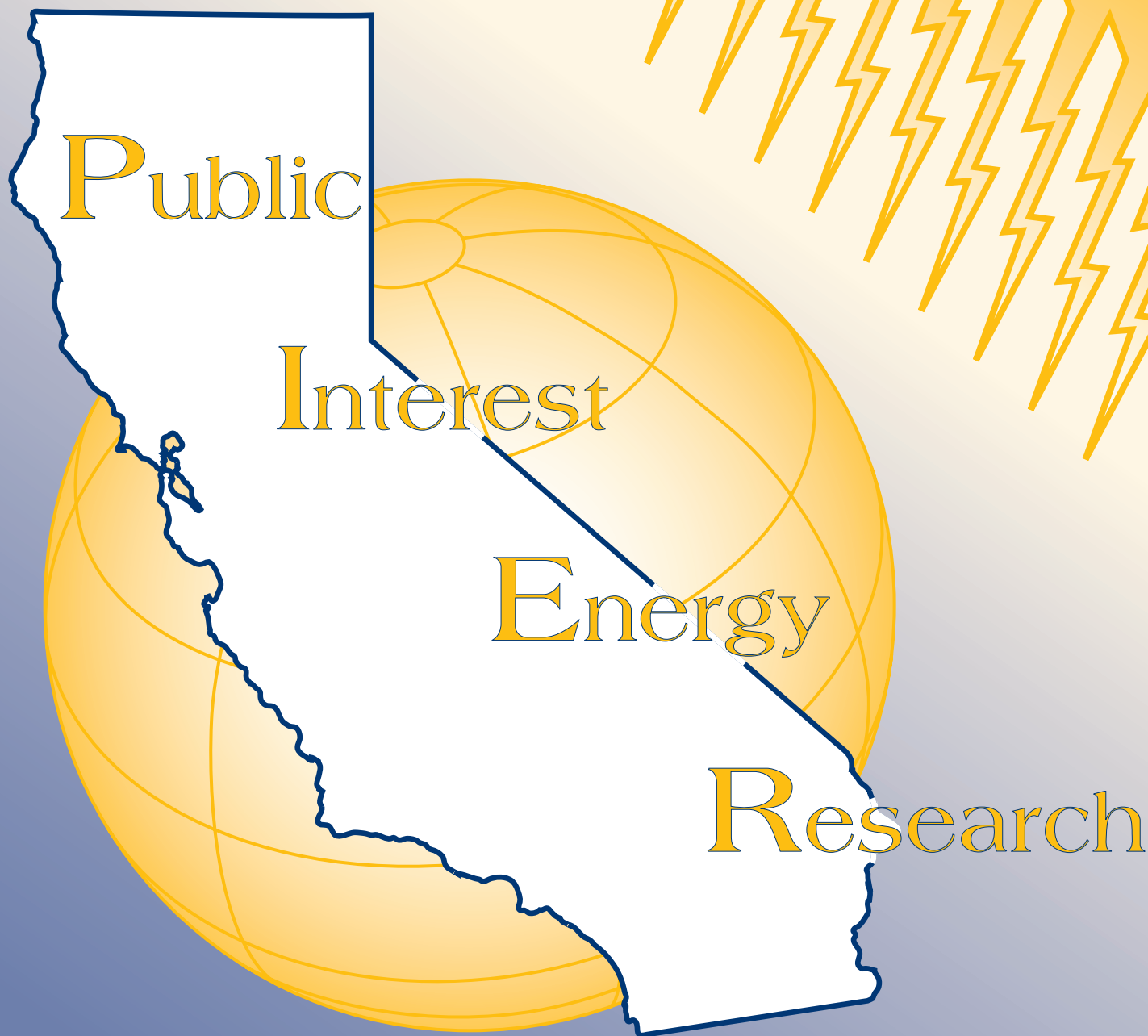


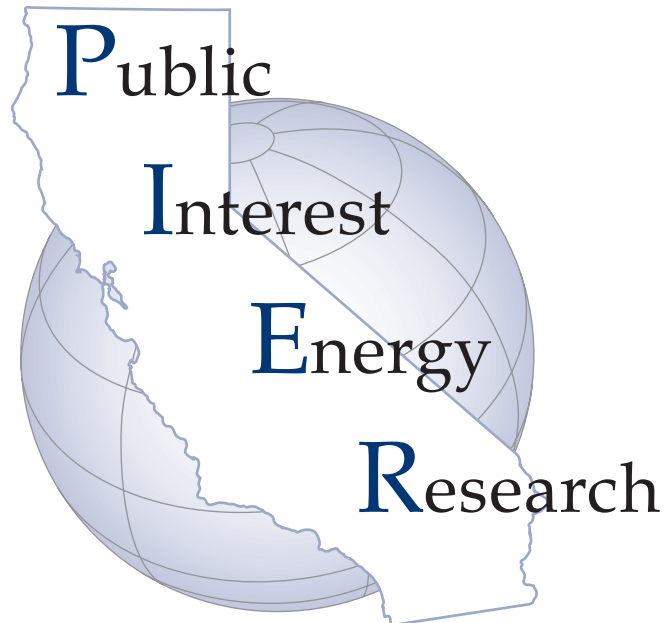
CALIFORNIA



Independent PIER Review Panel Final Report
March 2001

CALIFORNIA COUNCIL ON SCIENCE AND TECHNOLOGY

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EXECUTIVE SUMMARY

The Public Interest Energy Research (PIER) program was established to conduct energy research, development, and demonstration (RD&D) projects in the public interest.¹ Initially, the Legislature authorized \$62.5 million annually for the program for four years through December 2001. The Legislature also established the requirement for an Independent Review Panel to evaluate the PIER program's public value and to make recommendations to the Legislature and to the Governor.² The panel was required to provide a preliminary report by March 2000 and a final report by March 2001.

The panel's March 2000 report affirmed that energy-related issues are important enough, both nationally and to California's unique interests, to warrant a targeted, effective energy RD&D program. California's energy infrastructure faces serious challenges, including the need to: meet the increasing demand for energy; maintain system stability and security with restructured electricity markets; improve transmission capabilities; continue increasing efficiency of energy-using technologies; and improve environmental performance of energy systems. The state has the intellectual resources and economic infrastructure to address those challenges through a well-managed, high-quality RD&D program.

The preliminary report for the period through March 2000 found that despite a number of successes, the PIER program exhibited a variety of problems hindering effective program execution. Some of the initial problems were typical of those inherent in any startup venture. Others, in the opinion of the panel, were the result of weaknesses in program development and infrastructure. The panel concluded the March 2000 report with the observation that unless the PIER program was significantly restructured, PIER would not become a truly outstanding research and development program that would benefit the citizens of California. The panel recommended that the PIER program be continued but that it be transformed into a new organizational environment, either inside or outside the California Energy Commission (CEC), that would provide high-quality management with efficient legal, operational, and financial support essential to a superior public interest energy RD&D program.

The CEC's Commissioners were in general concurrence with the conclusions of the panel's March 2000 report. The Commissioners believed the report would help the CEC address key areas of improvement needed for the PIER program to excel. Under the guidance of the CEC RD&D Committee and its Presiding Member, the CEC accepted the challenge to transform PIER within the CEC. The CEC formed three working groups to respond to the March 2000 report findings. The three working groups included (1) Leadership and Management, (2) Administration, and (3) Policy and Planning.

Recent legislation continues the PIER program for 10 years at the same \$62.5 million per year investment rate and requires the CEC to develop two investment plans for RD&D. The initial investment plan is to be submitted by March 1, 2001, and this investment plan must also address the recommendations of the panel's March 2000 report to either transform the RD&D program within the CEC or to administer it in cooperation with or through an external organization. A subsequent investment plan is due March 31, 2006.

The panel is generally pleased with the CEC response to the March 2000 report. The Commission's leadership and PIER staff should be commended for taking some major steps as initial efforts to transform PIER within the CEC. Now, it is critical for the Commission to maintain its commitment and momentum to implement the remaining changes necessary to complete the transformation. The CEC now has a new executive team in place. This team includes the RD&D Committee Commissioners, the CEC Executive Director, and the PIER Program Manager who are attempting to

¹ Assembly Bill 1890, Deregulation of the Electrical Industry, September 23, 1996.

² Senate Bill 90, as amended, Energy resources: renewable energy resources: funding. (enacted in 1997)

transform the PIER program within the CEC. This next year provides the opportunity for this new team to demonstrate whether or not PIER should remain within the Energy Commission.

The panel found that there are still major issues that must be dealt with by the state Legislature, the CEC, and the PIER team. The CEC must deal with identifying California's energy needs, leveraging the DOE programs to those needs, transforming the management of the PIER program, and obtaining value from the RD&D performed.

At the strategic level, California's energy trends, needs, and resources must be understood. The CEC then needs to define California's energy vision and, working with the DOE, provide the leadership essential to frame PIER's short- and long-term priorities so that the program can help meet California's unique energy needs. After determining the research and development agendas and programs of California's energy industry, the CEC must then identify the public interest research gaps that remain between California's energy vision and the plans of the energy industry. A combination of strategies to pursue California's energy vision needs to be selected. With the strategy selected, policies, procedures, programs, metrics, and budgets must be established to implement the strategy. Beyond the two legislatively mandated investment plans, the CEC must have a strategic planning process that is continuous, dynamic, and responsive to changes.

