FINAL REPORT

THE PROJECT FOR AN ENERGY-ENRICHED CURRICULUM

I. INTRODUCTION

The Project for an Energy-Enriched Curriculum (PEEC) reported here was a long-running effort at infusing energy/environment/economics (E/E/E) themes into the K-12 curriculum. While it was conducted as a single integrated effort by the National Science Teachers Association (NSTA), it was, in fact, supported by a series of contracts and grants, during the period 1976-84, from the Energy Research and Development Administration (ERDA) and the U.S. Department of Energy (DOE).

NSTA's PEEC project grew out of an earlier (1974-75) project supported by the U.S. Office of Environmental Education. The products of this contract, the Energy-Environment Source Book, the Energy-Environment Materials Guide, and the Energy-Environment Mini-Unit Guide, were distributed under contract to the Federal Energy Administration to 15,000 chairpersons of high school science and social studies departments in 1975. The interest and credibility established by these early materials laid the foundation for what has been accomplished since.

It was clear to NSTA and to those people in the federal government who were concerned with energy education, that background materials were not all that was needed; that the desired impregnation of the school curriculum with energy understanding could only come about through the availability of ready-to-use classroom materials. NSTA proposed to ERDA that it undertake a modest curriculum materials development program, the Project for an Energy-Enriched Curriculum. This project was funded under contract #E(49-1)-3841 in 1976.

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The list of tasks in that original proposal is given below:

- Task 1: Prepare Articles on Energy Education
- Task 2: Placement of Articles
- Task 3: Fact Sheets on Energy Technologies
- Task 4: Judging Entries and Making Awards: Energy Related Classroom Activities
- Task 5: Preplanning for Summer Workshops to Produce Interdisciplinary Packets

These tasks illustrate the several-pronged approach of the PEEC project to energy education: materials development, implementation and distribution, and communication and outreach. We will use these headings in the following section to describe PEEC products and results.

A. Contracts and Grants

PEEC, although it was considered by NSTA and by the project managers at ERDA/DOE as a long-running project, was funded on a year-by-year basis. The contracts, grants, and modifications that supported the PEEC operation and the periods covered are listed in the table below.

PEEC CONTRACTS/GRANTS

<u>Project</u>	<u>Contract/Grant Number</u>	<u>Dates</u>	<u>Amount</u>	<u>YTD Amou</u>
Phase I	E(49-1)-3841	2/27/76-6/30/76	\$ 33,290	\$ 33,29
Phase II	E(49-1)-3841 (M001)	6/1/76-9/30/76	\$115,359	\$ 148,64
Phase III	E(49-1)-3841 (A002)	12/2/76-12/77	\$199,960	\$ 348,60
Energy & Education	E(49-1)-3841 (A003)	9/30/77-6/30/78	\$ 30,025	\$ 378,63
Phase IV	EX-76-C-10-3841 (A004)	11/1/77-12/78	\$245,472	\$ 624,10
Phase IV Modification	EX-76-C-10-3841 (A005)	N/A	\$ 35,971	\$ 660,07
Energy & Education	EX-76-C-10-3841 (A006)		\$ 38,560	\$ 698,63
Energy & Education Modification	EX-76-C-10-3841 (A007)	N/A	\$ 1,188	\$ 699,82
Phase V	EX-76-C-10-3841 (A008)	1/1/79-12/31/79	\$269,160	\$ 968,98
Energy & Education	EX-76-C-10-3841 (A009)	9/79-6/30/80	\$ 33,839	\$1,002,82
Energy & Education Modification	EX-76-C-10-3841 (A010)	N/A	\$ 2,470	\$1,005,29
Energy & Education	EX-76-C-10-3841 (A011)	9/1/80-6/30/81	\$ 41,484	\$1,046,77
	EX-76-C-10-3841 (A012)			
	EX-76-C-10-3841 (A013)			
	DE-AC01-76IR03841 (M014)			
Phase VI	DE-AC05-80IR10984	1/2/80-1/1/81	\$307,130	\$ 307,13
Phase VII	DE-AC05-80IR10984 (A001)	1/2/81-1/1/82	\$311,570	\$ 618,70
Phase VII Modification	DE-AC05-80IR10984 (M002)			
Phase VII Modification	DE-AC05-80IR10984 (A003)			
Phase VIII	DE-FG05-81ER10284	9/18/81-12/31/82	\$299,950	\$ 299,95
Phase VIII Modification	DE-FG05-81ER10284 (M001)			
Phase VIII Modification	DE-FG05-81ER10284 (M002)			
Phase VIII Modification	DE-FG05-81ER10284 (M003)			

A list of the tasks assigned to each of these projects and grants is shown in Appendix 1.

B. Goals and Tactics

The term "energy-enriched," used to describe the NSTA project, was deliberately chosen to provide an image of E/E/E topics infused into an existing curriculum rather than added on to one that is already almost unmanageable in its diversity of content and requirements. The PEEC planners chose to look at what teachers were already doing and then to "do it with energy"--to try to meet existing learning goals with E/E/E examples.

Since it was NSTA's overriding purpose to teach about energy rather than science or social studies, it was determined from the beginning that the PEEC materials would be interdisciplinary. The lessons, fact sheets, etc., dealt with E/E/E issues as a whole, rather than dividing them up among the disciplines. Thus, it was hoped that the science teacher became aware of related social issues, and the social studies teacher learned a little science.

The goals of the project, of course, had to do with the students--with increasing their cognitive performance and increasing their awareness of E/E/E matters. Three goals, which were implicit in the 1976 PEEC proposal, were, by the 1978 proposal, set down explicitly as:

1. The student-citizen will understand the scientific, technological, and social aspects of energy and its pervasive role in national and world society.
2. The student-citizen will be able to make informed political decisions on energy options as they arise.
3. The student-citizen will be able to make personal life-style decisions which are consistent with energy realities.
4. The student-citizen will be aware of and prepared for employment opportunities in energy-related industries.

