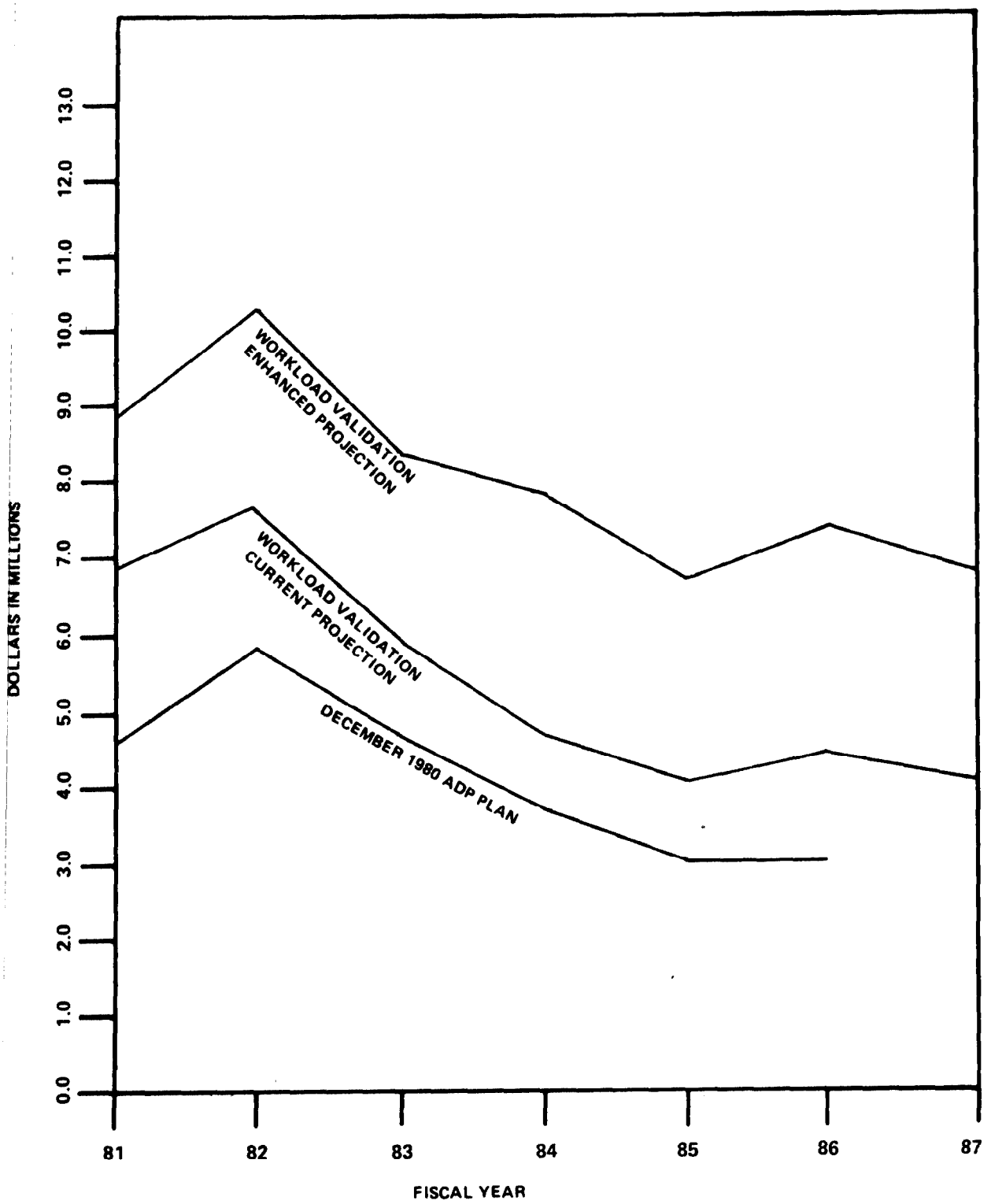
Minicomputers

The demand by TVA users for minicomputers has leveled off, per management direction. The validated minicomputer workload was not projected to rise materially and no major procurements of minicomputers are being pursued or expected in the near future. A word processing procurement is planned and some minicomputer replacement actions may be required in the longer term.

