Come See SENIOR ADVISORY COMMITTEE ON ENERGY SENIOR ADVISORY COMMITTEE ON ENVIRONMENTAL SCIENCES ‘CEER RESPONSE TO COMMITTEE RECOMMENDATIONS (January 1979 combined meeting, Mayaguez)

TABLE OF CONTENTS

CENTER FOR ENERGY AND ENVIRONMENT RESEARCH, University of Puerto Rico
Responses to Recommendations made by the Energy and the Environmental Sciences Senior Advisory Committee at their January 1979 Meeting

It is the purpose of this document to review the status of the recommendations made at the last meeting (January 29/30/31, 1979) of the CEER; UPR Senior Energy and Environmental Sciences Advisory Committees. In many cases, the action taken with respect to specific recommendations is clearly stated. In other cases, references are made to specific CEER documents which describe action taken or provide additional information. This document supplements CEER’s revised two-year plan (1980-81), CEER’s Five Year Plan (1982-1986), and recent annual reports.

We would like to remind the Committees that although in some instances we concurred with their recommendations, budget constraints prevented implementation. In the case of institutional and developmental funds, CEER has reasonable flexibility in utilizing them in accordance with specific administrative grant procedures described in its 1979 "Request for Proposals" document. However, in the case of OHER-DOE funds (Marine Ecology, Terrestrial Ecology and Human Ecology), programs require specific OHER-DOE approval.

Break - ENERGY COMMITTEE RECOMMENDATION 1. BASIC RESEARCH

A number of other suggestions were made by the committee last year about which we received very little, if any, feedback at this year's meeting. For example, in the area of basic research, it was urged that:

1) "Seed funds be made available for research on ferroelectric materials."

2) In the biomass research, "a careful and credible land use analysis be carried out."

3) An effort be made to integrate more effectively the activities of CEER with related or complementary expertise resident in other departments of UPR.

CEER RESPONSE

1) Seed funds: A proposal on this subject was received from Rio Piedras in 1978 and was evaluated carefully according to the "Guidelines for Proposals" issued by the Center every year. The overall rating of the proposal did not warrant any funding. However, a revised proposal was submitted to CEER in 1979 with an acceptable project involving research on ferroelectric materials and subsequently Dr. F. A. Diaz from UPR Rio Piedras has received a CER grant ($16,000 for the fiscal year 1979-80) to work on “Energy Conversion by Means of Ferroelectric Materials.”

2) Land Use Analysis: The Center is involved in developing all aspects of biomass, especially as it relates to the production of a high fiber sugar cane compatible with present sugar cultivation techniques. Biomass represents a highly viable alternative source of energy for Puerto Rico and we agree that a comprehensive and conclusive land use study is a prerequisite to further development of this program. This study was performed for CEER by Dr. George Samuels and will be presented at the January 1980 meeting. Also, CEER's Terrestrial Ecology Division is presently preparing a proposal to study the ecological impact of extensive sugar cane cultivation in Puerto Rico for biomass production.

3) CEER UPR Integration: CEER feels that its efforts to involve several UPR departments in its research, development, and training activities have been extremely successful and of mutual benefit.

Benefit. Below is a list of professors who were either supported by funds or have actively worked with the Center on various projects.

INVESTIGATOR TITLE

De N. Azsir: Multidisciplinary Energy Curriculum, UPR Mayaguez Development Program

Dr. L. Echegayen: Photo Induced Electron Transfer States, UPR Rio Piedras

Dr. B. Vagos: Studies on Surfaces of Electrodes, Bi, Blam

Dr. S.Y. Weise: Study of the Optical and Aging Characterization, UPR Rio Piedras

Dr. C.G. Aleaide: Energy Education Energy Seminar and Exposition, UPR Mayaguez

Prof. M.I. Tiado: Course on Energy, Energy Conservation and Environment, UPR Rio Piedras

Dr. F. Herrero: Energy Demonstration Laboratory, UPR Rio Piedras

Dr. F.A. Diaz: Energy Conservation by Means of Ferroelectric Materials, UPR Rio Piedras

Dr. D.J. Santiago: Photoacoustic Spectroscopy of Charge Carrier-Defects Interactions in CaS/CuS Heterojunction Solar Cells, UPR Rio Piedras

Prof. R. Brown: Nuclear Reactor Simulator, UPR Mayaguez

Dr. H. Plaza: Concrete Roof Insulating Scheme, UPR Mayaguez

Dr. F. Pla: Mini Baja Car, UPR Mayaguez

Dr. R. Coban: Conversion of Tropical Biomass to Liquid and Gaseous Fuels by Short Residence Pyrolysis, UPR Mayaguez

Dr. H. Batis: Ethanol and Ethanol Evaluation as a Motor Fuel, UPR Experiment Station

Dr. B. Vassos: Studies of the Surfaces of Electrodes Used in Fuel Cells, UPR Rio Piedras

Dr. H. Plaza: Energy Conservation in the Residential Sector by Shading and Insulating, UPR Mayaguez

Dr. F. Pla: Design, Test and Evaluation of Solar Air Conditioning Machine, UPR Mayaguez

Dr. A. Alexander: Expansion of the Saccharum Genetic Base with Growth Regulatory Chemicals, UPR AES

Dr. A. Alexander: Seminar on Alternate Uses of Sugar Cane for Development in Puerto Rico, UPR AES

ENERGY COMMITTEE RECOMMENDATION

U1. CEER TECHNICAL PROGRAMS (Marine and Terrestrial)

The Energy Committee would like first to comment generally on CEER's environmental programs, being mindful that detailed suggestions on the programmatic aspects thereof are properly the...