These goals continued to provide guidance throughout the project.

II. TASKS AND RESULTS

A. Materials Development

The core of the PEEC program was a set of classroom teaching units-- "classroom packets." These are teacher-produced, infusable, interdisciplinary lessons organized around a unifying E/E/E theme. These classroom packets were supported in their use by a variety of materials and mechanisms which are also described below. First, however, we describe the method of development, testing, review, etc of the packets.

1. Method of Development

PEEC was not a curriculum development project of the 60s style in either size or philosophy. There was no intent to change educational philosophy. What NSTA set out to do, and what ERDA and the DOE wanted us to do, was seed school systems with instructional examples showing that students could be taught the important concepts and could deal with the important E/E/E issues within the traditional school curricula. Thus, rather than spend our efforts on changing the curriculum, we tried to understand what was being done and to take advantage of it. We looked for matches between these opportunities and the E/E/E ideas that we wanted to infuse. In this we relied not on research, but on the experience of teachers. The following production model evolved. The PEEC staff chose topics for summer packets. The topics were fleshed out with suggested lessons and were then the major focus of a steering committee meeting (see below) which developed the packet outlines further. We went into the summer writing session knowing more or less what packets we wanted to develop.

The classroom materials were written by teachers under PEEC staff direction at a series of writing sessions held during summers 1976, 1977, 1978, 1979, and 1980. Typically, the writing sessions were composed of 10 teachers from various grade levels and having backgrounds in science or the social studies. These teachers worked in teams of three or four to produce four or five packets during the 1 month session. All in all, 80 teachers produced 110 person-months of writing session effort. To this is added $29\frac{1}{2}$ person months by PEEC staff at the writing sessions. Thus, the 35 or so draft packets, which resulted from these writing sessions, received almost 4 person months of creative effort per packet. Appendix 2 lists the writing session sites and participants.

a. Review

The classroom materials, developed at the summer writing sessions, were lightly edited and polished, retyped, and sent out for testing and review. The review covered both content accuracy and pedagogy. All in all, we have received written reviews from 212 reviewers. Some reviewed more than one packet, but each of the 35 packets was reviewed by at least 3 reviewers, and the average of 6 per packet is considerably higher than the norm for commercial texts.

b. Testing

All of the packets have undergone classroom testing. The first 15 were printed by the DOE while still in draft form, and 6,000 of them were distributed. We received evaluation forms for them from 767 teachers.

The other 20 or so packets (which have not been printed) were subjected to a smaller but more controlled testing process. We asked for the teachers (selected to provide geographic and demographic diversity) to return a day-by-day "classroom log" on which they recorded each day's experience with the packet. This was augmented by classroom visits by PEEC staff. In addition, we identified some Schools of Education, which served as "testing centers,"⁽¹⁾ and used selected packets with their pre- or in-service teachers.

All in all, 106 classroom teachers participated in the testing (in addition to the 767 noted above), and one or more of the packets have been used with a verified student population of about 122,000.

The record of evaluation and review is summarized in the table below.

<u>Year</u>	<u>Teacher/ Writers</u>	<u>Staff (Including Clerical)</u>	<u>Packets Produced</u>	<u>Reviewers (Sending Comments)</u>	<u>Test Teachers</u>	<u>Number of Student Using Packets (Verified)</u>
1976	15	3.5	6	28	15	11,900
1977	15	4.0	9	35	767	81,050
1978	20	6.5	8-9	92	37	19,800
1979	20	5.5	9-10	26	15	5,280
1980	<u>10</u>	2.5	<u>5</u>	<u>31</u>	<u>54</u>	<u>4,166</u>
Totals	80		37-39	212	888	122,196

c. Steering Committee Review

In addition to the review and testing procedures described, a Steering Committee has provided continuing oversight and review in each year of the PEEC project, meeting at least once in 1976, 1977, 1978, 1979, 1980, and 1981. The Steering Committee was chosen to represent the different segments of the energy-environment community in order that the PEEC materials would be both accurate and

⁽¹⁾ Testing Centers: University of North Dakota, Arizona State University, California State University-Fresno, and Iowa State University.

objective. This group has also provided important pedagogical and policy advice. The members of the Steering Committee, as of 1981, are listed in Appendix 3.

The Steering Committee had two specific tasks: (1) We presented to them for discussion the reviewer reports and revised manuscripts resulting from the previous year's activities; and (2) We put forward for discussion and modification the outlines for the packets which were to be worked on by the summer writing session during that year.

In addition, the Steering Committee gave general guidance, produced technical reviews or identified reviewers, and counseled PEEC on dissemination and on unmet needs in energy education.

d. Publication

The first 15 classroom packets produced by PEEC were printed in large quantity by the DOE and distributed, free of charge, by the Technical Information Center at Oak Ridge. A breakdown of numbers printed and distributed is shown below.

<u>Packet Title</u>	<u>Total Distribution</u>
How a Bill Becomes a Law to Conserve Energy	134,516
Agriculture, Energy, and Society	83,470
Energy, Engines and the Industrial Revolution	103,001
Transportation and the City	97,115
Community Workers and the Energy They Use	145,443
The Energy We Use	45,827
Energy and Transportation	86,760
Mathematics in Energy	94,298
U.S. Energy Policy--Which Direction?	10,221
Energy Transitions in U.S. History	77,406
Networks: How Energy Links People, Goods and Services	51,032
Bringing Energy to the People: Washington, D.C. and Ghana	14,908
Energy in the Global Marketplace	68,659
Two Energy Gulfs	51,853
Western Coal: Boom or Bust?	14,254

With the change in publication policy of the new administration in 1981, no further packets have been published, and several have been withdrawn from publication.

All the remaining classroom packets (the full set of 38 is listed in Appendix 4), however, have gone through the full PEEC developmental process described above and turned into the program office at DOE as finished manuscripts.

NSTA owns the copyrights to the unpublished manuscripts and has made a considerable effort to find ways and means to get them into print. We discuss some of these ideas in the sections which follow and in the conclusion.