OVERALL ASSESSMENT OF THE VALIDATION EFFORT

We believe that the main benefit of validating computer workload goes beyond the quantitative assessment of needs. Of even greater importance is management's close involvement in planning for ADP resources. Because of historical neglect in establishing effective management controls, TVA found itself in a position where only a lengthy and detailed analysis could satisfy concerns of apparently unsubstantiated ADP growth projections. As a result of TVA's validation effort and the implementation of additional management initiatives, we believe it is unlikely that the same level of review of existing applications will need to be repeated. New requirements should be reviewed in detail within a systematic management review of all new system proposals. Methodical, but less

COMPARISON OF SCIENTIFIC PROCESSING SUPPORT EXPENDITURE PROJECTIONS



APPENDIX II

intensive, review of all existing workload within the annual budgeting process should provide the needed continual validation of needs. This systematic validation of workload is clearly preferable to the conduct of urgent, one-time special project reviews as part of the acquisition process.

Our evaluation of TVA's effort also surfaced some deficiencies. The number of minicomputers (currently installed or projected) in support of validated systems could not be correlated with those identified in previous plans. Part of this problem stems from TVA's classification of computer equipment. TVA makes use of off-the-shelf minicomputers for specialized functions, such as process control and data monitoring and analysis. User placement of equipment in different equipment categories contributed to an incomplete hardware inventory in the validation effort.

Another shortcoming was the apparent lack of definition of new information systems. Users identified few new opportunities where information technology could assist TVA management in its decisionmaking processes.

Many TVA users pointed out the amount of time spent in getting usage data for projection analysis as the most time-consuming task. We believe that the great amount of manual effort expended in securing this information detracted from the time users could have spent identifying new opportunities. More automated techniques and uniform policies on the assignment of job account numbers would have reduced the burden on most users.

Although the opportunity was provided to describe unsatisfactory service levels, such as turnaround and response time, many organizations failed to identify such instances. Ironically, after the forms were completed, some users voiced dissatisfaction with the service level provided by the existing central site computers.

Usage and cost reporting

TVA user organizations have often expressed the need for better central site computing usage and cost reports for planning, management control, and resource accounting. To minimize the proliferation of office-developed individual systems, the division of management systems put a high priority on the design and programming of the resource reporting and charge-back system. Of particular significance to the planning function, this system, now operational, will report actual versus planned use on several levels. Such comparison will also be given in terms of costs. It will provide information on costs incurred due to priority requests and savings realized due to off-prime processing. This system will benefit both the day-to-day management operations of individual ADP units and office- and TVA-level ADP planners in formulating future projections. The system will also facilitate future validation efforts.

APPENDIX III

TVA's PROGRESS IN IMPROVING MANAGEMENT CONTROLS

TVA should incorporate the discipline of workload validation into its information systems planning process. Weaknesses found in TVA's management controls are similar to problems we have found in reviews of other Federal agencies. TVA needs to provide for a more explicit and concise interrelationship between business planning and information systems planning and to enhance its management control over software. We believe that the implementation of an applications software inventory and a formalized systems development methodology is needed, especially in light of the increased user perceptions of opportunities provided in low cost computing.

MANAGEMENT INITIATIVES WILL AID TVA IN ACHIEVING BETTER MANAGEMENT OF ITS ADP RESOURCES

In addition to implementing workload validation, TVA has initiated a number of other corrective actions. It is too early to evaluate the results of all these initiatives; however, we believe that the integrated use of these improvements, when implemented, will aid TVA in achieving better management of its ADP resources.