This text pertains to the responsibility of the Environmental Committee. Regarding the Marine Ecology program, we question the appropriateness of phasing out (or significantly decreasing) the Guayanilla Bay program in favor of OTEC related environmental research. Our Committee agrees that a major environmental program in support of the Center's OTEC program is needed. Such a program, which is supportive of another of the Center's technical R&D projects and is directly relevant to Puerto Rico's energy needs and to its indigenous energy resources, should certainly be

undertaken.

On the other hand, the Marine ecology work at Guayanilla Bay appears to be far from complete and we understand it to be of exceptionally high quality. Under these conditions, we urge in the strongest terms that the Center aggressively seek support in order to continue both programs. Our committee had no comments on the Center's Terrestrial Ecology program, with the exception of the Biomass work (which will be considered separately) and the somewhat tentative suggestion that opportunities appear to exist at the Center for examining the micro-climatological consequences of local energy-related activities in the Caribbean Islands, for example: the impact of OTEC plants, wind energy, solar concentrators, etc. The islands of Vieques and Culebra in particular might be appropriate sites for such studies.

CEER RESPONSE: See response to Environmental Sciences Committee on pages 21 and 22.

ENERGY COMMITTEE RECOMMENDATION

I. WORKING RELATIONSHIP BETWEEN CEER AND THE AGRICULTURAL EXPERIMENT STATION

An administrative issue involving the working relationship between the Center and the Agricultural Experiment Station, which appears to be impeding the smooth cooperation of these two organizations, surfaced during discussions of the Biomass program. Recognizing that resolution of the problems associated with this relationship is an internal matter for UPR/Agricultural Experiment Station/CEER, the Committee nevertheless did attempt to understand the problem and offers.

The following are some very general suggestions that we hope will prove useful. "The University should recognize and attempt to provide specific visibility to the close relationship between agriculture and energy. For example, UPRICEER Agricultural Experiment Station jointly sponsored programs in Biomass already exist, and others, such as the development of more energy-efficient practices in agricultural production and the recovery of energy from agricultural wastes, might be undertaken. One strong reason for urging joint programs is to facilitate the utilization of the excellent and, to some extent, unique technical facilities and also the competent specialist staff at the Rio Piedras Agricultural Experiment Station. The University administration should satisfy itself that the overhead charges being levied against CEER programs carried out at the Agricultural Experiment Station are appropriately constituted.

CEER RESPONSE: The Committee’s recommendation for closer collaboration between AES and UPR, with special emphasis on an increased awareness by AES of the importance of energy agriculture, is extremely important for the future success of collaborative projects by the two UPR divisions. We have alleviated this primarily administrative problem by meetings between the director of CEER and the AES director, plus the Dean of the UPR College of Agriculture, and the UPR President. CEER has also initiated contacts and exchanges between the CEER Project and Program Coordinator and non-CEER divisions of UPR that are actively collaborating with CEER. Also, Dr. Alex Alexander now has a joint appointment between AES-CEER. Dr. Alexander will direct all Biomass programs as Division Head. Additionally, the overhead matters have been clarified.

ENERGY COMMITTEE RECOMMENDATION IV, BIOMASS PROGRAM: The Biomass program continues to be very well managed from a technical standpoint. The Committee noted, however, that the program, as currently organized, is directed toward the development and use of sugar cane and other tropical grass sources.

Materials. It has been brought to our attention that the overall program might be improved by broadening its scope to include silviculture and energy production from agricultural wastes. The Committee therefore urges that CEER support research and seek external funding for a broader program in biomass energy.

CEER RESPONSE: The Committee's request that additional biomass resources, especially woody biomass resources, be evaluated is valid. To this end, one silviculture biomass project proposal was submitted to DOE-PFB requesting $2.7 million over an 8-year period. In addition, CEER is funding a low-level effort in silviculture. A CEER Biomass demonstration field station is being established at a Toa Baja farm with joint funding by UPR CEER and Puerto Rico Office of Energy.

ENERGY COMMITTEE RECOMMENDATION V, ENERGY PROGRAMS: Solar. The Committee was impressed with the technical accomplishments of the industrial process heat and the solar collector design groups. We urge that work be undertaken to explore in some detail the economic feasibility of these specific systems. CEER should also explore technology transfer problems relating to the solar R&D it is sponsoring, in particular the solar collector designs which appear to us ripe for transfer to industry. And finally, the Committee urges in the same connection that CEER applicable patent policies, exclusive licensing agreements, etc. be investigated and appropriate steps be taken to ensure that its overall patent policy is sound, fully operational, and adequate to protect the interests of the contributing parties. Impediments to technology transfer arising from these well-known institutional (as opposed to technical) barriers do indeed exist and efforts should be made to overcome them.

CEER RESPONSE: Solar. Work performed by the industrial process heat and the solar collector design group will continue. In addition, it is planned to work on the construction of a high-temperature test facility for real-life experiments and parametric analysis of collectors.

The text has been developed, including Economic Feasibility Studies. The solar group has submitted two proposals to USDOE dealing with large-scale photovoltaic and industrial process heat application in Puerto Rico. Both projects include extensive economic feasibility studies.