The panel has questioned the program value of some of the R&D that has been performed to date. PIER management also recognized this and some projects were canceled. As part of assessing the R&D value of the PIER projects, the panel members met with CEC personnel, reviewed contracts and reports, and interviewed a number of the PIER performers. To date approximately \$85 million has been awarded and half the funds expended, while about \$20 million in membership fees and small grants have been awarded. There was a mixed consensus on the value of these projects since, other than the transition projects awarded in early 1998, a majority of the projects were only 10% to 50% complete. In a broad sense these projects were strategic in nature and involved the public interest but their public value is yet to be determined. A number of the projects had the potential to reduce energy demand, improve system reliability, or address environmental issues that would not otherwise be funded. However, the potential and probability of future market utilization was not always readily apparent nor were there clear links to other state-funded market transformation programs.

From the PIER performers there was good feedback on the importance of the PIER program, the value of applications research, which has both social and industrial benefits, and the honest broker role played by PIER in the process. However, performers described the contracting procedure as a "painful process" fraught with legal issues and administrative details that took too much time, with the purpose of the research getting lost in the process. These complaints from performers confirmed the panel's preliminary findings that many PIER functional processes are unnecessarily bureaucratic and rigid.

The panel found that PIER management and staffing are critical issues. The CEC needs more R&D experienced managers and the ability to attract and retain these managers through a variety of mechanisms. The contracting processes still need to be significantly streamlined. Since research does not proceed in an absolutely linear and predictable fashion, there also needs to be provisions for unexpected and mid-course corrections. The whole process would be better served by having more R&D experienced managers at the CEC, by instituting a range of flexible contract alternatives, and by streamlining the pre- and post-award contracting processes. While there is uniform support for the potential value of this kind of work, the way in which the process has been managed and implemented at the CEC must still be improved.

The panel offers a set of expectations of what the Governor, the Legislature, and the CEC must accomplish over the next year to transform PIER into a high-quality research program within the CEC. If these expectations are not achieved, then the Legislature should consider the option of developing a PIER organization outside the California Energy Commission. The panel's expectations

are grouped into: those that the CEC must accomplish internally; those that the CEC must accomplish externally in conjunction with the Governor's office and the Legislature; and those that deal with the CEC developing a broader set of energy relationships. The grouped expectations are listed below.

Internal within the CEC

- PIER organizational responsibility will have grown through the formation of a dedicated division with program managers and functional heads solely responsible for PIER.
- The PIER Program Manager will have been given authority to manage the PIER budget and selected authority to administer those funds.
- The quality and experience base of PIER research managers will have continued to develop.
- California energy research targets will have been set and contracts or grants awarded to achieve those targets.
- The PIER Program Manager will have developed a management roadmap.
- The PIER program will have, on average, awarded contracts in four or less months.

External to the CEC

- The Governor and the Legislature will have been provided with the CEC forecasts of energy trends, needs, and resources developed as part of PIER's strategic planning process.
- The CEC will have requested and received legislative relief from specific constraints on PIER innovation related to contracting, streamlining, and staffing.
- PIER will have become an integrated part of California's funded energy efficiency and renewable energy programs.

Broader Energy Relationships

- The CEC will have developed a mechanism for informing the California Congressional Delegation of federal funding needs.
- The CEC will have begun to affect the portfolio of DOE programs and their funding to meet California's energy needs.
- Partnerships and collaborations will have been pursued with other research centers.
- PIER program advisory groups will consist of knowledgeable people from a range of stakeholders including utility, industry, regulatory, academic, and public interest.

This panel recommends accelerating the next legislatively mandated independent review possibly to as early as 2002. The panel also recommends that an organization such as the California Council on Science and Technology (CCST) be requested by the Governor and the Legislature to assist the next panel. The first order of business for the new independent panel should be a follow-up review to determine if the expectations outlined in this report have been achieved or whether the Legislature should consider other options for PIER. The expectations outlined in this report can be used as the framework to determine whether the changes necessary for transformation of PIER within the CEC have been implemented. Then the panel should assess the public value of completed PIER projects awarded during 1999 and 2000.

California has a unique opportunity this year to build an exceptional research and management team for public interest energy research but it will require significant changes through the collaboration of the Governor, the Legislature, and the CEC. Achieving the fundamental expectations described in this final report also provides the framework for cooperative efforts that can be applied to the management and organizational concepts of other state organizations.

1. INTRODUCTION

1.1. CHARGE TO THE PANEL

Assembly Bill (AB) 1890 restructured the California electricity industry in 1996.³ The legislation also authorized collection of a surcharge on retail electricity sales of not less than \$62.5 million annually for four years to ensure a continuation of public interest energy research, development, and demonstration projects. The PIER program was established at the CEC to implement this provision and was funded at \$61.8 million annually from January 1, 1998 to December 31, 2001.⁴ Senate Bill (SB) 90 further defined the PIER program in October 1997,⁵ identifying key program areas and administrative and funding criteria.⁶

Public Resources Code Section 25620.9(a) directed that an independent panel be established to conduct a comprehensive evaluation of the PIER program. The evaluation was to include a review of the public value of programs and was to evaluate factors including, but not limited to, the monetary and nonmonetary benefits to public health and the environment of those programs, and the benefits of those programs in providing funds for technology development that would otherwise not be adequately funded.

The CEC requested the assistance of CCST to nominate panel members and manage the review process. The panel members were selected because of their competencies in areas necessary to evaluate the PIER program.⁷ The evaluation of the program's public value and benefits, and the program management assessment, were based on the panel members' broad expertise in RD&D program management and execution.

A preliminary report to the Governor and the Legislature on the PIER program implementation was required no later than March 31, 2000 and a final report no later than March 31, 2001. This final report presents the panel's final findings regarding the PIER program.

1.2. CONCLUSIONS OF PANEL'S PRELIMINARY REPORT

The panel was formed in 1999 and eight public meetings were held between February 1999 and February 2000. The panel reviewed PIER documentation, including draft strategic plans and PIER project summaries, met with PIER personnel and two CEC Commissioners, and considered alternative RD&D organizational structures. The preliminary report, submitted to the Governor and the Legislature in March 2000, presented the panel's findings regarding both PIER program management and public benefits, and made near-term and longer term recommendations. Those findings and recommendations are summarized in the following paragraphs.

The importance of energy RD&D to California's continued economic growth, environmental performance, and science and technology leadership demands that the PIER program be implemented effectively. California's energy system faces serious challenges, including the need to: meet increasing demand for energy; maintain system stability and security with restructured electricity markets; improve transmission capabilities; continue increasing efficiency of energy-using

3 Assembly Bill 1890, Deregulation of the Electrical Industry, September 23, 1996.

4 The originating legislation left determination of minimum funding levels for public interest transmission and distribution projects at the discretion of the CPUC who also administered those funds. The CPUC set the amount at \$700,000 per year. The panel did not include the CPUC public interest transmission and distribution projects in their review. The 2000 legislation, SB 1194, moves this effort to the CEC in 2002.

5 Senate Bill 90, as amended, Energy resources: renewable energy resources: funding (enacted in 1997). The PIER program does not address issues related to transportation or nuclear energy.

6 CEC, PIER 1998 Annual Report, March 1999.

7 See Appendix A, Matrix of Panel Member Competencies. Panel member selection included conflict of interest disclosure. While some panel members are under contract with the CEC or other interested parties, no conflicts of interest exist with respect to PIER.

technologies; and improve environmental performance of energy systems. The state has the intellectual resources and economic infrastructure to address those challenges through a well-managed RD&D program.

The panel found that many of the factors affecting the efficiency and effectiveness of the PIER program's planning, contracting, and management processes were internal to the CEC. At a fundamental level, these factors were inherent in the current structure of the agency and its standard operating procedures. The CEC's internal constraints shaped a PIER organization through policies and practices that needed to be changed if PIER was to satisfy the expectations set when it was established. In particular, the characteristics of the CEC organizational culture and bureaucracy conflicted with the characteristics of an organizational environment that facilitates a superior RD&D program.

The panel agreed that the PIER program had many strengths and was sponsoring some high-quality RD&D projects. However, unless it is significantly transformed, PIER may not become a truly outstanding research and development program that will benefit the citizens of California.

The panel identified two alternative ways to enhance the future success of the PIER program:

1. Increase the autonomy and flexibility of PIER within the CEC. This includes: raising the stature of PIER; clearly defining the roles of the CEC Commissioners; providing a program director with responsibility and authority for program planning and execution; delegating greater responsibility to the PIER program area managers; and streamlining personnel and contracting policies, with management and core staff responsible solely for PIER.
2. Provide PIER with the requisite autonomy and flexibility through an external organization that will provide the kinds of flexible decision-making and personnel recruitment discussed above. Options include: assigning PIER to an existing university or the creation of a university association; assigning PIER to an organization with broad energy RD&D portfolio management experience; creating a new independent agency with responsibility for energy RD&D; or incorporating the PIER program into the newly planned California Institutes for Science and Innovation.