ADP planning

In our opinion, developing a comprehensive, long range ADP plan is a recognized approach to (1) achieve efficient and effective use of resources, (2) assure that these resources support agency missions and objectives, and (3) commit top management to action. The importance of ADP planning is emphasized in Office of Management and Budget Circular No. A-71, "Responsibilities for the Administration and Management of Automatic Data Processing Activities."

Our recommendation that TVA establish a formal planning process 1/ was implemented by the division of management systems in October 1979. As of August 1981, TVA had

- --completed two annual planning cycles (fiscal 1980 through fiscal 1985 and fiscal 1981 through fiscal 1986) and produced the resulting ADP management plans and
- --contracted for the review of its ADP planning process by an outside consultant and implemented some of the consultant's recommendations.

1/"Improvements Needed in the Tennessee Valley Authority's Management and Use of Its Automatic Data Processing Resources," EMD-79-102, Sept. 6, 1979, p. 14.

The recently completed validation effort is being incorporated into the development of the third cycle (fiscal 1982 through fiscal 1987).

We are encouraged by the growing awareness among office level management of the necessity for ADP or information system planning. Our review of TVA's ADP planning efforts indicates progress, although major problems still persist. We believe that refinements to the planning process, especially the inclusion of corporate business plans, should improve TVA's management of ADP resources.

WE HAVE RECOMMENDED A FRAMEWORK OF PRINCIPLES AND PROCEDURES FOR MANAGING SYSTEMS DEVELOPMENT

After extensively reviewing Government-wide problems associated with the development of large, complex ADP systems, we recommended a framework of principles and procedures for managing systems development. 1/ Major pieces of this framework were the following principles:

--Top management and user management involvement.

--Formal system planning including the identification of all resources consumed.

--Systematic management review and control.

--Cost accounting and reporting procedures.

TVA has made strides in implementing a formal system planning process and in obtaining increased user involvement in the analysis of requirements. Also, cost accounting and reporting procedures are being improved. However, we believe further improvements can and should be achieved.

TVA SHOULD INTERRELATE BUSINESS PLANNING WITH INFORMATION SYSTEMS PLANNING

We have frequently reported that senior management levels in Federal agencies have been inadequately involved in the formulation of ADP or information systems plans. Top management direction should be provided in the form of documented corporate level business plans and should serve as input to the budget process. Corporate business plans should be strategic in nature and reflect top management's perception of those functions that are vital to accomplishing the organization's mission.

1/"Government-wide Guidelines and Management Assistance Center Needed to Improve ADP Systems Development," (AFMD-81-20, Feb. 20, 1981).

We believe that although information systems planning can be performed without the benefit of business planning, the task is more likely to succeed under a "top-down" approach where future business trends and organizational constraints are fully considered. In our exposure draft on ADP planning, 1/ we relate the availability of established, long range program objectives to the development of consistent and effective plans.

When TVA initiated the first ADP planning cycle in October 1979, the only business perspective available was that provided in the budget plan. Accordingly, actions in the ADP plan were planned to parallel the budget process. However, in its desire to be immediately responsive to our report, which recommended that a formal ADP planning process be established, TVA initiated the ADP planning period 3 months before the start of the next business planning cycle. A major shift in corporate direction during the business planning cycle left the ADP plan proceeding in a different direction than the corporate plan and made its requirements inconsistent.

TVA has acknowledged the need to provide greater input from the business planning perspective, especially in providing future business direction. In that regard, TVA's office of planning and budget has issued guidelines on the development of strategic business plans. In our opinion, TVA should develop its information systems planning guidelines for the next cycle, capitalizing on the anticipated availability of corporate management philosophies and goals. The strategic level of the information systems plan should establish the strategies, guiding how information processing will support those philosophies and goals. Using this base, TVA could perform project-oriented tactical planning. The resulting plans should determine the parameters that guide the acquisition and use of computer equipment. The concept of workload validation is compatible with this approach to information systems planning, and an assessment of how effectively current information needs are met should be an integral part of TVA's information systems plan.