Technology Transfer: The first technology transfer to the industry will take place in the fiscal year 1979-1980 when CEER supplies Roche Products (a large pharmaceutical company on the Island) with a faceted CPC collector for year-round accumulation of solar energy at the company site. Roche plans to extend the project to a large-scale industrial steam generation facility large enough to supply 10-20% of their total energy consumption.

In addition, the Solar Division has developed a novel design called "Solar Drying Tower" under its new agricultural process heat program. Several proposals have been submitted for community applications including coffee growers and small farmers. CEER also conducted seminars during the year directed specifically to Puerto Rico industries.

Patent Rights: In accordance with the Committee's recommendations, the Center is investigating applicable UPR and Puerto Rico patent policies to protect specific inventions developed in its funding programs. This effort will lead to establishing methods for exclusive licensing agreements and contractual designs for technology transfer to the industry.

ENERGY COMMITTEE RECOMMENDATION VI OTEC: The Committee recommends that CEER offers to help the PRWRA and the P.R. Energy Office investigate the social, legal, and economic issues (including the possible taking of credit for spin-offs and by-products) associated with the establishment of an OTEC Plant in Puerto Rico. We recognize that this socio-economic expertise does not currently reside in CEER but strongly recommend that CEER assume responsibility (as part of its mission) to seek out this expertise in the UPR community and organize it for the benefit of the above user. CEER should take the initiative in proposing to the PRWRA, which if OTEC.

"Becomes a reality in Puerto Rico, the operating organization will initiate a small joint program to transfer technical expertise to the Water Authority. The Committee recognizes that PRWRA is the only major U.S. electric utility sufficiently interested in OTEC to offer cost-sharing funds for a development program. However, PRWRA does not have a technical staff with expertise in the OTEC area, while CEER does. We recommend that CEER pursue the opportunity to provide this expertise in a joint program with PRURA. CEER recognizes that, if the LCU operational plans proceed as expected, it may be possible to expand the onboard R&D program to include real heat exchange testing at minimal additional cost. CEER is encouraged to seek funding to carry out this expanded program.

CER RESPONSE CBER-PRWRA-PROE Relations Discussions are being held with the Puerto Rico Office of Energy with a view towards establishing closer working relations. At present, the situation with respect to this, and other agency integrations, is as follows:

1) In the Spring of 1979, an Interagency OTEC Committee was formed to coordinate all OTEC activities in Puerto Rico. The lead organization of this committee is the Puerto Rico Water Resources Authority. In addition to PRWRA, the other organizations represented on the committee are the Center, the Office of Energy and Fomento. The function of the committee is largely focused on coordinating external OTEC affairs. That is, each member of the committee has agreed to discuss with the committee and coordinate with the other agencies of the Government of Puerto Rico before any response is made to any RFP from DOF. This will ensure that two organizations in Puerto Rico do not compete for the same job. However, more than that, it will also assure that each organization in Puerto Rico seeking to promote OTEC will have the support of all of the other government agencies also interested in OTEC. The main thrust of the committee at this time is to assure, if possible, that the OTEC."

The modular experiment (OTEC-30-100) is based and operated in Puerto Rico. Each organization represented on the committee is making a contribution in this area. The Center's contribution, of course, is in research. We hope and expect that both our biofouling and environmentally related OTEC research will make a substantial contribution to establishing the modular experiment in Puerto Rico.

The Center's subcontract with Consultores Técnicos Asociados is progressing as scheduled. Our

physical oceanographic study last year, funded by DOF, was expanded with additional funds by the Water Resources Authority to study Punta Vaca in Vieques as well as Punta Tuna in Puerto Rico. The PRWRA physical oceanographic study information includes (a) an alternative site to Punta Tuna and (b) an indication of the spatial as well as the temporal variability of the physical oceanographic parameters.

The Water Resource's proposal with the Center subcontract to study issues related to OTEC power integration in the electrical system of Puerto Rico is in the final stage of negotiation. The contract is expected to be signed before the end of June. The awarding of this contract will provide approximately 100,000 dollars in additional funds for the Center's OTEC environmental studies.

Expanded LCU Operations: In addition to the Heat Transfer Biological and Corrosion Studies presently planned for the LCU operation, CEER has a tentative commitment for physical oceanography, biological oceanography to be performed from the LCU. In addition, the Applied Physics Laboratory of John Hopkins University is seeking funds to conduct heat transfer experiments from the platform. CEER has prepared a brochure stating the facilities which are available and inviting the participation of other researchers.

In addition, CEER has proposed to DOE that the facility be expanded with a cold water pipe so that OTEC condenser studies can be performed. CEER believes that it is an excellent idea to expand the operations of the LCU and hopes for a successful future in this area. CEER.

The following text is the corrected version:

Prepared a complete “OTEC Matching Funds Proposal to the Puerto Rico Office of Energy". The Office of Energy funding is still pending. Copies of this program have been given to all Committee members.

ENERGY COMMITTEE RECOMMENDATION

VII. CEER TRAINING PROGRAM

1) The Committee sees little hope of changing DOE's decision to eliminate funding for CEER's Training and Education program.

2) The CEER staff does not itself have significant strength in the education and training areas. Furthermore, manpower training is properly the function of an educational institution. The Committee noted that the original terms under which the CEER was established called for a substantial annual UPR financial contribution. The Committee suggests that this commitment might possibly be discharged by having UPR accept responsibility for CEER's energy-related manpower training program.