2. Fact Sheets

In parallel with our development of the first set of interdisciplinary classroom packets, NSTA undertook to produce brief, concise fact sheets on energy technologies. There were 19 titles in all. These are listed below:

1. Fuels from Plants (Bioconversion)
2. Fuels from Wastes (Bioconversion)
3. Wind Power
4. Electricity from the Sun I (Solar Photovoltaic Energy)
5. Electricity from the Sun II (Solar Thermal Energy Conversion)
6. Solar Sea Power (Ocean Thermal Energy Conversion)
7. Solar Heating and Cooling
8. Geothermal Energy
9. Energy Conservation: Homes and Buildings
10. Energy Conservation: Industry
11. Energy Conservation: Transportation
12. Conventional Reactors
13. Breeder Reactors
14. Nuclear Fusion
15. New Fuels from Coal
16. Energy Storage Technology
17. Alternative Energy Sources: Environmental Impacts
18. Alternative Energy Sources: A Glossary of Terms
19. Alternative Energy Sources: A Bibliography

We saw these Fact Sheets as supplementing the more integrated discussion of energy that was contained in the NSTA Energy-Environment Source Book. The Fact Sheets were more than technical descriptions of the energy technologies. In them we tried to develop the economic, environmental, and social impact of the technologies as well.

The Fact Sheets were much in demand by teachers and were also used by the DOE as a general response to requests for information on energy technologies. All in all, more than two million were distributed.

a. Revisions

We agreed in the proposal submitted in December 1978 to revise the old Fact Sheets, combine some of them, and produce some new ones. The titles of the 20 proposed Fact Sheets on Energy Technologies are listed below.

1. Biofuels
2. Burning Coal
3. Wind Power
4. Electricity from the Sun I: Photovoltaic
5. Electricity from the Sun II: Solar Thermal
6. Oil Shale and Tar Sands
7. Solar Heating and Cooling
8. Geothermal Energy
9. Energy Conservation: Homes and Buildings
10. Energy Conservation: Industry
11. Energy Conservation: Transportation
12. Conventional Reactors
13. Breeder Reactors
14. Nuclear Fusion
15. New Fuels from Coal
16. Energy Storage
17. Centralized Versus Decentralized Energy Production
18. Fuel Cells
19. Energy Technologies: A Bibliography
20. Energy Glossary

These Fact Sheets were developed carefully by the author, PEEC's Project Director, Dr. John M. Fowler (who also wrote the earlier set). Each was independently reviewed by content experts.

They were also submitted to the DOE for internal review. Unfortunately, however, there were policy conflicts within the DOE over the nuclear Fact Sheets, in particular, which were never resolved. With the change in publication policies that accompanied the change in administrations, the new Fact Sheets were never published.

3. Teaching Units

While workshops and meeting presentations can help convince existing practicing teachers to teach about energy, no topic is firmly entrenched in the curriculum until it is in the teacher preparation curriculum. To facilitate this transfer, NSTA convened a group of teacher educators from science, social studies, and mathematics in summer 1980 to produce lesson collections and suggestions for the use of PEEC materials in education "methods" courses.

The participants in this writing session are listed in Appendix 2. The five collections developed from that session are listed below.

Energy in Secondary School Science Teacher Education
Energy in Elementary School Science Teacher Education
Energy in Secondary School Social Studies Teacher Education
Energy in Elementary School Social Studies Teacher Education
Energy Education in Middle/Junior High School
Mathematics Teacher Education

They were used and revised the following year, but met with the same decision not to publish which has hampered our other efforts.

4. Energy-Related Microcomputer Software

The PEEC proposal submitted in July 1981, offered to conduct a writing session to produce microcomputer software with an energy education content. Two such efforts were mounted in the summer of 1981, an elementary level session at George Mason University in nearby Virginia and a high school level program conducted in cooperation with the Technical Education Research Center (TERC) and held at their facility in Cambridge, Massachusetts.

The elementary session, headed by Dr. Helenmarie Hofman of the PEEC staff, was intended to be experimental in order to find out the possibilities and constraints of software design at this level.

This session lasted for only 1 week and did not produce finished materials. Several of the participants, however, continued development of the ideas on their own.

The high school effort resulted in both important experience in developing microcomputer software and in finished materials.

The materials were developed by teams of one high school teacher plus one student programmer working with PEEC and TERC staff. (These writing teams are listed in Appendix 5.) The ideas for software packages were generated and fleshed out during a 3 day meeting, July 6-8, 1981, at TERC headquarters.

The teacher-student teams then worked together using equipment available to them to develop the programs. The draft packages were then reviewed and criticized at a meeting later that summer, August 13-14, 1981, and revised versions were available that fall.

PEEC then made these draft packages available to teacher or teacher educators who could provide feedback. (The list of reviewers is also provided in Appendix 5.) This review and testing process was directed by Mr. Ted Hall, a high school chemistry teacher with a strong microcomputer background, who was a temporary PEEC staff member from June 29, 1981 to December 31, 1982.

a. Publication and Distribution

In order to finish the software packages and make them available to teachers, NSTA entered into a commercial contract with TERC and Human Relations Media (HRM), a software distribution firm.

HRM provided a royalty advance to TERC to refine the programs, edit, and print the documentation. The completed packets are being offered for sale both by HRM and NSTA.

In Appendix 6, we collect the letters arranging for this distribution mechanism with DOE, a copy of the contract between NSTA, TERC, and HRM, and the publicity materials describing the software packages.

The first 6 months of commercial sales shows the initial demand for these software packages to be substantial.

5. Collections

The first 15 classroom packets (as listed earlier) were published and distributed free of charge by the DOE. By 1981, it was clear that this practice would not be followed for the remaining packets.

In a modification to the final grant (#DE-FG05-81ER102⁶~~84~~) NSTA proposed to repackage the lessons from all the classroom packets by grade level and discipline. There are seven "collections," one each at the K-3 and 4-6 grade level, separate social studies and science collections at the middle school/junior high (7-9) level, and three collections at the high school level in social studies, physical, and life sciences.