The panel chose not to evaluate in detail the pros and cons of various organizational arrangements, but agreed unanimously on the characteristics necessary for an outstanding program.

Therefore, the panel recommended that the PIER program be continued but be transformed into a new organizational environment, either inside or outside the CEC, that would provide the legal and organizational basis for a superior public interest energy RD&D program.

1.3. PANEL'S APPROACH TO YEAR TWO

The panel agreed that the second year would involve four major activities. Those included:

1. Assessing the progress of the CEC in administering the PIER program in response to the panel's preliminary report;
2. Reviewing the value of the PIER projects placed on contract from the program's inception through the summer of 2000;
3. Staying attuned to state government legislative activities related to the PIER program; and
4. Preparing the panel's final report for a March 31, 2001 submittal to the Governor and the Legislature.

The panel held five public meetings between March 2000 and March 2001. These meetings included briefings by and discussions with CEC executives, CEC staff, PIER management, and outside R&D organizations. This was supplemented by three panel subcommittees and interaction with the CEC staff leads on CEC responses to the issues presented in the panel's preliminary report. To assess the PIER projects, the panel formed five subpanels and met with CEC personnel, reviewed contracts and reports, and interviewed a number of the PIER performers.

1.4. RECENT LEGISLATION

SB 1194, Electrical Restructuring: Public Benefit, passed the Senate and Assembly and was signed by the Governor on September 30, 2000. This legislation extends the collection of a nonbypassable system benefit charge to fund three specific programs. Those programs are: a) \$228 million per year for energy efficiency and conservation activities; b) \$135 million for in-state operation and development of existing, new, and emerging renewable energy resources; and c) \$62.5 million per year for public interest research, development, and demonstration (RD&D). The last component is the PIER program.

This bill extends the authority to collect funds to support these programs for up to 10 years in two five-year blocks. However, rather than simply extending the funding authorization, this bill requires the CEC to develop investment plans for the renewable and RD&D programs covering each five-year block.

The CEC is required to submit their initial investment plan by March 1, 2001, addressing the application of moneys collected between January 1, 2002 and January 1, 2007. A subsequent investment plan is due March 31, 2006, relating to the application of moneys collected between January 1, 2007 and January 1, 2012. No moneys may be expended in the years covered by these plans without further legislative action.

This bill also requires the Governor to appoint an independent review panel of members with expertise on the energy service needs of large and small electricity consumers to review the operation of the programs. The panel, to be appointed by January 1, 2004, is required to prepare a report on or before January 1, 2005 evaluating the public purpose programs. The report will also assess whether the programs are consistent with the statutory goals, if established targets for renewable generation are likely to be achieved, and whether changes should be made to result in more efficient use of public resources. The panel is also directed to compare the CEC's programs with efforts in other states. The report is aimed at helping the Legislature to determine whether to change or eliminate the collection of the system benefits charge.

2. ASSESSMENT OF CEC RESPONSE TO PANEL'S PRELIMINARY REPORT

The CEC Commissioners were in general concurrence with the conclusions of the panel's March 2000 Preliminary Report. The Commissioners believed the report would help the CEC address key areas of improvement needed for the PIER program to excel. The CEC Research, Development and Demonstration (RD&D) Committee and staff entered into discussion with the panel regarding the best means for responding to the issues presented by the panel. Under the guidance of the CEC RD&D Committee and its Presiding Member, the CEC accepted the challenge to transform PIER within the CEC.

2.1. CEC WORKING GROUPS

The CEC and the panel agreed that the issues raised and findings identified in the panel's preliminary report could be grouped into three categories. Those categories were: (1) Leadership and Management of the program; (2) Administrative Streamlining of the program; and (3) Policy and Planning for the program. Accordingly, the CEC assigned key staff members into three working groups to address the panel's recommendations. In turn, the panel formed three subcommittees whose members would be available to the CEC for informal clarification or discussion of various topics presented in the panel's preliminary report. Interactions between the CEC staff leads and the panel subcommittees were ad hoc and informal during the summer of 2000. The panel's subcommittee assignments are listed in Table 1.

Table 1 Panel Subcommittee Assignments

Subcommittee	1. Leadership and Management	2. Administrative Streamlining	3. Policy and Planning
Panel Members	<i>H. Agnew</i> <i>J. Foster*</i> <i>K. Fowler</i>	<i>R. Balzhiser*</i> <i>E. Soriano</i> <i>M. Walshok</i>	<i>L. Cohen</i> <i>J. Sweeney</i> <i>C. Weinberg*</i>

* Lead panel member for subcommittee

The following paragraphs in this section provide a summary of the CEC actions in responding to the panel's preliminary report.

2.2. LEADERSHIP AND MANAGEMENT

This CEC team, led by the CEC Executive Director, addressed the important leadership and management issues raised in the panel's preliminary report.

2.2.1. The organizational structure of the PIER program will be fundamentally changed.

The CEC decided that effective management of the PIER program required a fundamental organizational change within the agency. Accordingly, this program will reside within its own division at the Commission, and the PIER Program Manager will report directly to the Executive Director. Details of the division structure and constituents are in development.

2.2.2. A new PIER Program Manager was selected from outside the CEC.

The CEC decided to hire a new program manager to lead the PIER program. This was achieved through an "interjurisdictional exchange." This allowed a search throughout a broad range of institutions. Dr. Terry Surles was selected from among a number of highly qualified candidates with outstanding management and leadership skills. The Commission announced its appointment in September and Dr. Surles took his position at the CEC in late October 2000.

2.3. ADMINISTRATION

This CEC team addressed various PIER administrative streamlining issues raised in the PIER panel's March 2000 report. The PIER Administrative Streamlining Team expects to develop specific proposals that will be presented for the RD&D Committee's review and approval. The CEC anticipates that streamlining improvements will occur over a six to twelve month period of time. The following list highlights the issues that the CEC is addressing:

2.3.1. Reduce the total amount of time from the issuance of the request for proposal (RFP) to starting work on an executed contract.

The CEC's goal is to reduce the average time it takes to complete this multi-phased process from more than nine months to less than six months, and to make the time more consistent across all funded projects. Several changes have already been made in recent solicitations that improve the process. For example: RFPs now include more specific instructions on the formats for work statements and budgets; future contract managers are participating more directly in the review and selection of the proposals; and the Commission has completed a Competitive Negotiation Solicitation that enables more interaction between the contractor and the Commission during the selection phase of the process.

2.3.2. Develop agreements that have the flexibility needed for research projects yet still have appropriate levels of accountability.

The CEC will evaluate the work statements of several other organizations (such as EPRI, GTI, NYSERDA and UC) to see if they have more suitable processes that PIER should adopt. The CEC is examining what benefits would result from using grants instead of contracts for more of their research. They may seek additional changes to their legislative mandate. Some strides have already been made in this area. For example, PIER contracts now allow task level changes to occur without specific approval of the Commission unless there is a significant change in the scope of the work or the goal of the project.

2.3.3. Improve the consistency and quality of contract management.

PIER contracts have several features, including flexibility, that are different from other contracts in the Commission. The biggest issue here is to ensure that all staff working on PIER contracts receive training in how to properly manage and implement these features. The CEC is going to develop clearer roles and responsibilities for everyone involved in these PIER contracts, and they will establish an annual review of all projects receiving PIER funds to determine whether funding should continue.

2.3.4. Establish an on-going mechanism to improve the PIER contracting processes.

The CEC plans to identify contracting process targets and measures of effectiveness. With these in place, the CEC will be able to compare their performance to these measures on a regular basis and make improvements accordingly.

2.4. PLANNING AND POLICY

This CEC team is addressing the various PIER policy, planning, and program evaluation issues raised in the PIER panel's preliminary report.

Since the release of the panel's preliminary report, the CEC developed a framework, schedule, and report outline for future PIER policy, planning and program evaluation efforts. Their objective was to determine how an "Integrated PIER Plan," with related budgets, could be produced and documented primarily using staff resources. This approach calls for a plan which carefully reviews the expected California "context" issues, identifies those areas where "public interest" research could be of value, and then develops an "integrated methodology" for prioritizing funding allocations. The RD&D Committee approved the proposed integrated planning framework, and directed staff to develop a specific step-by-step methodology for implementing this approach.

2.5. PANEL OBSERVATION

The panel is generally pleased with the CEC response to the March 2000 report. The Commission's leadership and PIER staff should be commended for taking some major steps as initial efforts to transform PIER within the CEC. Now, it is critical for the Commission to maintain its commitment and momentum to implement the remaining changes necessary to complete the transformation. The CEC now has a new executive team in place. This team includes the RD&D Committee Commissioners, the CEC Executive Director, and the PIER Program Manager who are attempting to transform the PIER program within the CEC. This next year provides the opportunity for this new team to demonstrate whether or not PIER should remain within the Energy Commission.