3) It should still be recognized that CEER does provide energy-related research training and that it also performs an educational function for the general public through its energy information dissemination services. In order to improve the last mentioned function, the Committee recommends that mechanisms for the dissemination of research results should be included in all proposals for research projects.

4) The Committee recommends that UPR/CEER investigate the possibility of obtaining specific manpower training grants for the newly established DOE minority manpower training program.

CEER RESPONSE

“This program was relatively active during the first year in funding a number of projects, seminars, courses, and demonstrations at CEER, UPR, and other locations throughout the Island. In the summer of 1978, Dr. Amador Cobas of the CEER consulting staff organized and conducted a science teachers course at the University of Puerto Rico in collaboration with the Island Department of Education. All text materials were prepared at CEER and approximately 100 teachers participated in the program. Using this program as a model, the Cayey University College submitted a

In the summer of 1980, Professor Agnes B. Werner of the UPR Faculty developed a similar proposal for a Summer Science Student Program, which was funded by the US Department of Labor through the Department of Energy. This program, operating at a base level of $214,000, was carried out in UPR facilities in San Juan and Mayagüez. In addition, CEER's North Annex building in Rio Piedras was rehabilitated and also used for this and other future education and training programs. With these projects well received, it seems possible to develop further programs in the area of competitive funding for this group and expand operations to utilize staff and facilities available in the CEER-UPR Department of Education complex to their full potential. The CEER Director has held several meetings with DOE officials regarding other possible sources of funding for Education and Training, including Minority Programs.

ENERGY COMMITTEE RECOMMENDATION

Given recent DOE organizational changes (and the possibility of more forthcoming), the general budgetary constraints under which the DOE must operate, the unpredictable program cuts that seem to occur periodically, and the Advisory Committee’s concern for the long-term health of the CEER, the Committee strongly urges that CEER dedicates a substantial part of its management effort to developing alternate sources of long-term funding for CEER. The Committee suggests that CEER, if properly coordinated with complementary UPR resources, could assume the role of primary energy problem solver for the Commonwealth of Puerto Rico. In particular, it appears possible that CEER is, in principle, capable of becoming the R&D arm of the Puerto Rico Office of Energy. CEER should also recognize that since there are several competitors for this role, CEER is not likely to receive automatic support from the Puerto Rico Energy Office for their programs or the automatic assignment of programs and projects.

The following text is of interest to the Puerto Rico Energy Office. Accepting such responsibility does not, of course, preclude CEER's involvement in long-term basic energy-related research and specific applied programs independently funded by DOE, NSF, and other agencies of the federal government. We recommend that CEER should devote some of its institutional funds to help the Puerto Rico Energy Office identify problems and develop its program plans. They should set up a mechanism for negotiated contracts from that Office. Such contracts will require co-funding or cost-sharing from another source and it will be the role of CEER, and not the Energy Office, to seek out and formalize this co-funding.

Secondly, we believe that the Puerto Rico Energy Office would welcome jointly funded proposals to study the energy resources of Puerto Rico, which would:

1. Collect and review previous studies and reports and use this as a reference data base.
2. Develop current data on the potential quantities of energy from Biomass, Hydropower, OTEC, Wind, Conservation (emphasis on Industrial Cogeneration and waste heat utilization) and Direct Solar Collection.
3. Recommend actions deriving from the National Academy study on the Energy Needs of Puerto Rico.

There is a specific need for the hydropower resource assessment which should include the following:

1. Take account of new technology being developed in the DOE low-head hydro program.
2. Assess the potential for hydraulic power for energy storage and peak shaving.
3. Update previous studies on hydropower resources.
4. Include rehabilitation of existing facilities including those presently shut down.

The basic research projects funded by CEER at UPR and elsewhere do not have sufficient visibility in the program, and there is no spokesman or representative for them in the CEER organization chart. While basic research may have to be limited to a small, say 10%, portion of the total funds, it should be carried out in such a way as to provide funding continuity, visibility, and integration.

With the overall CEER objectives, 4) We are concerned about an apparent lack of liaison between CEER’s funded basic projects and CER’s staff involved in related applied projects (for example, in the solar materials area), and we urge that this liaison be strengthened. We also urge the UPR Rio Piedras faculty to initiate direct requests to DOE (Basic Energy Sciences Division), NSF, and other agencies for funding to supplement CER's own institutional funding of such projects with the objectives of enlarging CEER's role here to one of coordination, technical management, and review in addition to its own direct efforts in this area. CEER is encouraged to strengthen its procedures for follow-up and monitoring of the external (UPR) projects which it is funding.