Since this different format is closer to the usual textbook presentation, it was our belief that our chances of finding private sector support to publish them independently are greater. NSTA has circulated a proposal for support to energy companies based on this repackaging. We are presently negotiating conditions to bring one of these, the high school physical science collection, into final manuscript form and have it printed and distributed by NSTA. If this publication is successful, we will publish other volumes of the collections.

B. Implementation and Distribution

Although they are free, the packets alone cannot imprint energy on the existing curricula. To get them into the possession of teachers and then into the classrooms, workshops were needed. Grade level workshops have been held at most of the annual and regional conventions of the National Science Teachers Association (NSTA) and the National Council for the Social Studies (NCSS) since 1976. We have, in addition, sponsored workshops of our own and made ourselves available to a large number of independently assembled workshops around the country. A list of sites and dates of energy workshops in which PEEC staff have participated can be found in the task completion reports of Appendix 1. At these workshops we try to convince teachers that energy education does have the urgency to require their involvement in it, and that with the materials we've produced, they can teach it.

1. Workshop Handbook

Since it was clearly impossible, as demand for workshops grew over the years, for PEEC to provide staff participation at all of them, we produced an Energy Education Workshop Handbook. This handbook was anticipated in the September 1976 proposal and intended for supervising personnel who conducted "in-service days." As the table of contents below indicates, it provides step-by-step directions.

ENERGY EDUCATION WORKSHOP HANDBOOK

Table of Contents

- Organization of This Handbook
- 1 Introducing the PEEC Packets
- 2 What Are the Facts Behind the Energy Crisis?
- 3 Interdisciplinary Approaches to Teaching Energy
- 4 Infusing Energy Topics into Traditional Subjects
- 5 Adapting PEEC Materials to Regional Interests
- 6 Workshop Planning Aids

The Workshop Handbook was published in 1979, and 18,104 copies were distributed on request.

2. Meetings with Textbook Publishers and Authors

The PEEC classroom packets were primarily intended to be examples which would show teachers and administrators that energy themes could usefully fit into the existing curriculum. But as many studies over the years have established, what dominates curriculum is the textbook. If E/E/E concepts and issues are to remain in the curriculum, they must enter through texts.

Recognizing this fact, the NSTA scheduled a meeting with representatives of science textbook publishers at the annual meeting of NSTA in 1979.

The message from this meeting was clear and disappointing. Although informal surveys in both science and social studies had shown publishers that energy themes ranked high among the teachers' "other interests," publishers were not planning to exert the leadership to bring E/E/E into their texts. The demand had to be demonstrated by curriculum and book selection committees, etc.

Failing a positive response from publishers, NSTA decided to go instead to precollege textbook authors and met with some of them at the NCSS Annual Meeting in New Orleans, Louisiana, November 28, 1980, and at the NSTA annual meeting in New York on April 3, 1981. This was a much more receptive audience, and the classroom examples were rather eagerly carried away by many of them. It is interesting to note in this context, that the example of executive branch decision making in the federal government used in civics books has traditionally been the "Bay of Pigs" affair. After publication of PEEC's U.S. Energy Policy, Which Direction?, which described the development of the first "National Energy Plan" by the the Carter Administration, this topic was used in a newly published civics book.

The dominance of the textbook and its insufficiency as far as E/E/E coverage is concerned, was further documented by the energy education survey we report further on.

3. Reprints and Excerpts

That the PEEC packets, at least those which were reprinted and distributed, accomplished much of their goal of example setting is attested to by the large number of requests for permission to reprint or excerpt large portions of them. And, of course, much use was made of them without permission, since they were in the public domain.

We list in Appendix 7 a non-inclusive listing of some of the records we have of the use of PEEC materials in other materials. They were, in particular, adapted or adopted by many state and local school groups producing energy education materials.

C. Communication and Outreach

1. Energy & Education Newsletter

Materials and workshops are a good start toward a project, but more is needed. We have publicized the existence of the materials and described our philosophy, etc. in journals and newsletters of both NSTA and NCSS. The need for a newsletter specializing in energy education was also soon apparent, and with partial funding from the DOE, such a newsletter, Energy & Education, was born in the fall of 1977. Energy & Education is a bimonthly publication. In its five issues per year, energy educators can find out what is going on and who is doing what around the country. Readers are given a calendar of events, a list of free and inexpensive materials, an editorial from someone with something to say to energy educators, reviews of important energy books, and an energy facts page which keeps them up-to-date on data, etc.

A free publication, Energy & Education began with a mailing list of 10,000, and the circulation grew to a high of 35,000 in June 1980. In the fall of 1980, we required, for inclusion on our mailing list, that a reader fill out a questionnaire. The gamble paid off--by June 1981, we had recovered 15,000 of our readers.

DOE funding for Energy & Education was terminated in June 1981 in response to the reduced publications policy of the new administration. Motivated by our feeling for the importance of this newsletter, NSTA decided to try to continue Energy & Education on a subscription basis at \$9.00 per year for the five issues. We began this policy with the October 1981 issue (Volume 5, No. 1) and have now produced three volumes on this self-sustaining basis. Its present circulation is about 2500.

Energy & Education is in many ways our most important product. It is the one thing that gives a national image to energy education. It's a way for the science teacher, the social studies teacher, or the education manager of an electric utility or an oil company to say to himself, "I belong to that group of people who call themselves energy educators," and to keep up with what is happening in the field. That it still exists in a self-sustaining fashion is strong evidence that energy education is now a stable part of the school curricula. NSTA will make every effort to continue its production.

2. The Regional Energy Education Network, REEN

The final step in the expansion of the early PEEC writing efforts into a full-fledged project was to establish our Regional Energy Education Network (REEN). Since PEEC had grown in stature to a national project, it was clearly important to us to have communication channels to educators in various parts of the country. We needed to find out from them what was going on in energy education there and to let them know about and assist in their use of our materials.