We believe that the effectiveness of annual operating plans or budgets is enhanced by timely input from the information systems planning process. Each organization's ADP costs should be budgeted based on the input provided in the information systems plan, but until recently, TVA made no effort to build such a relationship. For example, capital ADP investment funding decisions were determined without any information from the ADP planning process.

Responsibility for the capital ADP investment budget falls under the responsibility of the division of management systems. Since budget formulation is usually interactive in nature, it is

---

1/"Questions Designed to Aid Managers and Auditors in Assessing the ADP Planning Process"--Exposure Draft, Aug. 1979, p. 20.

easy to see how fluctuations in funding requirements seriously affect final ADP investment decisions. This is particularly critical in instances where individual organizations seek funding for equipment destined solely for their use. In such cases, we believe that TVA should consider delegating the capital investment portion of the ADP budget to each office level. This would provide office-level managers with the opportunity to redirect funds based on organizational priorities and not on the first-come, first-served approach currently employed.

Current accounting procedures do not provide TVA with the ability to determine ADP costs at various levels of responsibility. We believe that TVA needs to develop systems for tracking actual performance against ADP plans and budgets. The implementation of a computer usage and cost reporting system (see p. 15) should improve this situation.

Different cost charges for periods of use

TVA's heavy processing during the prime shift (8 a.m. to 4 p.m. weekdays) is a major contribution to the size of the central site computing facility. Until fiscal 1981, users had little incentive to process their workload on other than the prime shift. In October 1980, at our strong urging, TVA instituted new cost charge-out rates for periods of use, thus encouraging the use of the computer during non-prime shifts. Deferred processing has enabled TVA to offload approximately 8 percent of their prime time workload to night and weekend shifts. The general manager told us that in light of his directive to reduce all costs, every office will continue to be encouraged to make greater use of nonprime shift opportunities.

Disaster recovery plan

The growing dependence on ADP resources has increased the importance of plans to prevent loss of their availability. We believe that these plans are necessary to minimize the damage caused by unexpected and undesirable occurrences in or around the ADP facilities, and in 1980 we reported on the lack of such contingency plans in Federal agencies. 1/ At TVA, there are few situations where a manual process can replace an automated function without seriously affecting the effective conduct of its operations.

TVA has recognized the risk involved in not being able to provide continued operation in the event of a major outage of its Chattanooga facility. As a result, it is currently considering a proposed ADP disaster recovery plan. Essential factors specified

---

1/"Most Federal Agencies Have Done Little Planning for ADP Disasters," AFMD-81-16, Dec. 18, 1980.

in a recent National Bureau of Standard (NBS) publication 1/ were considered. Those factors included management support, identification of critical systems, and risk analysis.

The proposed plan identifies approximately 25 percent of the total workload as "critical" to TVA's continued operations. The proposed plan calls for a backup facility in Knoxville, Tennessee, equipped with a computer that is compatible with the main site and that has a capacity sufficient to handle the critical workload. A minimal staff would operate this facility. During normal operations, this facility would be expected to handle about 20 to 25 percent of the total workload that is clearly deferrable in the event of disaster. High speed telecommunications already link the two sites, and backup file and operating software compatibility questions as well as other appropriate considerations have been addressed. The incremental cost of the proposed backup facility's annual operation is about $1.5 million over existing normal operations.

TVA SHOULD EMPHASIZE ITS MANAGEMENT CONTROL OF SOFTWARE

TVA has identified the need to incorporate an inventory of all its ADP assets in its formal system planning process. Expenditures for application software is the largest and fastest growing area of ADP investment. ADP equipment and personnel inventories are being developed; however, the development and maintenance of an application software inventory has not received sufficient attention. We found that the original plans to develop the application inventory system have been delayed because of scoping uncertainties and management's other priorities. We believe that an inventory system to identify and maintain application software asset information is needed in TVA. Without such an application software data base, effective ADP planning would be difficult, and the allocation and ranking of resources to support systems both operational and under development are dependent on this information. TVA's investment in software more than likely exceeds the hardware and facilities investment, and proper management of the software requires sound information.