CEER RESPONSE 1), CEER, in an effort to assess its own future, has conducted an in-depth study of its needs and potentials as a research and development organization. This resulted in a detailed report under the title "R&D Program Needs for Energy Alternatives in Puerto Rico”. In this extensive report, the Center outlines its proposed solution to the ominous problems of energy and environment which threaten the well-being of the Puerto Rican community. In a national and international context, selected alternative energy sources and concomitant environmental problems are elaborated. Necessary funding and possible sources are analyzed. The unique position of CEER and its ability to exploit the advantages inherent in the Puerto Rican site are included. The possibilities of exporting technology are presented. Relationships with the U.S. Department of Energy, the Commonwealth Energy Office, and the University of Puerto Rico are discussed. This report serves as a base for CEER's Five Year Plan (1982-1986) which will be discussed at the January 1980 meeting. Basic conclusions are (1) Puerto Rico's energy crisis demands an expanded role by CER in R&D which current levels of funding and institutional relationships cannot sustain; (2) with adequate funding, CEER can also function as a

"Technology exporting organization with special relevance to the Caribbean, Latin America, and other areas in the fields of OTEC, biomass, photovoltaic, ethanol, and solar steam. The scale of operations and funding level of CER are not adequate for performing the research and development role required in Puerto Rico's energy crisis. No alternative institution of equal capacity for such a role is perceived to exist in Puerto Rico. Without adequate support for research and development, the energy crisis will reach disastrous proportions in a very short time. The main recommendation of this report is that necessary funds be provided toward the goal of energy independence, or at least partial energy independence, for Puerto Rico. Jointly funded studies by CEER and PROE are recommended. The center completely agrees with the concept of jointly funded studies on the energy resources of Puerto Rico, specifically on the following recommended by the Senior Advisory Committee:

a) Collect and review previous studies and reports to make this available as a reference database.
b) Develop current data on the potential quantities of energy from biomass, hydropower, OTEC, wind, and direct conversion of solar radiation.
c) Recommend actions deriving from the National Academy study on the energy needs of Puerto Rico.

Non-solicited proposals in these areas and others will be submitted by CEER to the Office of Energy. The possibility of direct contract work will also be explored.

A specific need for a hydropower resource assessment by PROE is identified. The Center has conducted an in-depth study of the report prepared by Energy and Applications, Inc. on the "Low Hydro Feasibility Project" dated November 3, 1978. Our principal observations are as follows:

1) The indicated report is very vague in assessing the economic feasibility of the project.
2) It is silent in addressing the potential of this type of effort as an alternative solution to Puerto Rico's energy problem.
3) The basic research project is funded by CER. The Center funds projects from UPR or from..."

Elsewhere, not on the basis of visibility, but on the basis of overall merit. The meaning of this merit is clearly outlined in the "Guidelines for Preparation of Proposal", issued every year based on CCEER’s policies for that specific year. Again, on that basis, CER does not set any limits to basic research. In the last year, CER funded basic research in excess of 108. However, since CEER itself is tied to a 5-year plan, it cannot provide funding continuity by the very nature of the type of funding it receives.

4) The lack of liaison between CEER and UPR has seen great improvement. The appointment of the CER Director to the UPR Board of Directors has been particularly helpful in this matter. Specifically, the CER Marine Ecology Division is working closely with the Marine Sciences Department of the University of Puerto Rico, and the CER Solar group with the School of Engineering. An area that needs a closer relationship is with the basic research being conducted at Rio Piedras.

In order to improve this relationship, CEER will encourage scientists from that campus to work with CER scientists on joint projects. Of course, CER believes that it is part of the granters'

responsibilities to keep CEER informed and interrelated as required in the award contracts. CER carefully reviews the progress of each grantee on a quarterly basis.

5) The Advisory Committee for Rio Piedras strongly desires to initiate direct requests to other agencies. Due to the nature of its own funding (8-year plan), the Center cannot provide any research organization with the funding continuity which may be desirable for certain types of research projects. Therefore, in full agreement with the Advisory Committee, CER recommends that all research departments of UPR utilizing CEER's research funds submit proposals to U.S. organizations for continuing funding. CER can only supply a limited amount of "seed money" to help research teams develop competitive proposals. At present, UPR Rio Piedras is encouraged to apply for external funding.

"Piedras scientists are in the process of finalizing competitive proposals to continue the seed efforts funded by CEER for submission to federal agencies. Recommendations on possible sources of funding and internal administrative procedures for follow-up of these proposals are required. There is a need for clarity on whether the proposal should go directly from UPR Rio Piedras campus or through CEER to the grantee.

EXERCISE: COMMITTEE RECOMMENDATION IX, THE 1980 MEETING

One of the Committee's suggestions for an improved format of the 1980 meeting has already been briefly noted. This is to include in the Director's presentation specific responses to Committee recommendations. In addition, the Committee would appreciate:

1) Continued distribution of information on the status of ongoing programs prior to the meeting, highlighting specific achievements, advances, and issues which have occurred since the last Committee meeting.

2) Presentation by the Director of a budgetary overview for the current and future fiscal years.

3) A detailed description of the method by which CEER allocates its own R&D funds.

4) Description of CEER's own procedures for project monitoring and review.

CEER RESPONSE: The Center agrees with all the following items and will organize the aforementioned meeting accordingly.

1) Prior distribution of relevant information on the status of ongoing programs, indicating the highlights of specific achievements, advances, and issues since the last committee meeting. Documents provided for the January 1980 Meeting are listed: FY 1980 Annual Report, FY 1950 Institutional and Developmental Programs, OTEC Research for P.R. (A Matching Funds Proposal to the P.R. Office of Energy), Five Year Program (1982-1986), Two Year Program (1980-1981).

2) Director's budgetary overview will be presented.

3) Detailed description of the methods by which CEER allocates its own R&D funds. (CEER's "Guide for the Submission and Renewal of Proposals" describes this procedure in detail).

4) Description of CEER’s own procedures for project monitoring and review."