Correspondingly, early in 1978, we established a 24-person Regional Energy Education Network. Twelve of the representatives were NSTA district directors, and 12 of them were social studies people in the same regions. REEN members were, on the whole, quite active in their home regions. They established workshops, they provided a distribution point for the PEEC materials and other materials, and they sent back to us their guidance for what was needed to make energy education work.

The benefit/cost ratio of the network idea was high enough that we were encouraged to seek private sector funding and expand it. We report on the National Energy Education Network project under III. "Related Activities," below.

3. Practitioners Conferences

Growth and the recognition of our national responsibilities caused us to branch out in another direction. While Energy & Education served as a satisfactory mass communication mechanism, we began to feel the need of meeting with the practitioners in the field who were teaching energy and, therefore, meeting the problems of implementing energy education materials head-on.

With DOE funding we held what we called the "First Annual Practitioners Conference on Energy Education" at the University of Maryland in December 1978. This first conference established the format that was followed at subsequent ones. The 60-70 participants were organized into small working sessions and asked to both summarize the state of the art in energy education and to give recommendations for its improvement.

The first conference was one in which internal communication and mutual support were extremely important. It was the first time that many people, who had been doing energy education in isolation in various

parts of the country, were able to come together, share their concerns, and receive the support of others with similar enthusiasm. The first conference was reported in the January 1979 issue of Energy & Education. It seemed to have filled a need, because, early in 1979, we began to receive inquiries about holding the second conference and, with funding from a variety of sources, held it at Rockford College in Rockford, Illinois in late 1979.

The effects of a year's success were noticeable. The participants were more outwardly directed and their recommendations (which are available in a report from NSTA) essentially said to the school districts and state and federal agencies, "Energy education is important, and here's what we need if we are going to continue it."

The upsurge of that confidence and growth was also evident at the Third Practitioners Conference held in November 1980 at the Tennessee Valley Authority's Land Between the Lakes conference center. But this conference was not overconfident; the participants began to look very realistically at the future. The working group reports from that session (and these are also available in a report from NSTA) concern themselves with private and public cooperation, with guidelines for the search for funding, etc. It was already clear to us in November 1980 that the funding picture, which until that time had been largely federally based, was about to change.

The Fourth Practitioners Conference held at the 4-H Center in Washington, D.C., December 10-12, 1981, was the last of these events. It was funded by the DOE through a consortium of energy company associations (the National Coal Association, American Petroleum Institute, American Gas Association, Atomic Industrial Forum, and Edison Electric Institute). PEEC staff carried out most of the arrangements.

Following the general sessions, participants broke into smaller working groups. Most of the conference was devoted to assessing the needs of energy education and to developing guidelines for future growth.

The major conference recommendation was the formation of a national coordinating committee for energy education, to include representatives from the organizations involved nationwide, such as:

Center for Study of Responsive Law
Education Commission of the States
National Council for the Social Studies
National Energy Foundation
National Science Teachers Association
American Gas Association
American Petroleum Institute
Atomic Industrial Forum,
Edison Electric Institute
National Coal Association

The National Council for Energy in Education, described under III. "Related Activities," was a major outgrowth of this coordinating committee.

4. National Conference on Energy Education

Energy education reached, in 1981, a level of professionalism that suggested the usefulness of a national conference, and with partial support from PEEC, a National Conference on Energy Education was held in Detroit on November 22, 1981.

This conference was the first attempt to treat energy educators as a professional entity. It was held simultaneously with the Annual Meeting of the National Council for the Social Studies, and attracted, in addition to the social studies teachers, several hundred science teachers, teachers from other disciplines, and educators from the private sector.

The program included over 60 energy-related concurrent papers and workshops and also featured a 2-day energy film festival sponsored by the American Petroleum Institute.

5. Reports and Articles

Communication with teachers and others interested in energy education took the specific routes described in the above. In addition, NSTA used its journals and those of other professional groups to keep the E/E/E educational challenge highly visible. A list of articles prepared by PEEC staff over the period of ERDA/DOE support is given below.

Fowler, John M. "An Energy-Rich Curriculum--Help Us Evaluate It!" The Science Teacher, December 1976.

Carey, Helen H. "Energy Is Elementary," Science and Children, May 1976.

Kryger, King C. "Some Guidelines for Energy Programs," Today's Education, September/October 1977.

Fowler, John M. "The Energy Elephant," The Journal of College Science Teaching, November 1977.

Fowler, John M. "Energy: Present Problems and Future Potential," Science and Children, March 1978.

Kryger, King C. "How to Harvest a Crisis: Teaching About Energy," Social Science Record, Fall 1978.

Fowler, John M. and King C. Kryger. "Vocational Education and Energy for the Future," VocEd, January 1979.

Fowler, John M. "The Nuclear Equation," Voter, Vol. XXIX, #2, pp. 1-6, Summer 1979.

Hofman, Helenmarie. "The Role of Educators in Today's Energy Problem," Chemistry in the Two-Year College, Vol. XX, 1979.

Hofman, Helenmarie. "Energy Crisis--Schools to the Rescue Again," School Science and Mathematics, 1980.

Fowler, John and Helen Carey. "Energy and the Social Studies: A Match That Works," The Social Studies, 1980.

Fellows, Julia A. "Energy and the Curriculum: An Infusion Process," Intercom, No. 98, July 1980.

Hofman, Helenmarie. "Energy Crisis--Schools to the Rescue Again," School Science and Mathematics, October 1980.

Carey, Helen H. and John M. Fowler. "Teaching Energy Issues in the Social Studies," The Education Digest, October 1980.

Fowler, John M. "A Lot of Energy at the NSTA," Contemporary Education, March 1981.

Fowler, John M. "A Lot of Energy at the NSTA," Contemporary Education, Vol. 52, No. 2, Winter 1981, pp. 73-77.

Fowler, John M. "Energy Education and the Environment," Environment, May 1981, pp. 40-42.