IMPLEMENTATION OF A FORMALIZED SYSTEM DEVELOPMENT METHODOLOGY IS NEEDED

We believe that TVA must develop procedures requiring that all development projects be reviewed by management. Procedures should also specify the management level at which reviews and approvals are required--based on clearly defined thresholds of cost, schedule, scope, and performance. As a minimum, the procedures

---

1/FIPS/PUB 87, Mar. 27, 1981.

should require continual monitoring and intermediate reviews when planned cost or time threshholds are exceeded or when performance criteria are not met.

Attempts to implement such a system development methodology have not been successful at TVA. A review performed by the internal ADP audit organization in 1978 revealed minimal implementation and use of the methodology. A new review, started in April 1981, confirms this situation. TVA plans to identify specific difficulties in the use of the methodology and to develop necessary changes. We believe that such an effort is necessary to establish firm project control procedures based on cost, schedule, and performance criteria.

MANAGEMENT CONTROL OVER LOW COST COMPUTERS IS NEEDED

We believe that a formalized system development methodology is also needed in light of the increased user perception of opportunities provided by low cost computing.

In the past few years, significant reductions in computer hardware costs, coupled with advances in technology, have resulted in the development of relatively inexpensive yet powerful computers. Benefits of capitalizing on the opportunity to acquire low cost computing hardware include

--improving mission support capability,

--enhancing productivity by automating manual tasks, and

--modernizing existing computers and applications that are costly and outmoded.

TVA organizations should take advantage of economic opportunities to acquire and use low cost computers. At the time of our review, existing ADP guidelines did not address these opportunities. However, acquisition policies should also consider the need for management to control the frequently more expensive and complex software investment and operational costs associated with use of these computers. Total expenditures associated with low cost, computer-based systems are often misunderstood. Although hardware costs have decreased substantially, the work of systems design, programming, documenting, testing, and maintenance is similar to the level of effort required for larger computer systems. In addition, many systems development and programmer productivity tools for such systems are not available. The uncoordinated development of applications on a multitude of small computers could result both in subversion of existing standard systems and in costly duplicate system development and programming efforts.

The dilemma faced by TVA and most Federal agencies is how to balance the need to exploit low cost computing technology with the

need for controlling the diversity and uneconomic application of this technology. TVA has not given its users clear guidance on how to properly balance these issues in specific instances. Further, TVA lacks a policy or procurement mechanism for assuring standardization in the computers and applications developed on them.

SUMMARY AND CONCLUSIONS

TVA has become increasingly dependent on the use of computers to perform its diverse functions. Although energy-related activities, particularly the nuclear program, dominate the annual budget of almost $6 billion, TVA performs other functions, such as flood control, navigation, and fertilizer research.

A series of interim ADP procurement actions raised congressional concern that TVA was not properly managing its ADP resources. In the House report accompanying the 1981 Energy and Water Development Appropriation Bill, TVA was directed to justify the planned acquisition of general purpose computing equipment by conducting a detailed requirements analysis.

Working with us, TVA developed an approach which incorporates user management validation of the need for ADP support. The results of the workload validation effort were successfully incorporated in the general purpose computer procurement with the potential benefit of avoiding over $21 million in computer acquisition costs. We believe that TVA's validation of computer usage has also benefited the agency by instilling a management discipline that promotes cost effective use of ADP resources.

Historical neglect in establishing effective management controls placed TVA in the position where only extensive analysis could satisfy concerns of apparent unsubstantiated ADP growth. The Energy and Water Development Appropriation Bill, 1982, Committee Report (House Report No. 97-177) stated that

> "* * * the Committee wishes to note that accurately determining data processing requirements and acquiring computers to match the requirements is a basic responsibility of TVA management. It is unfortunate that the Committee and the General Accounting Office must become involved with TVA and many other agencies to ensure cost-conscious, successful planning and management of automatic data processing. If more agencies adhered to existing Executive Branch guidance and regulation as well as numerous published General Accounting Office findings and recommendations, the need for such involvement would be reduced."