Referred to under "3") 18

ENVIRONMENTAL SCIENCES COMMITTEE RECOMMENDATION

1. GENERAL COMMENTS

We continue to believe that the Commonwealth of Puerto Rico requires strong expertise in the areas of human, terrestrial, and marine ecology. Tropical ecology differs from that in temperate regions. Puerto Rico can no more rely on expertise from mainland United States than it can depend on the mainland's agriculture programs to cater to Puerto Rico's tropical agriculture needs. This implies that the Commonwealth needs programs, including the education and training of individuals at all levels of expertise, the capability to conduct "state of the art" research, as well as the ability to collaborate closely with industry and government agencies to solve a variety of specific problems.

Increasing the public's awareness and sophistication regarding human, terrestrial and marine ecology is also necessary. The University of Puerto Rico plays a major role in these areas, and the CEER environmental group also has a role within the University of Puerto Rico. One of the tasks of the President is to define the relative role of CEER in responding to these needs and to encourage cooperation and coordination among the various University components to ensure that the entire range of Commonwealth needs are met.

By emphasizing this need, we do not wish to suggest that cooperation does not currently exist. A number of Master's theses have resulted from the CEER terrestrial ecology program and, according to all concerned, the degree of cooperation between the marine ecology program and the Department of Marine Sciences has improved over what it was some years ago.

For CEER to play the role that the committee feels it should, it must be able to attract and retain competent and energetic people. This can be achieved, in part, by providing opportunities to work on interesting and significant problems - for which there appears to be no shortage in the Commonwealth of Puerto Rico - and to have the facilities and support necessary to do so.

The job, as well as being adequately recognized for the work performed, is important. Although CEER facilities do not compare with those of some of the larger, more mature institutions, they are not without resources. However, we believe these could be improved by a more aggressive policy of sharing of university facilities. For example, if there are such pieces of equipment as high-resolution gas chromatograph and mass spectrometers at the university, which are not being used currently and are needed by CEER, then usage of this equipment by CEER should be encouraged and facilitated by UPR. We also believe it would be helpful for some of the senior CEER staff to have joint appointments or other formal relationships with the relevant departments within the university. In this way, graduate students at the University of Puerto Rico could be more easily integrated into the CEER program. Finally, the committee feels that compensation, specifically in the form of equal salaries and promotion opportunities for CEER professionals, should be comparable to those of the University of Puerto Rico faculty with comparable experience and abilities. Only in these ways can CEER guarantee a staff of the necessary competence and

stability that will allow it to play the role in the Commonwealth which the Advisory Committee feels it might and should.

CER RESPONSE

1) A senior staff group, under the direction of the CEER's Director, has developed a proposal for a mechanism to enable the University of Puerto Rico through CEER to mount the massive R&D effort needed to solve the energy environment problems of the Commonwealth. This proposal was sent to the UPR President in May 1978. The proposal is also an integral part of the Five Year (1982-86) CEER Program Plan.

2) The Environmental Sciences staff agrees that increased sharing of special research equipment and facilities of the university would be advantageous to CEER's program. Individual scientists and divisions are independently pursuing possibilities for sharing costs.

Exchanging services in such analytical capabilities, for example, the easy chromatograph mass spectrometer which was specifically mentioned. A CER computer needs committee made recommendations which were implemented to improve data processing capabilities for the Center. This resulted in three terminal computer facilities (fact 3). CEER also sought an increase in the capital equipment budget commensurate with its needs arising from the changes in direction of its OHER- DOE funded "Marine and Terrestrial Ecology Programs". The effort resulted in only $5000 being assigned for equipment which is not enough (fact 4). As noted by the Senior Advisory Committee, significant student involvement in the Terrestrial programs is evident. Students are also working towards degrees in the Marine Biology programs. The anticipated increase in funding of environmental research under the Minority Institution Research program of EPA and DOE carries with it the beneficial requirement for student participation. As yet, although the staff recognizes the positive benefits of such arrangements, co-staffing and joint appointments with the University are not common with CER. Possibilities for seeking more such arrangements in conjunction with new staffing are under consideration (fact 5). CER endorses the Committee's recommendation that at least equivalent status and recognition be accorded CEER personnel within the University of Puerto Rico.

ENVIRONMENTAL SCIENCES COMMITTEE RECOMMENDATION

I. NEED FOR LONG RANGE PLANNING

At the first meeting of the Advisory Committee, we were presented with a CER five-year plan. It is our impression that the plan has undergone considerable change in the past two years and we believe it would be useful for CEER to update its five-year plan, and at the same time perhaps present a more detailed two-year plan. We believe that a periodic review and revision of long-range plans is a useful exercise for any organization such as CEER.

CEER RESPONSE

CEER has completed drafting a new Five Year Plan (1982-86). This plan includes

Alternate scenarios are designed to accommodate the significant uncertainties in base funding growth that we can project. They also incorporate the Committee's suggestions in the detailed development of the first two years' plans. Copies of the plan have been given to all committee members. Additionally, a draft revision of the last two years (1980-81) of the actual five-year (1976-81) plan has been distributed to all committee members.

Page Break

ENVIRONMENTAL SCIENCES COMMITTEE RECOMMENDATION II: IN-DEPTH REVIEW OF PROGRAMS

We believe it would be beneficial for CEER to undertake an in-depth review of the individual components of its program on a regular basis. Perhaps one such review could take place every 12 to 18 months, allowing the entire CEER program to undergo such a review over a four or five-year period. We wish to note that the CEER Advisory Committee is not currently performing this function and, as it is presently constituted, it would be difficult for us to do so. However, if the CEER administration accepts this recommendation, we would like to be involved - perhaps by having one or more of our members serve as either active members of review teams or as a liaison between a review team and the CEER Advisory Committee.