Hofman, Helenmarie and Lynn W. Glass. "Three Studies for Evaluating Energy Education Curriculum Materials," School Science and Mathematics, June 1981.

Fowler, John M. "Energy Education in the United States," New Trends in Physics Teaching, 4, UNESCO series, to be published in 1984.

PEEC activities and workshops were also held at national and regional meetings of NSTA and NCSS and at the meetings of several other organizations. Meeting presentations, titles, and authors of the major examples of such presentations are listed in the task completion reports of Appendix 1.

D. Evaluation

While the reviews and classroom testing described earlier constituted formative evaluation, NSTA has conducted no evaluation of the student or teacher response to the PEEC materials, nor is it appropriate that the producer of the materials conduct such evaluation.

In 1979, the DOE did provide some funds to Battelle in Columbus, Ohio to perform a preliminary evaluation of DOE's energy education products including the NSTA classroom materials that were in print and available at that time.⁽²⁾ The study consisted of teacher interviews and a questionnaire which was mailed to a random sample of 12,000 secondary level science, social studies, and mathematics teachers.

While the survey showed that the large majority of the teachers at the time did not know of the existence of the NSTA materials (or of any other energy education material), from the interviews and the questionnaire returns two very positive results did emerge:

⁽²⁾ Review and Evaluation of DOE Energy Education Curriculum Materials, Prepared by Battelle, Columbus, Ohio 43201, U.S. Department of Energy, Office of

- Of the teachers reporting that they have received and have in hand energy education materials, about two-thirds of them actually use the materials in their classes. This is true for teachers receiving the NSTA developed materials, as well as for teachers receiving Oak Ridge developed materials. For the one-third of the teachers receiving but not using the materials, principal reported reasons for non-use included limited class time available and lack of time to evaluate the materials.
- Teacher users of the materials generally provided a favorable evaluation of the materials. Both teacher-users of Oak Ridge and teacher-users of NSTA-developed materials generally reported:
 - High student interest levels in the materials and that the materials are related to their students' experience and background;
 - That the materials are relevant to both their students' information needs and geographic regions;
 - That students achieve the learning objectives of the materials;
 - A relatively high impact of the materials on students' awareness and understanding of the energy situation;
 - That the reading and technical levels of the materials are appropriate to their students;
 - That the materials fit into existing units or subject matter taught, and with most teachers reporting no additional teacher training required for effective use of the materials.

Evidence of the success of NSTA materials can be found elsewhere. In a study conducted by the Education Commission of the States⁽³⁾ it was found that the energy education program most frequently recommended by State Education Agencies was the NSTA-PEEC.

In a study of economic concepts and energy carried out in 1981 for the Joint Council on Economic Education by the Center on Economic Education, Curry Memorial School of Education, University of Virginia, there are two references to the PEEC materials. First:

⁽³⁾ The Status of State Energy Education Policy: Final Report, Prepared for the Education Commission of the States by Energy Information Associates, Inc., Littleton, CO (provided through Grant #EU-78-G-01-6241 from the U.S. Department of Energy) September 11, 1978, p. 7.

When asked to suggest or recommend useful materials to use in economic/energy studies only seven titles were suggested more than once by the numerous respondents:

- Energy, The Environment and the Economy (numerous titles) prepared by the National Science Teachers Association for the Department of Energy^(a)
- Indiana Curriculum Guide I-II, Middle Grades
- Energy Trade-Offs in the Market Place, Washington Council on Economic Education
- Economics and the Energy Problem, JCEE
- Energy and Economics, BFA
- Background Series, Exxon

(a) This series is not likely to continue in production and distribution. Some of the developed but not yet distributed materials have become more economics oriented--particularly a few that are more economic analysis.

Second:

The Department of Energy, working closely with the National Science Teachers Association and the National Council for the Social Studies, has a remarkably fine record in producing energy education materials for science, social studies, mathematics and consumer education classrooms. Some of their recently produced (but not yet published) materials have demonstrated greater concern for economic issues in energy. In addition, they have been investing significant dollar amounts in teacher education institutes (DOE Faculty Development Program)-- some of these institutes were devoted to economics and energy. It is highly unlikely that either materials productions or teacher institutes will be continued beyond fiscal year 1982.

1. A Survey of the Penetration of Energy Education into the Classroom

In 1982, the DOE provided funds to the PEEC project to survey several groups of teachers and school administrators to find out about the amount of energy education taking place in the schools and to identify incentives and barriers to its further penetration.

The survey was conducted by Educational Research Service, Inc. of Arlington, Virginia. Seven randomly selected groups of 1000 each were given questionnaires—elementary school teachers, secondary school teachers of science, social studies, mathematics, and home economics, elementary and high school principals.

About 20% responded. These responses support the conclusions of other studies, and a substantial number came from those who do not teach energy. Thus there is no apparent reason to think that the respondents differ significantly from the general population.

A full accounting of the survey results is given in the report, "Energy Education in the Schools," Janet A. White and John M. Fowler which is provided as Appendix 8. Among the highlights of this report are the following conclusions:

Energy topics were taught by well over half of the teachers responding. Teachers and principals overwhelmingly support energy education. More than 90% agree that topics like basic energy knowledge, energy problems, and the future of energy should be part of every school's curriculum. Forty-three percent of elementary teachers and 60% of secondary teachers report that student knowledge and awareness of energy issues is poor.

Teachers create more than 60% of the supplementary materials they use. This seems to be the product of several factors including:

- dissatisfaction with textbooks;
- a perceived lack of support;
- personal commitment.

An overwhelming dissatisfaction with the treatment of energy in textbooks is reported. Although 47% of those who teach energy use textbooks to do it, 63% find textbook coverage inadequate.

Teachers perceive a lack of support from the state district or school administration. Despite the strong agreement of principals and teachers that energy should be part of the curriculum, nearly 80% of all the respondents report little/no district emphasis on energy concepts/issues in curriculum policy or guides. Furthermore, 68% of elementary teachers and 83% of secondary teachers report no emphasis from their principals.