As a result of its efforts, made in response to the Committee's request, we believe TVA has validated its needs for ADP support and has made substantial progress in achieving management

APPENDIX III

control over its ADP activities. We believe that TVA's integration of the validation concept into its information systems planning process and development methodology will prevent the need for such a special effort in the future. Similar integration of this validation into planning would probably benefit most other Federal agencies. We found such validation to be widely used in private industry. 1/

1/"Non-Federal Computer Acquisition Practices Provide Useful Information for Streamlining Federal Methods," AFMD-81-104, Oct. 2, 1981.

APPENDIX IV

TENNESSEE VALLEY AUTHORITY

ADP WORKLOAD VALIDATION PROJECT

PREPARED BY THE
ADP PLANNING STAFF
JANUARY 1981

DIVISION OF MANAGEMENT SYSTEMS
400 Commerce Avenue (200 HBA-K)
Knoxville, Tennessee 37902

APPENDIX IV

C | E

TENNESSEE VALLEY AUTHORITY
VALIDATION OF ADP APPLICATION RESOURCE
SYSTEM-LEVEL REQUIREMENTS

System Name: _____

Number of Computer Jobs in System: ___

Date of Last PRIDE Review _____
Date of Last Internal Audit Review _____

System Abstract: _____

Requirements for High Cost Resources:
___ On-Line Files
___ Batch Day Shift
___ Day Shift T.P. Transactions
___ Time Sharing
___ Fast-Batch Turnaround
___ Other than Day Shift T.P. Transactions

ADP Cost: The costs below pertain to utilization of computer resources, overhead, and personnel, i.e., total ADP cost of the system.

Cost in (000)

	FY	FY +1	FY +2	FY +3	FY +4	FY +5	FY +6
Central Site							
Decentralized							
Scientific							
Staff							
Other Related							
Total							

User Management Evaluation: As the manager primarily involved with the use of this system, the following is my evaluation of its value relative to its costs:

___ Necessary--No other practical method
___ Necessary--Current method the most cost effective
___ Necessary--Current method not the most cost effective
___ Not Necessary--Should be eliminated

In the event any authorized TVA or non-TVA regulatory organization desires to review any aspect relative to this system's use of information technology, I will provide the:

Rationale for utilizing the computer to accomplish the functions performed by this system.

Supporting documentation.

Name: _____ _____
Signature

Title: _____ Date: _____

TENNESSEE VALLEY AUTHORITY
VALIDATION OF ADP APPLICATION RESOURCE
JOB-LEVEL REQUIREMENTS

CENTRAL SITE COMPUTING SERVICE

C | E

System Name: _____

Job Number: [ ][ ][ ][ ][ ][ ] Job Name: _____

Job Frequency: ___ Daily ___ Weekly ___ Monthly ___ Other Specify _____

Job Abstract: _____

CPU Source: ___ Central Site ___ Martin Marietta ___ Other Outside Central Site Compatible
___ Other, Specify _____

CPU RESOURCES	BATCH (000)				TP (000)				TSO-ROSCOE (000)			
	12-8	8-4	4-12	WKEND	12-8	8-4	4-12	WKEND	12-8	8-4	4-12	WKEND
FY__ SEC												
JOB/TRANS/SESS												
FY+1 SEC												
JOB/TRANS/SESS												
FY+2 SEC												
JOB/TRANS/SESS												
FY+3 SEC												
JOB/TRANS/SESS												
FY+4 SEC												
JOB/TRANS/SESS												
FY+5 SEC												
JOB/TRANS/SESS												
FY+6 SEC												
JOB/TRANS/SESS												