3. PIER PROJECTS ASSESSMENT

3.1. OVERVIEW

As part of assessing the R&D value of the 95 PIER projects, the panel members met with CEC personnel, reviewed contracts, and reports, and interviewed a number of the PIER Performers. As of December 2000, approximately \$85 million had been awarded and approximately half the funds expended while another \$20 plus million in membership fees and small grants have been awarded.

3.2. PROJECT ASSESSMENT FRAMEWORK AND PROCESS

To assess the PIER projects, the panel formed five subpanels with four of the subpanels composed of two panel members and one subpanel composed of three panel members. The three-member subpanel was assigned responsibility for two PIER program areas and the other four two-member subpanels were each assigned one PIER program area for review. Table 2 shows panel member assignments for the six PIER program areas.

Table 2 Subpanel Assignments for Projects Review

1. Buildings (End-Use Energy Efficiency)	2. Industry/Agriculture/ Water (End-Use Energy Efficiency)	3. Environmentally Preferred Advanced Generation	4. Renewable Generation	5. Environmental Research	6. Strategic Research
J. Foster M. Walshok	H. Agnew E. Soriano	K. Fowler C. Weinberg	R. Balzhiser P. Miller	F. Kittler L. Cohen J. Sweeney	

The panel used the following seven questions to frame their project review process:

1. Does this project address a strategic opportunity? This is a “big picture” question that puts the R&D effort in the context of a larger state level need or vision.
2. What is to be accomplished through the project? Specifically, what is the effort called for by the statement of work that will be completed by the performer over the life of the contract?
3. How is what this project proposes to achieve now performed? How is the technical effort or task called for in the contract currently being accomplished? Or what is the current design that this contract seeks to improve?
4. How does one know when the project is finished? Is there an exit criterion? Are there criteria specified against which progress can be assessed? Has the end point been defined? Can the work be accomplished in the established timeframe?
5. What is the plan to transition the technology to industry? What is the project’s connectivity to the marketplace? What is the utilization potential for the project’s outcomes? What is the potential public benefit?
6. If successful, what difference will it make? Is it important? Will it make a difference to the state’s energy picture? Is this project part of a larger plan, where the results will be critical in achieving a future energy objective?
7. Why are state funds required? Why should the state fund this project as opposed to funding coming from other sources? Other funding sources could be federal, private, industry group, other public funds, or any combination of sources.

The panel reviewed project proposal information, statements of work (SOW), status reports (if available), and final reports (if available). Panel members also held discussions with program area leads, and selected project managers. Three of the five subpanels conducted interviews or site visits with a number of contract performers.

3.3. PROGRAM AREA ANALYSIS FROM THE SIX PROGRAM AREA SUBPANELS

3.3.1. Buildings (End-use Energy Efficiency)

Foster and Walshok were the two PIER panel members who agreed to assess the PIER buildings area projects. There are approximately 28 projects in the buildings area; the 10 contracts awarded during the initial transition phase are completed. Of the approximately \$27.6 million awarded for these contracts, \$8.8 million was expended as of December 2000. In addition to reviewing the projects' SOWs and reports (final or progress, if available), the two panel members contacted some of the performers (contractors) for the buildings area projects.

Foster contacted UC's California Institute for Energy Efficiency (CIEE) and Lawrence Berkeley National Laboratory (LBL) while Walshok contacted Southern California Edison (SCE). CIEE had been awarded six of the ten transition contracts and LBL had been awarded four PIER 2 contracts and one programmatic contract. LBL was also a subcontract performer under some of the CIEE transition contracts. CCST, the PIER program area lead, and the PIER contract manager participated in the discussions with UC and CIEE.

The goal of the visits to the performers was to understand the relationship between research in an area, the RFP, the contract, change control process, movement to the marketplace, and how the loop is closed.

In response to the question "What can be done to add flexibility to the R&D contracting effort," performers suggested the system must take a more innovative approach and be willing to accept additional risk. The CEC should insist on the best people and let them perform. The performers believed other state agencies, and specifically the University of California, had a more flexible approach to R&D contracting than the CEC.

A number of organizations within the state have excellent expertise in the general management of R&D and in conducting basic research. UC, LBL, LLNL, and EPRI are such examples. These institutions are positively engaged with the CEC. However, the CEC must identify more effective ways to partner with these institutions. For example, the CEC could provide the vision, strategic direction, allocation of funds, and governmental oversight while these centers of expertise propose and execute the research plan. Three buildings area programmatic contracts awarded in 2000 show many effective elements of this partnering concept.

Performers agreed that the initial contract process takes too long and there is a perception that the CEC workflow processes are not optimized. The CEC's own operating rules appear to be the limiting factor; the staff is not the limiting problem. Working relationships between performers and the CEC contract manager are good and that person usually buffers the performer from some of the CEC bureaucracy. Performers were concerned about the part that legal reviews play in delaying contract awards. It was generally believed that lawyers from the R&D performing companies also cause delays, and that CEC lawyers did not create all legal hurdles.

Other insights gained from the project review included the observation that the market transformation process appeared weak. There is an interagency Energy Efficiency Market Transformation Committee chaired by the California Public Utilities Commission (CPUC) to which the CEC belongs. While this is constructive, the state could be more directly involved in market transformation or actual planning in a more integrated way. The CPUC administers well over \$300 million per year for the combined programs in energy efficiency and conservation activities and renewable energy. If the CPUC and the CEC work together more closely, there will be more opportunities for leveraging these state funds. The programmatic contracts show a significant improvement over the transition contracts relative to market transformation but the long-term planning and downstream use of PIER and other available state funds in an integrated way can still be improved. Multiphase program funding could be linked to milestone achievement to build a sustainable funding path to go from R&D to market transformation.

The CEC has a responsibility to see that the ratepayers obtain value for their investment but to date there was little evidence of that from the completed transition contracts. However, the more recent PIER 2 and programmatic contracts which are only 10% to 50% complete offer the potential for return on investment. This was the case for the LBL programmatic contracts and the SCE PIER 2 contract. For example, the SCE R&D center in the refrigeration area appeared well connected to suppliers and users and the potential existed for knowledge transfer and eventual benefit to ratepayers.

Summary of Buildings Area Observations

- For the early transition contracts, there is little evidence of return on investment or a tight feedback between the ratepayers' needs and the research agenda.
- It is still too early to judge recently awarded PIER 2 and programmatic contracts; however, they are structured to offer a higher potential for ratepayer return on investment because of the connections between the R&D centers and the industrial suppliers.
- Mechanisms are needed to more effectively use grants. This will provide more flexibility and be more consistent with the management of early stage R&D.

3.3.2. Industry/Agriculture/Water (End-use Energy Efficiency)

Agnew and Soriano were the two panel members who reviewed the diverse projects in this program area. This program area included nine projects of which four were completed, one was canceled, and four are still active. Of the approximately \$8.4 million awarded for these contracts, \$3.4 million was expended as of December 2000. The subpanel was particularly interested in identifying for specific projects: (1) market connectivity; (2) market utilization potential; (3) potential for reducing energy consumption or demonstrated result for some public benefit; (4) adherence to the principle that they were projects that would not otherwise be funded by industry; and (5) success at meeting the terms of their scopes of work.

The subpanel was most impressed with the projects dealing with water conservation and the more efficient use of electrical energy in water irrigation practices. As indicated by their CEC project manager, these projects seemed to have been funded with an understanding of market need, potential utilization in the marketplace, and some estimate of energy savings if and when implemented by industry.

For the other projects reviewed, there did not seem to be this level of detail in market analysis. Some projects simply were canceled after substantial project funds were spent. Another could not meet the matching funds target it had initially proposed. In response to a direct question posed by a subpanel member, one project staffer agreed that at least one of the projects under his purview "is research that the industry is conducting anyway and probably did not need PIER funding for it to be conducted." Funding programs that would otherwise be funded by industry runs counter to the legislative intent that enabled PIER. Further, PIER legislation calls for some assurances that the projects to be funded should connect with the marketplace so that their implementation would achieve a public benefit. While the projects reviewed indicated this type of analysis had most likely been done during the initial proposal evaluation, there was no indication that it guided the projects' outcomes.

In the subpanel's view, each project's connectivity, utilization potential, potential for reducing emissions or power consumption, and potential public benefit, should be reviewed beyond the initial evaluation phase and actively planned for as part of the project's success criteria. It does not appear that this was the case. The subpanel would argue that such analysis, even post hoc, should be conducted for each funded project. Only with such analysis in hand can staff and the PIER panel truly assess the public benefit and efficacy of the project funded with PIER support.

Summary of Industry/Agriculture/Water Area Observations

- Not all projects had an understanding of market need, potential utilization in the marketplace, and estimates of energy savings if and when implemented by industry.
- At least one project should have been funded from a source other than PIER.

3.3.3. Environmentally Preferred Advanced Generation

Fowler and Weinberg were the two panel members who reviewed the projects in this program area. This area included 12 projects of which two were canceled by the CEC. Of the approximately \$10 million awarded for these contracts, \$6.9 million was expended as of December 2000. This subpanel's report was based on material in the PIER 1999 Annual Report, additional material provided by the CEC, individual telephone calls to Contractor Project Managers (see Appendix B for some of the comments from the contractors contacted from the Environmentally Preferred Advanced Generation Program Area) for seven of the 10 surviving projects, and a conference call with the PIER program lead for this area.