Seventy percent of those who teach energy said that personal conviction is a major incentive; 38% of those who do not teach energy said that personal conviction would be a significant incentive.

The most frequently taught energy topics are conservation (90%); production technologies (conventional, 63%, renewable, 59%); energy-environment interaction (54%); and economics (44%).

Materials from business and industry are used by 48% of those who teach energy.

The most significant barrier to teaching energy is that it is not specified in the curriculum (57%).

A major incentive to those who do not teach energy would be the availability of good free or inexpensive materials (54%).

To individuals and organizations who have been trying to infuse energy concepts and issues into school curricula, the survey results were clear. The schools offer a fertile field ready for cultivation. Education about the energy situation is recognized as important, and student knowledge is seen as deficient. What teachers ask for as inducement to undertake this high priority task are definite curricular requirements, more (and better) free and/or inexpensive materials, and encouragement from their principals. Principals believe that they do support energy education; they must be encouraged to effectively communicate their support to teachers.

It is hoped that the results of this survey will help energy education maintain the impressive momentum it shows. While these results were part of a report to the U.S. Department of Energy, which contributed importantly to the growth of this momentum, little help can be expected from that source in the future. Teachers themselves will, no doubt, continue to be the most important resource. Administrators, professional organizations, and the private sector must more effectively implement their support--"put their money where their mouth is"--to help teachers do this still important educational task.

It is also much to be desired that the survey be repeated in 1984 or 1985 to gauge the schools' continuing commitment to the important E/E/E themes and issues.

III. RELATED ACTIVITIES

The PEEC staff participated in several other activities which while not supported by the project funds, owed their existence at least in part to the experience and central communication the PEEC effort provided. Among these were the National Energy Education Network project, the International Conference on Energy Education, and the companion project to PEEC at NSTA in 1977-78 to produce discipline specific classroom materials.

A. The National Energy Education Network

In 1981, NSTA, in cooperation with the Education Commission of the States, circulated to a number of energy companies a proposal to create a National Energy Education Network. Sufficient funds were provided to hold three regional meetings, in Minneapolis, Minnesota for the Midwest, in Houston, Texas for the Southwest, and Madison, Connecticut for the North-eastern region.

These meetings not only exposed the key energy educators for the states in each region to energy education techniques and materials, but also built up contacts and acquaintances within and among the states. With the depletion of both federal and state funds, these contacts and the mutual support they provide have done much to keep energy education alive.

B. The International Conference on Energy Education

Under sponsorship from a global group of energy industries, an international conference on energy education was held in Gatlinburg, Tennessee in June 1982 in connection with the World's Fair in Knoxville, Tennessee. I quote from Energy & Education:

The International Energy Information Forum and Workshop for Educators, held June 10-12, 1982 in Gatlinburg, Tennessee, concentrated on the responsibility of educators to help future citizens become aware of energy problems and their interrelationships. Workshops on themes such as energy resources and technologies, international energy issues and the environmental, economic and social aspects of energy provided a context for discussing educational concerns.

Thirty-five nations were represented. General sessions provided an opportunity to present developments in energy and energy education in 14 countries. Small "crackerbarrel" sessions facilitated discussions between conferees and conference leaders.

The International Energy Forum was coordinated for the 1982 World's Fair by Southern Science Applications, Inc., a division of Black and Veatch, Dunedin, Florida.

The PEEC materials were a prominent part of the materials packet distributed. John M. Fowler, PEEC Project Director, served on the Conference Advisory Committee and was the U.S. representative in the forum's "talk show style" presentation.

C. Discipline Specific Classroom Materials

In 1977, ERDA put out an RFD for an "Energy Education Materials Development" project. With the PEEC experience and mechanisms, NSTA with the National Council for the Social Studies cooperating, was the successful bidder. Four teaching units were developed, one each for science

and social studies at the 4, 5, and 6 level and at the 7, 8, and 9 level. These units, as specified in the RFP, dealt with energy conservation, fossil energy, nuclear energy, including fusion, and solar energy.

The four packets listed by title below were produced by teacher-writers and carried through the PEEC style, editing, review, testing, revision, and publication cycle.

How We Make Energy Work
The Energy Dome
The Energy Future Today
Energy Systems, Present-Future ("Extraterrestrials")

IV. CONCLUSIONS AND RECOMMENDATIONS

Energy Education in 1981 seemed to have accomplished the difficult feat of reaching its apex and nadir essentially simultaneously. According to its sponsors, National Energy Education Day (NEED) was celebrated on March 20 in some 10,000 schools; proclamations were signed by 47 governors, and several million students were made aware, at least for one day, of our energy situation. There was an International Conference on Energy Education sponsored by the University of Rhode Island in August, the Fourth Annual Practitioners Conference on Energy Education was held in October, the first (and only) National Conference on Energy Education in November, along with the Midwestern National Energy Education Network meeting. It was ironic that this year of high visibility coincided with a major change in the nature, and the level, of funding for energy education. Changes in the budget of the DOE not only reduced the small budget of the Education Division from \$5 million in FY 1981 to \$1.7 million in FY 1982, but more importantly, terminated (effectively) the Energy Extension Service and the block grants--the State Energy Conservation Program, for instance--which provided most of the funds which states used to fund energy education. And most states, having suffered revenue shortfalls in 1980, not only could not pick up the slack, but also initiated further cuts. The large reduction in 1982 funding for the DOE's

Conservation and Renewable Energy programs will eliminate most of the money supporting solar energy education. All in all, federal/state support for energy education in 1981 was perhaps one-tenth of its previous level. The oil companies, once strong supporters, were forced by the 1981-82 recession to cut back, and again education support suffered.

The reduction in the capabilities of groups like NSTA and the disappearance of the state energy education coordinators, who were supported by the block grants, leaves several questions whose answers will determine the future of energy education as an identifiable national endeavor.