ADP COST (000)	BATCH				TP				TSO-ROSCOE				TOTAL
	12-8	8-4	4-12	WKEND	12-8	8-4	4-12	WKEND	12-8	8-4	4-12	WKEND	
FY__													
FY+1													
FY+2													
FY+3													
FY+4													
FY+5													
FY+6													

Estimator's Name: _____ Title: _____

ADP Manager Concurrence

As the manager primarily involved with the use of this system, the following is my evaluation of its value relative to its costs:

___ Necessary--No other practical method
___ Necessary--Current method the most cost effective
___ Necessary--Current method not the most cost effective
___ Not Necessary--Should be eliminated

In the event any authorized TVA or non-TVA regulatory organization desires to review any aspect relative to this system's use of information technology, I will provide the:

Rationale for utilizing the computer to accomplish the functions performed by this system.

Supporting Documentation.

Name: _____

Signature: _____

Title: _____

Date: _____

APPENDIX IV

APPENDIX IV

C | E

TENNESSEE VALLEY AUTHORITY
VALIDATION OF ADP APPLICATION RESOURCE
JOB-LEVEL REQUIREMENTS

DECENTRALIZED
COMPUTING SERVICE

System Name: _____

Job Number: _____ Job Name _____
Job Mode: _____ Batch _____ Interactive _____ Combination

Job Frequency: _____ Daily _____ Weekly _____ Monthly _____ Other Specify _____

Job Abstract: _____

CPU Source: Make: _____ Model: _____
Serial No.: _____ Location: _____
TVA Tag No.: _____

Hours of Operation:

	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	Sun.
From							
To							

Percentage of weekly computing services used by job: _____
Account Number: ____ - ____

ADP Cost: The costs below pertain to utilization of computing resources.

Cost in (000)

	FY	FY +1	FY +2	FY +3	FY +4	FY +5	FY +6
CPU							

Estimator's Name: _____ Title: _____

ADP Manager Concurrence: As the manager primarily involved with the use of this system, the following is my evaluation of its value relative to its cost:

_____ Necessary--No other practical method
_____ Necessary--Current method the most cost effective
_____ Necessary--Current method not the most cost effective
_____ Not Necessary--Should be eliminated

In the event any authorized TVA or non-TVA regulatory organization desires to review any aspect relative to this system's use of information technology, I will provide the:

Rationale for utilizing the computer to accomplish the functions performed by this system.

Supporting documentation.

Name: _____ _____
Signature

Title: _____ Date: _____

C E

TENNESSEE VALLEY AUTHORITY
VALIDATION OF ADP APPLICATION RESOURCE
JOB-LEVEL REQUIREMENTS

CDC CYBERNET AND
OTHER OUTSIDE SCIENTIFIC

System Name: _____

Charge Number: _____

Project Number: _____

Job Frequency: ___ Daily ___ Weekly ___ Monthly ___ Other Specify _____

Job Abstract: _____

Service Contractor: _____

CPU Source: Make: _____ Model: _____

CPU RESOURCES		BATCH (000)				INTERACTIVE (000)			
		12-8	8-4	4-12	WKEND	12-8	8-4	4-12	WKEND
FY___	BILLING UNITS								
	JOB/SESS								
FY+1	BILLING UNITS								
	JOB/SESS								
FY+2	BILLING UNITS								
	JOB/SESS								
FY+3	BILLING UNITS								
	JOB/SESS								
FY+4	BILLING UNITS								
	JOB/SESS								
FY+5	BILLING UNITS								
	JOB/SESS								
FY+6	BILLING UNITS								
	JOB/SESS								

ADP COST (000)	BATCH				INTERACTIVE				TOTAL
	12-8	8-4	4-12	WKEND	12-8	8-4	4-12	WKEND	
FY___									
FY+1									
FY+2									
FY+3									
FY+4									
FY+5									
FY+6									

Estimator's Name: _____ Title: _____

ADP Manager Concurrence

As the manager primarily involved with the use of this system, the following is my evaluation of its value relative to its costs:

___ Necessary--No other practical method
___ Necessary--Current method the most cost effective
___ Necessary--Current method not the most cost effective
___ Not Necessary--Should be eliminated

In the event any authorized TVA or non-TVA regulatory organization desires to review any aspect relative to this system's use of information technology, I will provide the:

Rationale for utilizing the computer to accomplish the functions performed by this system.