CEER RESPONSE

A comprehensive review of the Marine Biology and Terrestrial Ecology programs was performed during 1979. Major changes in both programs will be discussed later. This review was carried out by new CEER staff in cooperation with previous CEER staff, outside consultants, and other DOE officials. Plans are being developed for a peer group review of programs as well as a regular consultant seminar program. Each division (at maximum intervals of four years) will be reviewed by a team of 3 or 4 recognized experts from disciplines appropriate to the programs involved. The Senior Advisory Committee may be asked to recommend candidates for such peer groups as well as CEER staff and other consultants. The objective of the consultant seminar peer review program is to combat the isolation inherent in the island situation by

Having senior staff members invite at least one expert a year to visit, to present seminars or workshops and to formally evaluate that member's program efforts. He will be asked to submit his report in the form of a letter to be filed with the Director and to be made available to the Senior Advisory Committee or other reviewers of the Center's programs.

ENVIRONMENTAL SCIENCES COMMITTEE RECOMMENDATION IV. COMPOSITION OF THE COMMITTEE

It's our impression that the CER energy program benefits from having the Director of the Office of Energy on the energy subcommittee, since he provides a link with an important potential user group of CEER and is also aware of Commonwealth priorities in this area. We would like to suggest that the Director of the Environmental Quality Board or someone in an equivalent position might serve in a somewhat similar capacity to the CER environmental program if he were a member of the environmental subcommittee.

CEER RESPONSE

Additional local personnel have been added to both the Environmental and Energy Senior Advisory Committees. In addition to the directors of the Office of Energy and the Environmental Quality Board, the directors of the Puerto Rico Electric Power Authority, Puerto Rico Water and Sewer Authority and the Department of Natural Resources have been appointed to the committee.

ENVIRONMENTAL SCIENCES COMMITTEE RECOMMENDATION TERRESTRIAL ECOLOGY

This program continues to be the cause of our greatest uneasiness. We are concerned about the fragmentation of the program and the apparent lack of focus. We do not believe it is our task to make specific programmatic suggestions, but we do believe that the CEER administration should undertake a careful review of this program during the next year.

CEER RESPONSE

Terrestrial Ecology has a new focus under a new Ecology Section headed by Dr. Laurence Tilly. The Terrestrial Ecology objectives have been reviewed internally, new staff hired, and new programs planned. Candidates are being interviewed for the

The position of Division Head is now held by Dr. Tilly, who is also the Acting Director of a group more appropriately named "Terrestrial and Aquatic Ecology." The major program areas include Ecosystem Structure and Process Studies, Ecological Effects Studies, and Resource Management Studies.

The Ecosystem Structure and Process Studies are aimed at outlining the major structural-functional features of ecosystems subject to alteration by development, especially that associated with energy production and land utilization. Projects within this area include (1) DOE-funded cycling and transport studies, (2) DOE-funded National Environmental Research Park Study, and (3) Power Plant siting studies funded by the Puerto Rico Electric Power Authority.

In collaboration with the Institute of Tropical Forestry of the U.S. Forest Service, we are drafting a proposal for the NSF Long-term Ecological Research Program. If funded, this would blend with NERP to augment the DOE-funded studies centered in El Verde.

Ecological Effects Studies include the completion of a draft report on the effect of 20 years of a cooling system operation on the Savannah River Plant's Par Pond. This work is subcontracted from Savannah River Lab.

Resource Management Studies feature projects in water reclamation. One of these is a biological system approach utilizing water hyacinths to remove nutrients and provide biomass for anaerobic production of methane. Other projects relate to the application of high-density magnetic separation for waste stream clean-up. The research aims to generalize what physical, chemical, and biological properties of waste systems make this treatment appropriate.

More recently, activities of the Terrestrial Ecology group have centered on the review and summary of earlier activities, formulation of a new program, and writing of proposals. The immediate effort is

directed toward publication of those summary results during the period of preparation for the new projects. Expected in the first quarter of calendar year 1980 are new terrestrial...

Ecology Research Plan for DOE, the NSF/LITER proposal, the Limnological Survey Report (for Rio Espiritu Santo), the 10-year post-irradiation succession paper, and miscellaneous publications on the Rio Espiritu basin studies, hyacinth work, and magnetic separation reports.

ENVIRONMENTAL SCIENCES COMMITTEE RECOMMENDATION VI. MARINE ECOLOGY

One difficulty with the marine ecology group is that the total professional and administrative experience of the group is limited, considering the size and complexity of the program for which they are responsible. Although the members of the group seem competent, their total experience is rather low when compared with the level of professionalism usually found in mainland United States with programs of comparable complexity. Having voiced our concern, we also note that this group seems to have made significant progress during the past two years.

We have some concern about the future direction of the program. Although we can sympathize with the pressures on the Department of Energy, which have led to the strong suggestion that the group move from Guayanilla Bay to Punta Tuna area where it can concentrate on providing the necessary environmental information for the proposed OTEC installation, we are concerned that completely phasing out of the Guayanilla operation would be shortsighted.