The subpanel members concluded that the research in this area was well justified under the PIER mandate. The 10 projects, most of which had a prior history under previous sponsorship, are focused on distributed electric generation. This is a high-leverage application of state funds to expedite commercialization of small power plants with reduced emissions, supportive of the California clean air initiative. In addition, the use of distributed resources has the potential to improve the reliability of the electric supply and provide competitive options. The subpanel found specific examples of the leveraging value of PIER funds in moving technologies to market.

The main concerns expressed by performers confirmed the panel's suspicions that some PIER contract managers are and are perceived to be unnecessarily bureaucratic. The main technical input comes in setting up the work statement. After that, projects are often managed with an unchanging checklist approach against the work statement with little room for the flexibility essential to accommodate unexpected events common to research. This points to the continuing need for professional development, training and oversight of PIER contract managers, most of whom were drawn from within the CEC and did not have previous research management experience.

In a broad sense these projects were strategic in nature and involved the public interest.

Summary of Environmentally Preferred Advanced Generation Area Observations

- Good use of leveraging PIER funds in moving technologies to market.
- Current contract management procedures are inflexible and not adaptable enough for an R&D environment.
- Need continuing staff professional and technical development.

3.3.4. Renewable Generation

Balzhiser and Miller were the two panel members who reviewed the projects in this program area. This area included 16 projects of which three were completed and two were canceled by the CEC. Of the approximately \$11.4 million awarded for these contracts, \$7.1 million was expended as of December 2000.

California's interest in renewable energy far exceeds that of any other state. Both the size and diversity of the state contribute to the energy potential available. Geologically and geographically the state offers abundant solar, wind, hydro, biomass, and geothermal resources. Their contributions to commercial energy supply, however, remain modest with the exception of numerous hydro projects scattered across the state. Cost, environmental concerns, and unpredictable availability have all contributed to renewables' limited contributions to date.

However, the nation's accelerating consumption of oil and gas coupled with California's discouragement of coal and nuclear energy use requires renewables to play a significant role in the state's energy portfolio. Clearly state policy requires that PIER give significant attention to the renewable resources, as they are attempting to do. Thirteen percent of the completed and ongoing PIER funding focuses on renewable resource utilization. Of the 11 active projects: five were solar related (four involved photovoltaics (PV)); three biomass; and one each for wind, geothermal, and hydro. None of these contracts were with universities, while GRI, NREL, and Los Alamos were each a partner in one project.

Storage, an essential component of solar and wind based generation, is largely absent from the PIER program as it is in the DOE. Pumped hydro and Compressed Air Energy Storage (CAES) facilities have been demonstrated by the DOE. Battery and superconducting energy storage devices are getting minimal attention in industry and government programs, the latter primarily for assuring system reliability (frequency control). Rural and developing countries without electric or gas service require electrical storage to provide reliable 24-hour service from PV and wind resources. These are two potentially large contributors of an energy source to meet future rural electricity needs. Biomass fuels could also contribute to remote backup power requirements using fuel cells or small turbines if costs can be significantly reduced at these smaller scales.

The spectrum of technologies in producing electricity from renewables is much greater than from other traditional resources, as is the scale of production, which is typically much smaller. Distributed generation includes these renewable options along with small turbines and fuel cells that can operate on biomass fuels as well as gas or oil-based fuels. Distributed generation can complement or replace conventional grids in providing electrical services. However, grid compatibility will be an important factor in expanding renewable resources for grid use, large or small.

The PIER panel dealt with CEC staffing practices in earlier parts of this report. The panel acknowledged CEC staffs' academic capabilities and the challenges of serving both regulatory and research objectives within the Commission. In the renewables area, the subpanel found an even broader array of disciplinary requirements extending from PV to geothermal or biomass. The electrical system requirements for the integration of these distributed resources into a grid, large or small, involves the disciplinary capabilities and most importantly, the industrial or utility experience necessary to bring a system-based perspective to an applications-based R&D program.

Other energy R&D organizations such as EPRI faced these same challenges in their formative years. In EPRI's case, close relationships with industry, suppliers, users, and public interest constituencies were achieved by numerous advisory committees who assisted the staff in assuring that a robust experience base was brought to bear on decision making. The CEC/PIER staff will benefit greatly by working with EPRI's renewable project managers, where an experienced staff is contending with declining funding of a long range R&D portfolio. Indeed the combined efforts of PIER and EPRI could provide the critical mass needed to gain market penetration for many renewable technologies.

Summary of Renewable Generation Area Observations

- The nature of renewables generation requires increased R&D focus on reducing generation costs and confronting system integration challenges.
- Market penetration of successful research requires additional planning involving technology suppliers and users.
- An expanded advisory group of knowledgeable people representing a range of stakeholders from utility, industry, regulatory, academic, and public interest groups would aid in establishing renewables research targets and priorities.

3.3.5. Environmental Research and Strategic Research

Cohen, Kittler and Sweeney were the three panel members who jointly studied these two program areas. They used material in the 1999 PIER Annual Report, additional printed material supplied by the CEC, meetings with various CEC staff, and telephone and face-to-face interviews with a number of PIER program performers. CEC staff members included the team leads for each of the two areas, and contract managers for the PIER program.

Energy Related Environmental Research. There are 12 contracted projects and the subpanel reviewed four of them with the PIER program area lead and three project managers. Panel members also interviewed the contractor, EPRI, for three of the projects. Of the approximately \$8.7 million awarded for these contracts, \$5.8 million was expended as of December 2000.

Strategic Energy Research. There are 18 contracted projects in this area and eight are completed. The subpanel reviewed six of them with CEC staff including the PIER program area lead and six project managers. Panel members contacted four of the contractors to gain their perspective. Of the approximately \$19.1 million awarded for these contracts, \$9.2 million was expended as of December 2000.

While the projects selected were deemed to be representative of both contract types and research areas pursued by the PIER program, the review was not comprehensive. Nevertheless, there was a qualitative consistency to the information gathered that leads this subpanel to conclude that their perceptions of the program were reasonably accurate.

Project managers were asked to evaluate their projects by answering the seven critical questions listed in section 3.2. In most cases, these questions were answered positively, and gave credibility to the management process. Some of the projects were transition projects for which the initial intention was to continue research conducted by utilities, not to meet the essential criteria of a state-funded public interest program.

The subpanel found these areas to be fertile areas in which to conduct public interest research, and well within the scope of the mandate of the PIER program. More than one performer reported that the funding took advantage of existing R&D by leveraging existing funding, stretching it to focus on a longer time horizon, or on external market conditions that offered potential for broad community interest.

In general, the contractors praised CEC project managers, regarding them as hard-working and technically knowledgeable. The contractors felt comfortable with them as scientists. Contractors also had generally positive things to say about the PIER program overall.

There were exceptions. Many contractors took issue with the CEC contracting procedures. Some complained that project managers were not available to administer the program for lengths of time when other CEC duties, such as siting, called them away. Others stated that they did not understand the PIER research agenda, that it lacks coherence.

These exceptions have diminished the value of the PIER program and reduced the ability of the program to attract the best managers and contractors. However, some of these issues could be attributed to the initial inexperience of CEC management in conducting R&D programs, as things seem to have improved since the program's inception.

Summary of Environmental Research and Strategic Research Areas Observations

- The CEC contracting procedures are a disincentive to attracting the best R&D performers.
- The projects in this area seemed to be fertile areas in which to conduct public interest research, and within the scope of the mandate of the PIER program.

3.4. SUMMARY OF OBSERVATIONS FOR THE SIX PROGRAM AREAS

Buildings Area

- For the early transition contracts, there is little evidence of return on investment or a tight feedback between the ratepayers' needs and the research agenda.
- It is still too early to judge recently awarded PIER 2 and programmatic contracts; however, they are structured to offer a higher potential for ratepayer return on investment because of the connections between the R&D centers and the industrial suppliers.
- Mechanisms are needed to more effectively use grants. This will provide more flexibility and be more consistent with the management of early stage R&D.

Industry/Agriculture/Water Area

- Not all projects had an understanding of market need, potential utilization in the marketplace, and estimates of energy savings if and when implemented by industry.
- At least one project should have been funded from another source.

Environmentally Preferred Advanced Generation Area

- Good use of leveraging PIER funds in moving technologies to market.
- Current contract management procedures are inflexible and not adaptable enough for an R&D environment.
- Need continuing staff professional and technical development.

Renewable Generation Area

- The nature of renewables generation requires increased R&D focus on reducing generation costs and confronting system integration challenges.
- Market penetration of successful research requires additional planning involving technology suppliers and users.
- An expanded advisory group of knowledgeable people representing a range of stakeholders from utility, industry, regulatory, academic, and public interest groups would aid in establishing renewables research targets and priorities.

Environmental Research and Strategic Research Areas

- The CEC contracting procedures are a disincentive to attracting the best R&D performers.
- The projects in this area seemed to be fertile areas in which to conduct public interest research, and within the scope of the mandate of the PIER program.