Supporting Documentation.

Name: _____

Signature: _____

Title: _____

Date: _____

APPENDIX IV

TENNESSEE VALLEY AUTHORITY

ADP PROJECT RESOURCE REQUIREMENTS

C | E

PROJECT NAME: _____ PRIDE # : _____

USING ORGANIZATION: _____ DEV. START: _____ CPU SOURCE: _____

DEVELOPING ORGANIZATION: _____ PROD. START: _____ CPU: _____

CPU RESOURCES	BATCH (000)				TP (000)				TSO-ROSCOE (000)				DISK K-BYTES	STAFF RESOURCES-FTE YI		
	12-8	8-4	4-12	WKEND	12-8	8-4	4-12	WKEND	12-8	8-4	4-12	WKEND		UsingOrg	OtherTVA	NonTV
FY__ SEC																
JOB/TRANS/SESS																
FY +1 SEC																
JOB/TRANS/SESS																
FY +2 SEC																
JOB/TRANS/SESS																
FY +3 SEC																
JOB/TRANS/SESS																
FY +4 SEC																
JOB/TRANS/SESS																
FY +5 SEC																
JOB/TRANS/SESS																
FY +6 SEC																
JOB/TRANS/SESS																

ADP COST (000)	EQUIP. CAPITAL EXPEND.	CENTRAL BILLINGS	OUTSIDE BILLINGS	EQUIP. RENT MAINT. DEPREC.	EQUIP. OVERHEAD	COMMUNICA-TIONS	TVA STAFF	NON-TVA STAFF	TOTAL
FY__									
FY +1									
FY +2									
FY +3									
FY +4									
FY +5									
FY +6									

NEW EQUIPMENT & FACILITIES:

NEW SOFTWARE:

SPECIAL RUN REQTS:

SYSTEM INTERFACES:

- ☐ Necessary - No other practical method
- ☐ Necessary - Planned method most cost effective
- ☐ Necessary - Planned method not most cost effective
- ☐ Not necessary - Should not be developed

_____
User Manager Date

APPENDIX IV

APPENDIX V

TENNESSEE VALLEY AUTHORITY
KNOXVILLE, TENNESSEE 37902

OFFICE OF THE BOARD OF DIRECTORS

APR 9 1982

Mr. J. Dexter Peach, Director
Energy and Minerals Division
U.S. General Accounting Office
441 G Street
Washington, DC 20548

Dear Mr. Peach:

We appreciate the opportunity to review and comment on the March 19 draft of your proposed report concerning TVA's validation of its future computer requirements.

We are gratified that the General Accounting Office has found TVA to have "made substantial progress toward achieving improved management of its ADP resources." It should be noted further that TVA has worked closely with the GAO in achieving greater management control over planning and use of computer resources and we are grateful for that assistance.

Further, TVA is in agreement with GAO's recommendations to further improve ADP management, building on the progress to date. More will be done to integrate information systems planning with the Agency's business planning. Stricter enforcement of our formalized systems development methodology is also necessary. Work continues to implement these and other recommendations in the GAO report.

Sincerely,

C. H. Dean, Jr.
Chairman

(913661)

An Equal Opportunity Employer

~~22115~~

~~22114~~

22133

AN EQUAL OPPORTUNITY EMPLOYER

UNITED STATES
GENERAL ACCOUNTING OFFICE
WASHINGTON, D.C. 20548

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE,$300

POSTAGE AND FEES PAID
U. S. GENERAL ACCOUNTING OFFICE

THIRD CLASS