There appear to be a number of important industry and energy-related environmental problems. One concerns the environmental response to the fact that mercury is no longer being dumped into the Bay from the Pittsburgh Plate Glass Company. Tracking the response time of the various environmental components such as fish, sediments, and mangroves to this cessation of mercury source can lead to important understandings about the pathways of mercury in this kind of environment.

A second problem would be to study the ecological response of a shift in the distribution of hot water into the Bay. Presumably, hot water will no longer be dumped into a relatively...

The text is confined to a "thermal pond" but will be led further offshore. It would be useful to know how long it takes for mangroves and other parts of the ecology to recover from this thermal insult. There may be other important problems, in addition to these two, which were brought to our attention by the CEER staff, which could be addressed by further research in Guayanilla Bay. It takes considerable effort to develop the necessary descriptive material to sufficiently understand an ecosystem such that one can ask important questions. Work in Guayanilla Bay predates CEER; as a result Guayanilla Bay is probably the best studied marine ecosystem in Puerto Rico, even though it may be a highly perturbed system because of heavy industrial use. The fact that the marine ecology group is considering the development of a deterministic model of the Bay is some measure of the level of understanding since it requires a fair amount of information about an ecosystem before one even dares to consider such a development. On the other hand, it has been the experience of many that such models serve best as diagnostic tools in pinpointing where our understanding is weakest. No deterministic model of such a complex system can be expected to work perfectly and where it fails badly is often an indication of where our ignorance is greatest.

In summary, we urge the marine ecology group not to completely abandon their work in Guayanilla Bay as they move into this new OTEC region of Punta Tuna and, if necessary, search for additional funding to continue some work in Guayanilla Bay. We recognize that the Punta Tuna proposal was put together quickly in response to an urgent request from the Department of Energy and that presumably this proposal is undergoing further alterations. We think the proposal would benefit from further discussions with those who are designing the OTEC program. For example, the ecological needs of OTEC would seem to vary from providing the necessary climatological data (atmospheric and oceanographic).

The text would be corrected as follows:

This would assist decision-makers in determining the feasibility of the Punte Tune site, while learning enough about the focal ecological processes to be able to design critical ecological experiments at the time OTEC begins operation. The current marine ecology proposal for OTEC seems to lack this kind of focus. It was apparent through discussions with DOE officials that more aggressive and creative planning on the part of CEER scientists would be viewed most favorably, and would add much to the quality of the proposal.

CEER RESPONSE: The Marine Ecology Division has been actively working in three areas which speak to the Committee's comments. These areas are: The plans for work in support of OTEC, proposals for additional funding especially for studies of Guayanilla, and planning for a more efficient and technically competent operation of the division through minor reorganization and delegation of responsibilities.

A revised, more focused, and detailed plan of work for OTEC has been drafted and sent to DOE-OHER for review. Meetings with DOE personnel should resolve remaining questions and the resulting plan will form the basis for hiring, equipment purchase, and other planning. The OTEC plan and the remaining portions of a new 5-year plan are now obviously guiding the activities of the members of the division.

As an aspect of the phase-out from DOE funding for Guayanilla, Marine Ecology staff who are not forecast to play a large role in the OTEC studies are writing proposals for submission to EPA and other agencies. For example, one of the results of the discontinuance of mercury discharges to Guayanilla, Dr. Chartock, an ecological modeler, has been working at CEER to develop a model of the bay to use in evaluating what components are most in need of further study from the standpoint of managing the industrial impacts on the system.

The Division has a new Acting Head, Dr. Jose Lopez. Dr. Juan Gone, the former Head, is needed to oversee the extensive plankton program which is central to the OTEC studies. Related

Changes are also expected to enable the senior staff to grow professionally by assuming more responsibility for specific division activities.

ENVIRONMENTAL SCIENCES COMMITTEE RECOMMENDATION VI. HUMAN ECOLOGY

We commend the group for its continued excellent work in Bilercia and other efforts on

environmentally related diseases in Puerto Rico reservoirs. We further commend it for its efforts to export its expertise to such areas as the Sudan. Although we recognize that the respiratory disease program has just begun, we are less sanguine about its development and would urge that the group work closely with epidemiological experts at the University of Puerto Rico and elsewhere to ensure it is developing a proper statistical protocol.

CEER RESPONSE

With the resignation of Dr. William Jobin and the hiring of Dr. Henry Negron in his place, this program undergoes a reorientation. Dr. Negron, without question, supplies the epidemiological expertise acknowledged to be needed in the studies of respiratory mortalities in relation to island location. Unfortunately, OHER-DOE suspended funds for this project in 1980.

ENVIRONMENTAL SCIENCES COMMITTEE RECOMMENDATION VIII. TRAINING AND EDUCATION

As noted earlier, we agree that the University of Puerto Rico needs strong training and educational programs in areas of human, terrestrial, and marine ecology, and we believe that CEER has a special role to play in this effort. We were not impressed with the initial effort to develop such a program as presented in the "CEER Training Plan, Fiscal 1979 to 1989." However, since we were given to understand that this program is being extensively revised, we spent little time in committee discussing its details. We are prepared to revisit the review at such a time as it has been revised.

CEER RESPONSE

Dr. Amador Cobas, former UPR President, assisted in drafting a new program plan which provided the opportunity to give new impetus to the training and education activities of the Center. Also, Dr. Manuel Garcia Morin, previously