3.5. CONCLUSIONS

The panel found that the PIER management and contracting processes still need to be significantly streamlined. The contracting process was a consistent element of concern from the PIER performers, which the panel highlighted in its first report. R&D contracting is fundamentally different and unlike the procurement contracting typical of other state agencies. The CEC proposes that the PIER program have authority to use contracting provisions similar to those provided by law to UC for the conduct of their directed R&D mission. The panel strongly endorses initiatives that align the contracting process as a means to achieve the vision, objectives, and strategy of the PIER program.

There is a need for CEC PIER personnel to possess and maintain a high degree of expertise in R&D management and technical or scientific competencies. There is also the need for CEC participation in technical conferences as well as direct interaction and collaboration with representatives of other R&D institutions, both on a state and a national level. The panel strongly endorses programs that will attract and retain people with the skills necessary to manage PIER. Professional development and training in areas critical to PIER success should be an integral part of PIER.

There was a mixed consensus on the value of these projects since, other than the transition projects awarded in early 1998, a majority of the projects were only 10% to 50% complete. In a broad sense these projects were strategic in nature and involved the public interest but their public value is yet to be determined. A number of the projects had the potential to reduce energy demand, improve system reliability, or address environmental issues that would not otherwise be funded. However, the potential and probability of future market utilization was not always readily apparent nor were there clear links to other state-funded market transformation programs.

4. FUTURE EXPECTATIONS FOR PIER WITHIN CEC

In this section the panel offers a set of expectations of what the Governor, the Legislature, the CEC, and the PIER program must accomplish over the next year to transform PIER into a high-quality research program within the CEC. If these expectations are not achieved then the Legislature should consider the option of developing a PIER organization outside the California Energy Commission. The panel's expectations are grouped into: those that the CEC must accomplish internally; those that the CEC must accomplish externally in conjunction with the Governor's office and the Legislature; and those that deal with the CEC developing a broader set of energy relationships. The grouped expectations are listed below.

4.1. INTERNAL WITHIN THE CEC

The first six expectations are those that the CEC must accomplish internally.

4.1.1. PIER organizational responsibility will have grown through the formation of a dedicated division with program managers and functional heads solely responsible for PIER.

There will have been an increase in PIER organizational responsibility within the CEC. The Commission, having authorized a dedicated PIER organization, will have sustained the PIER organization with a dedicated core staff and the required support staff whose primary roles and responsibilities are to achieve PIER program goals and objectives.

4.1.2. The PIER Program Manager will have been given authority to manage the PIER budget and selected authority to administer those funds.

The PIER Program Manager will have been given the authority to balance dollars and people resources in a timely way. The PIER Program Manager will have provided the RD&D Committee with an annual plan that includes research targets, budget, and measurable objectives. Approval of this plan should provide the PIER Program Manager with the authority for implementation and further actions should not be required by the Commission or the committee. A management information system must be in place to provide the RD&D Committee timely insight into the status and achievement of the agreed to measurable program objectives.

4.1.3. The quality and experience base of PIER research managers will have continued to develop.

The CEC will have developed methods to attract the best mix of people and the highest quality staff. The quality of people working on PIER within the CEC will have continued to increase through continued professional development and innovative methods to bring resources in from other state, federal, and private institutions. The CEC should use a range of methods to provide for a stable cadre of R&D experienced managers. One example is the novel approach using an "interjurisdictional exchange" to hire an experienced R&D PIER Program Manager from outside the CEC.

4.1.4. California energy research targets will have been set and contracts or grants awarded to achieve those targets.

Through the use of a strategic planning process, California energy research targets will have been set and contracts or grants will have been awarded to achieve those targets.

A PIER vision statement will have been presented that represents senior management's strategic intent for PIER – a description of what the CEC wants to attain for Californians over a period of 10 to 20 years, and the core technologies and developments needed to realize the vision. Through the process of developing California's energy vision, the CEC will have provided the leadership essential to frame PIER's short- and long-term priorities so that the program can help meet California's unique energy needs.

A combination of strategies to pursue California's energy vision needs to be selected by the CEC. Once the strategies are selected, policies, procedures, programs, and budgets must be established which implement the strategy. This strategic thinking, planning, and implementation must be a continuous process that is dynamic and responsive to external changes. In addition to a clear roadmap and metrics, there must be a management information system that provides insight into the progress of achieving PIER objectives.

4.1.5. The PIER Program Manager will have developed a management roadmap.

The PIER Program Manager will have developed a management roadmap with timelines and milestones. This includes the development of an explicit list detailing what is necessary to achieve success in the program.

4.1.6. The PIER program will have, on average, awarded contracts in four or less months.

The PIER program will have achieved its goal of awarding contracts in four or less months on average. The panel recognizes that this could be a demanding goal dependent on the types of contracts negotiated.

4.2. EXTERNAL TO THE CEC

The following three expectations are those that the CEC must accomplish externally in conjunction with the Governor's office and the Legislature.

4.2.1. The Governor and the Legislature will have been provided with the CEC forecasts of energy trends, needs, and resources developed as part of PIER's strategic planning process.

The CEC will have provided the Governor and the Legislature with forecasts of California's energy trends, needs, and resources and the Governor and the Legislature will have begun to use those forecasts to formulate state policy. The PIER program will have played a strategic role in projecting California's energy trends and developing solutions to California's future energy needs.

The CEC generated biennial energy reports through 1996 but discontinued the practice after the energy industry restructuring legislation of 1996 and 1997. After the panel's March 2000 report, the CEC reinitiated the practice of generating a forecast to provide the California context for their Five-Year PIER Investment Plan required to be submitted to the Legislature by March 1, 2001.

4.2.2. The CEC will have requested and received legislative relief from specific constraints on PIER innovation related to contracting, streamlining, and staffing.

The CEC will have requested legislative relief from the Legislature on contracting procedures and personnel rules that are constraints to PIER program management and the innovation process. The Legislature will have provided relief for those contracting, streamlining, and personnel issues.

4.2.3. PIER will have become an integrated part of California's funded energy efficiency and renewable energy programs.

PIER will have become more tightly integrated with the other California funded programs to provide leverage for the R&D dollars to move the successful projects into the market place. In addition to the public interest energy research program, those funded programs include energy efficiency and conservation activities and renewable energy programs.

PIER R&D dollars are seed funding for ideas that have potential for ratepayer return on investment or are in the public interest. Additional funding sources, both private and public, are required to move products beyond the R&D stage to the marketplace or to change consumer behavior, as with many conservation efforts. State R&D dollars provide the technology push for good ideas that would not otherwise be funded in the public sector while state energy efficiency, conservation, and renewable energy incentive dollars assist in the marketplace pull. Collectively, these state funds can provide an integrated life cycle funding base.

4.3. BROADER ENERGY RELATIONSHIPS

The last four expectations are those that deal with the CEC developing a broader set of energy relationships.

4.3.1. The CEC will have developed a mechanism for informing the California Congressional Delegation of federal funding needs.

The CEC will have worked with the California Congressional Delegation to reinforce with the DOE California's energy needs. The California Delegation will have sought to obtain funding for California's needs. This process will have been institutionalized to enable the Delegation to impact the annual federal budget process and affect the allocation of federal dollars in meeting the nation's and California's energy needs and challenges.

4.3.2. The CEC will have begun to affect the portfolio of DOE programs and their funding to meet California's energy needs.

The relationship between the CEC and the DOE will have developed into a collaborative partnership on energy issues.

4.3.3. Partnerships and collaborations will have been pursued with other research centers.

Partnerships and collaborations will have been pursued and some developed with other research centers of expertise to take advantage of R&D performed by others and to stretch the PIER R&D dollars. These centers of expertise are not limited to those within California. Examples include the state's university and college systems, EPRI, and those sponsored by other states or the federal government.

California ratepayers will be better off with a variety of mechanisms to tap into the R&D program and management of organizations such as EPRI who can share R&D products and insights that their staff have accumulated over the years of working with the industry. For example, EPRI could be helpful in addressing some of California's issues based on research results and their current understanding.

4.3.4. PIER program advisory groups will consist of knowledgeable people from a range of stakeholders including utility, industry, regulatory, academic, and public interest.

The CEC will have expanded stakeholder involvement and feedback beyond the current framework and constituency of the Policy Advisory Council. It is critical that the PIER program receives advice from knowledgeable and experienced people representing a broad range of stakeholders including utility, industry, regulatory, academic, and public interest groups. These constituencies can assist through a variety of forums in identifying and prioritizing issues and opportunities within the PIER strategic planning process. These forums should be fluid and dynamic and not rigid and fixed advisory mechanisms.

4.4. RECOMMENDATIONS

This panel recommends accelerating the next legislatively mandated independent review possibly to as early as 2002. The panel also recommends that an organization such as CCST be requested by the Governor and the Legislature to assist the next panel. The first order of business for the new independent panel should be a follow-up review to determine if the expectations outlined in this report have been achieved or whether the Legislature should consider other options for PIER. The expectations outlined in this report can be used as the framework to determine whether the changes necessary for transformation of PIER within the CEC have been implemented. Then the panel should assess the public value of completed PIER projects awarded during 1999 and 2000.

5. SUMMARY AND RECOMMENDATIONS

The panel is generally pleased with the CEC response to the March 2000 report. Under the initiative and guidance of Commissioner Robert Laurie, the Commission accepted the challenge of transforming PIER within the CEC and they should be commended for taking some major steps in this transformation process. Now, it is critical for the Commission to maintain its commitment and momentum to implement the remaining changes necessary to complete the transformation. The CEC now has a new executive team in place. This team includes the RD&D Committee Commissioners, the CEC Executive Director, and the PIER Program Manager. This next year provides the opportunity for this new team to demonstrate whether or not PIER should remain within the Energy Commission.

The panel found that there are still major issues that must be dealt with by the state Legislature, the CEC, and the PIER team. The CEC must deal with identifying California's energy needs, leveraging the DOE programs to those needs, transforming the management of the PIER program, and obtaining value from the RD&D performed.

At the strategic level, California's energy trends, needs, and resources must be understood. The CEC then needs to define California's energy vision and, working with the DOE, provide the leadership essential to framing short- and long-term priorities to use PIER for selected California unique needs. A combination of strategies to pursue California's energy vision needs to be selected. With the strategy selected, policies, procedures, programs, and budgets must be established which implement the strategy. This is a continuous process that must be dynamic and responsive to external changes.

The panel found that PIER management and staffing are critical issues. The CEC needs more R&D experienced managers and the ability to attract and retain these managers through a variety of mechanisms. The contracting processes still need to be significantly streamlined, and there also needs to be provisions for unexpected and mid-course corrections. The whole process would be better served by having more R&D experienced managers at the CEC, by instituting a range of flexible contract alternatives, and by streamlining the pre- and post-award contracting processes. While there is uniform support for the potential value of this kind of work, the way in which the process has been managed and implemented at the CEC must still be improved.

The panel offers a set of expectations of what the Governor, the Legislature, and the CEC must accomplish over the next year to transform PIER into a high-quality research program within the CEC. If these expectations are not achieved, then the Legislature should consider the option of developing a PIER organization outside the California Energy Commission. The panel's expectations are grouped into: those that the CEC must accomplish internally; those that the CEC must accomplish externally in conjunction with the Governor's office and the Legislature; and those that deal with the CEC developing a broader set of energy relationships.

This panel recommends accelerating the next legislatively mandated independent review possibly to as early as 2002. The panel also recommends that an organization such as CCST be requested by the Governor and the Legislature to assist the next panel. The first order of business for the new independent panel should be a follow-up review to determine if the expectations outlined in this report have been achieved or whether the Legislature should consider other options for PIER. The expectations outlined in this report can be used as the framework to determine whether the changes necessary for transformation of PIER within the CEC have been implemented. Then the panel should assess the public value of completed PIER projects awarded during 1999 and 2000.

California has a unique opportunity this year to build an exceptional research and management team for public interest energy research but it will require significant changes through the collaboration of the Governor, the Legislature, and the CEC. Achieving the fundamental expectations described in this final report also provides the framework for cooperative efforts that can be applied to the management and organizational concepts of other state organizations.

APPENDIX A: BIOGRAPHIES

INDEPENDENT PIER REVIEW PANEL MEMBERS

SHORT BIOGRAPHIES

Dr. Harold M. Agnew is the retired President, General Atomics and Past Director of Los Alamos Scientific Laboratory. He was Science Advisor to the Supreme Allied Commander in Europe 1961-64 and a New Mexico State Senator from 1955-61. Dr. Agnew's honors and awards include: recipient of the Ernest Orlando Lawrence award, 1966; and the Enrico Fermi award, 1978. He is an elected member of the National Academy of Science and the National Academy of Engineering, and a Fellow of the American Association for the Advancement of Sciences.

Dr. Richard E. Balzhiser retired as President and Chief Executive Officer of the Electric Power Research Institute (EPRI) in Palo Alto, California in August 1996. He remains active in a President Emeritus role at EPRI in addition to serving on several industry boards and technical advisory committees. Dr. Balzhiser currently serves on a variety of boards and committees including the Energy Subcommittee of the President's Council of Advisors on Science and Technology, the Mobil Technical Advisory Committee, the Pacific Northwest Laboratory Advisory Committee, the Technical Advisory Board of the Massachusetts Institute of Technology Energy Laboratory, the Board of Directors for the Aerospace Corporation, the Board of Directors for Reliant Energy, and the Board of Directors of Nexant, LLC.

Dr. Patricia A. Buffler is Dean Emerita and Professor of Epidemiology and Public Health at the School of Public Health, University of California, Berkeley. Dr. Buffler's research interests include epidemiology of cancer, specifically childhood leukemia and effects of environmental exposures and genetic susceptibility. She serves on the Board of Directors, U.S.-Japan Radiation Effects Research Foundation, Hiroshima, Japan; the World Health Organization, Expert Advisory Panel on Occupational Health; the Board of Scientific Counselors for the National Center for Infectious Diseases; the U. S. Public Health Service Centers for Disease Control and Prevention, Task Force on Community Preventive Services; and the National Institutes of Health, National Advisory Council on Environmental Health Sciences. She is a Fellow for the American Association for the Advancement of Science and the American College of Epidemiology and a member of the Institute of Medicine/National Academy of Sciences.

Dr. Linda R. Cohen is Professor of Economics at the University of California, Irvine. Her fields of study are political economy, government regulation, government policy for science and technology, and positive political theory and law. Dr. Cohen has advised numerous federal departments and agencies on science policies, including the Departments of Energy and Commerce, the Office of Technology Assessment and the Congressional Research Service and has served on several committees for the National Research Council. She has testified before state agencies and commissions, including the California Energy Commission and the California Constitutional Reform Commission.

Dr. John S. Foster, Jr. is a retired Vice President of Science and Technology at TRW Inc., and a member and former chairman of the Defense Science Board. Dr. Foster is currently Chairman of the Board of Directors of Pilkington Aerospace, Chairman of Technology Strategies and Alliances, and a consultant to TRW, Sikorsky, Jaymark, Arete Associates and Defense Group Inc. His field of specialization is Industrial Manufacturing and Operating Systems Engineering and he is recognized

for his work in the design and development of nuclear weapons and in the technological leadership in defense research and engineering. Dr. Foster was the director of the Lawrence Livermore National Laboratory from 1961 to 1965. Dr. Foster left the Laboratory to become the DOD's Director of Defense Research and Engineering (1965 - 1973).

Dr. T. Kenneth Fowler is Professor Emeritus in the Department of Nuclear Engineering, University of California, Berkeley. Dr. Fowler was chair of the Department from 1988 to 1994 and helped establish the multi-disciplinary Center for Nuclear and Toxic Waste Management at UC Berkeley. His honors and awards include elected membership in the National Academy of Sciences; Fusion Power Associates Distinguished Career Award, 1995; and The Berkeley Citation, 1995. Dr. Fowler's areas of interest include fusion energy and energy research funding and the appropriate role of government in anticipating problems of energy-associated pollution and energy-associated competition for resources in its research funding policies.

Fred W. Kittler is co-founder and co-president of Velocity Capital Management, an investment firm based in Palo Alto that provides equity funding for public and private technology and communications companies. Mr. Kittler was a research analyst and portfolio manager for J. Morgan Investment Management where he managed their portfolios of small technology and health science company stocks. He serves on the Visiting Committee on Advanced Technology for the National Institute for Standards and Technology.

Peter M. Miller is a scientist with the Natural Resources Defense Council, Inc., a nonprofit national environmental organization. He is part of NRDC's energy project, which promotes the increased development of energy efficiency and other environmentally sound and cost-effective energy resources. His work involves research, analysis, and advocacy at the state, national, and international levels. He has participated in utility advisory committees in California, Hawaii, and the Pacific Northwest, in numerous proceedings before the California Energy Commission, the California Public Utilities Commission and the Northwest Power Planning Council, and in rulemakings before the U.S. Department of Energy. He was appointed to the California Board for Energy Efficiency in April 1997.

Dr. Esteban Soriano established his own market research and program assessment company (The Resource Group), specializing in educational and economic assessments. He currently serves as Vice President for University Advancement at California State Polytechnic University, Pomona. He is an expert in communication strategies, economic impact studies and assessments, methodology and research design, and has extensive experience relating to electric and water utilities.

Dr. James L. Sweeney is Professor of Management Science and Engineering, Stanford University and a Senior Fellow of the Stanford Institute for Economic Policy Research. At Stanford, he has been chair of the Engineering-Economic Systems Dept. (1991 - 1996) and of the Department of Engineering-Economic Systems and Operations Research (1996 - 1999), Director of the Energy Modeling Forum, Chair of the Institute for Energy Studies, and Director of the Center for Economic Policy Research. He directed the Federal Energy Administration Office of Energy Systems Modeling and Forecasting (1975 - 1976). He is a Senior Fellow with the U.S. Association for Energy Economics. Dr. Sweeney has focused his research on application of economics methods and mathematical modeling, particularly to natural resource issues, energy economics, environmental economics, competitive analysis, and policy analysis.

Dr. Mary L. Walshok is Associate Vice Chancellor - Extended Studies and Public Programs and Adjunct Professor in the Department of Sociology at the University of California, San Diego. She is the recipient of many awards and honors, among them a Kellogg Foundation national fellowship. Dr. Walshok serves on the board of the California Council for the Humanities and is a member of

numerous community boards and professional associations including the San Diego Community Foundation, Girard Foundation, Eureka Communities, Foundation for Enterprise Development and ACCION.

Carl J. Weinberg is currently a private consultant after retiring from Pacific Gas and Electric Company where he worked for almost 20 years including eight years as Manager of Research and Development. Mr. Weinberg has been a contributor to the development and implementation of corporate, industry, and national energy policies and strategies through research program management. He has extensive understanding of energy technologies, including commercial and potential renewable and conservation technologies, and has demonstrated effectiveness at accelerating technology readiness and proving technology benefits.

MATRIX OF PANEL MEMBER'S COMPETENCIES

Panel members were chosen based on an assessment of the required capabilities of the panel. Table A.1 shows the match between needed capabilities and panel member competencies.

Table A.1 Matrix of Panel Member Competencies

	Academic	Industry	Public Interest
Technology – issues in R&D for energy and other technologies	<i>Cohen</i>	<i>Balzhiser Foster</i>	
Economics/Markets – market impacts of technologies, economics of energy	<i>Sweeney</i>	<i>Kittler</i>	
General energy and energy alternatives	<i>Fowler</i>	<i>Agnew</i>	<i>Weinberg</i>
Public Health and Environmental Impacts	<i>Buffler</i>		<i>Miller</i>
Non-energy	<i>Walshok Soriano</i>		

CCST PIER COMMITTEE REVIEW MEMBERS

SHORT BIOGRAPHIES

Octavia Diener is President and Owner of Densmore Engines in Fresno and Sacramento and is President and Owner of Tavie Farms, Inc. Ms. Diener was appointed to former Governor Wilson's State Transportation Commission, and is a member of the Fresno Business Council. She is an immediate Past President of the Fresno Economic Development Corporation, and a board member of the Futures Institute at CSU, Fresno. Ms. Diener was appointed by U.S. Agriculture Secretary Lying to the National Advisory Committee on Futures and Options, and has been active in the Central California Epilepsy Foundation, the Muscular Dystrophy Association, and the Foundation Board for Agriculture at CSU, Fresno.

Dr. Roger G. Noll is the Morris M. Doyle Professor of Public Policy, Department of Economics, Stanford University. Dr. Noll's primary area of teaching and research is public policies towards business. He is the author or co-author of 11 books and over 250 articles in areas such as telecommunications policy, federally supported research and development, environmental policy,

and the management of universities. Before coming to Stanford, Dr. Noll was Institute Professor of Social Science at Caltech, Senior Fellow at the Brookings Institution, and Senior Economist at the President's Council of Economic Advisors. Dr. Noll has served on many government boards and commissions, including the Secretary of Energy Advisory Board, the Advisory Board of the National Science Foundation, the Advisory Board of the National Aeronautics and Space Administration, the Commission on Behavioral and Social Sciences and Education of the National Research Council, and the President's Council for a National Agenda for the 1980s. Dr. Noll was the founding President and Chairman of the Board of the Telecommunications Policy Research Foundation.

Dr. Maxine L. Savitz is the General Manager, Technology Partnerships, Honeywell. Dr. Savitz has over 30 years experience managing research, development and implementation programs for the public and private sectors. Dr. Savitz joined Honeywell, previously AlliedSignal, in 1985. From 1987 until June 1999 she was the General Manager of AlliedSignal Ceramics Components, which is the only U.S. owned silicon nitride structural ceramic manufacturer for gas turbine application. In this capacity, she oversaw the development and manufacturing of innovative materials for the aerospace, transportation, and industrial sectors. She is currently General Manager for Technology/Partnerships. Prior to joining Honeywell, Dr. Savitz was employed at the U.S. Department of Energy and its predecessor agencies. From 1979 to 1983, she served in the capacity of Deputy Assistant Secretary for Conservation at DOE. She is a member of the Secretary of Energy's Advisory Board and the National Science Board. She is a member of the National Academy of Engineering and formerly served on the NMAB. She received her bachelor's degree from Bryn Mawr College and doctorate in Chemistry from the Massachusetts Institute of Technology, and held a postdoctoral fellowship at University of California, Berkeley.

Dr. Edward C. Stone has served as the Director of the Jet Propulsion Laboratory since January 1991. Dr. Stone is Vice President and David Morrisroe Professor of Physics at the California Institute of Technology. He has been a principal investigator on several NASA spacecraft missions, and served as the project scientist for the Voyager Mission. He coordinated the efforts of 11 teams of scientists in their studies of Jupiter, Saturn, Uranus and Neptune. Dr. Stone received the National Medal of Science and the American Philosophical Society Magellanic Award. He was a Sloan Foundation fellow and has received the NASA Exceptional Scientific Achievement Medal, the NASA Distinguished Service Medal, the American Aeronautics and Astronautics Dryden Medal and Space Science Award, the NASA Distinguished Public Service Medal and the NASA Outstanding Leadership Medal. Dr. Stone is a member of the National Academy of Sciences, the W.M. Keck Foundation's Board of Directors, the American Philosophical Society, and the International Academy of Astronautics. He is a Fellow of the American Physical Society, the American Geophysical Union, the American Institute of Aeronautics and Astronautics, and the American Astronautical Society. He is also a member of the American Astronomical Society and the International Astronomical Union, and an honorary member of the Astronomical Society of the Pacific.

Dr. Bruce Tarter is the eighth director of the Lawrence Livermore National Laboratory. His career began in 1967 as a member of the Theoretical Physics Division. He has served in various technical leadership assignments at the Laboratory in weapons physics, geosciences research, and space programs including strategic defense projects. Dr. Tarter has served on numerous research and institutional management committees within and outside the Laboratory. He has been a lecturer and graduate student advisor at the Department of Applied Sciences of the University of California, Davis/Livermore, and is an Adjunct Professor, Department of Applied Science, University of California, Davis. Memberships include the American Physical Society, the American Astronomical Society, the International Astronomical Union, and the American Association for the Advancement of Science. He received the Roosevelt Gold Medal Award for Science and is a Fellow of the American Physical Society.

APPENDIX B: PERFORMER FEEDBACK

Anecdotal Comments from Performer Project Managers – Environmentally Preferred Advanced Generation Program Area

“PIER ... better than our prior state experience, with California Air Resource Board, or California EPA, but even so authority is lacking to make trivial changes – drives up our overhead.”

“CEC Contract Manager was nitpicker. Would not allow any variance in costs per subtask even though he had the authority to do up to 15%. Still calling with questions that run up overhead costs even after project completed and reported.”

“CEC has some good people, but it is fraught with bureaucracy – orders of magnitude worse than DOE, DOD, NSF, GRI, EPRI.”

There is a surprising comment in the latest report from Project # 500-98-041, as follows:

“Technical Progress. Solar is awaiting CEC approval to engage Van Buren Kimper Engineering ... for drafting support ... At this point, the design work cannot proceed until a response from CEC is received.” Why would CEC have to approve a subcontract? Is this standard? This may have been a requirement for a Veteran organization involvement.”

“The original Contract manager we worked with was very good. He understood the technology and the need for flexibility and we got through the contracting reasonably quickly.”

“If I were a small independent contractor I would not have been able to do business with them. Couldn’t have spent days resolving minutia.”

“One year into the process General Services “ **** canned” the proposal due to lack of veteran preference information. It was in the attached material, which they didn’t bother to read.”

“Contract manager would not make progress payments when milestones were reached. Thought he should only pay when contract was completed”

APPENDIX C: ABBREVIATIONS AND ACRONYMS

Symbol	Definition
CAES	Compressed Air Energy Storage
CCST	California Council on Science and Technology
CEC	California Energy Commission
CIEE	California Institute for Energy Efficiency
CPUC	California Public Utilities Commission
CSU	California State University
DOD	Department of Defense
DOE	Department of Energy
EPA	Environmental Protection Agency
EPRI	Electric Power Research Institute
GRI	Gas Research Institute
GTI	Gas Technology Institute (formerly GRI)
LBL	Lawrence Berkeley Laboratory
LLNL	Lawrence Livermore National Laboratory
NMAB	National Materials Advisory Board
NRDC	National Resources Defense Council
NREL	National Renewable Energy Laboratory
NSF	National Science Foundation
NYSERDA	New York State Energy Research and Development Authority
PIER	Public Interest Energy Research
PV	Photovoltaic
R&D	Research & Development
RD&D	Research, Development, & Demonstration
RFP	Request For Proposal
SCE	Southern California Edison
SOW	Statement of Work
UC	University of California

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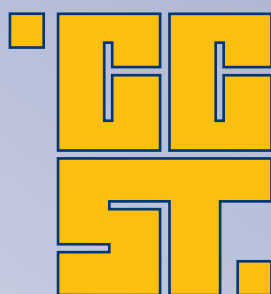
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