Questions

1. Personnel Support: With the reduction in federal and state support, who will provide the communication, coordination, planning, and general leadership now provided by energy educators in state energy or education agencies, and in national organizations such as the National Science Teachers Association, National Council for the Social Studies, and Education Commission of the States?
2. Networking: Where will support be found for the local, regional, and national meetings that allow energy educators to share experiences and make efficient use of multiple efforts? Will there be support for a clearinghouse of energy education materials and resource people? Will there be support for a newsletter?
3. Teacher Training: Where will support be found for the teachers workshops which are so necessary to the introduction of a new topic like energy into the curriculum? Where will the knowledgeable staff come from?
4. Materials Development: How can it be assured that the broad range of viewpoints on the complex economic, environmental, and social energy-related issues will be incorporated into energy education materials? In an era of quick change, how can these materials be kept up-to-date?

5. Evaluation: Should the commercially produced energy education materials made available to schools and teachers be evaluated as to accuracy, objectivity, and pedagogical effectiveness? Who should perform this function?

We hope that the private sector, the electric and gas utilities, oil companies, coal companies, and all the other companies, whose major product or raw material is energy, will pick up some of the slack. There is some optimistic evidence to support this hope. The energy industry associations have all increased their activity. The Edison Electric Institute, for instance, holds an annual meeting of utility education representatives to discuss their energy education activities. The American Petroleum Institute has formed a subcommittee on education and is considering several major projects. The American Gas Association produces classroom materials and sponsors "energy vans" which tour schools in several states. The National Coal Association and Atomic Industrial Forum also produce occasional energy education materials.

A. Creating a Lasting Structure

NSTA through PEEC concentrated its efforts in 1982 and 1983 on trying to provide a structure for energy education which would preserve its momentum in spite of the cutback in support and activity at the national level. Our efforts had two broad goals: to reinforce the already strong grassroots efforts and to create some national level forum which would provide the coordination and synthesis which the PEEC staff had provided for seven years.

There are two prongs to the grassroots approach. The Network project described earlier was designed to make connections between the "doers" in the states. Networking, if strongly begun, can continue on its own.

The other prong is the newsletter, Energy & Education, for which NSTA has accepted responsibility as long as it is self-sustaining. Energy & Education finished strongly in 1984, its third year without DOE subsidy. In April, the

second annual Directory of Energy Education Materials, grown from 8 to 12 pages, was published. Energy & Education is the only newsletters that bring the diverse community of energy educators news of what is happening. In a very real sense it is the symbol of energy education.

The task of creating a national level coordinating mechanism which would give educators from schools, colleges, industries, and state agencies a place to look for information, is, given the funding drought, a difficult one. A beginning on it was made at the last Practitioners Conference by the formation of a broad "organizing committee" (see earlier discussion). The first meeting of this group took place in March 1982 as reported in Energy & Education, April 1982 below:

An organizing meeting for the National Council for Energy in Education was held in Washington, DC on March 4 to develop guidelines for the new group. Organizers included representatives from energy trade associations, educational associations and consumer groups. The formation of the council was recommended at the Fourth Annual Practitioners Conference on Energy Education held last December.

According to the new guidelines, the National Council for Energy in Education will be composed of organizations interested in energy education. Its purpose will be to 'stimulate communications and cooperation among organizations in order to strengthen a continuing national effort to open the curriculum to energy concepts and issues.'

The guidelines also state that the council:

- 1) will encourage balance and diversity of views;
- 2) will not advocate one energy source or strategy over another;
- 3) will not take political positions;
- 4) will not endorse specific products or activities of organizations.

The council functions will include organizing and supporting a national energy education clearinghouse and compiling bibliographies of publications, speakers bureaus, conferences and policy recommendations; planning and obtaining support for a 5th Practitioners Conference; cooperating with existing networks; and encouraging incorporation of energy concepts and issues in curriculum revisions.

Representation on the council is open to all organizations interested in energy education whose membership consists of other organizations, agencies or individuals. Individual companies, schools and political entities may be represented by their national organizations.

The NCEE held meetings on May 25, 1982, December 14, 1982, May 19, 1983, and September 22, 1983. While it has now been somewhat inactive for several months, it does exist as a useful central body if interest in and the need for action in energy education should begin to grow again.

B. The Unpublished Materials

The most frustrating and inefficient aspect of the PEEC operation stems from the abrupt change in publication policy at DOE. PEEC was bound by the terms of its contracts and grants to produce manuscripts for 20 Fact Sheets on Energy Technologies and 20 or so classroom packets (in addition to the 15 which were published and distributed by DOE). But there no longer existed a mechanism for printing and distributing these materials.

NSTA circulated a proposal to several energy companies seeking funds to enable us to get these materials to teachers. In that proposal we gave the following summary of the publication worthiness of PEEC materials.

It is, therefore, appropriate to ask what special features make the PEEC materials unique and worthy of production. There are several general advantages of these materials. Among them are the following:

- The development and testing, which was supported by a significant amount of public money, is completed. The money sought will be spent largely in production. Thus, investment in PEEC materials will be very cost effective.
- The materials benefit from the reputation and credibility of the NSTA; thus, it is easier to gain teacher acceptance of them than of commercial material.
- The NSTA and the organizations with which it cooperates have existing channels and networks for distribution. Through the journals of the NSTA and NCSS, and through the NSTA newsletter, Energy & Education, the availability of the materials can be broadly publicized.
- The PEEC materials are already well-known and respected. Even though the complete set of classroom materials is not yet in print, many teachers are familiar with them through workshops and summer institutes at which draft materials were described or used.
- The PEEC materials are broader in coverage than any of the commercial materials. Not only do they cover grade levels K-12, but they are also interdisciplinary in content and thus deal with all the energy-related issues--energy production and consumption, and the associated environmental and social effects. The economic interconnections of these topics are strongly emphasized.

1. Teacher Demand

That the PEEC materials are desired by teachers is supported by the popularity of the 15 packets that were printed. About 1½ million of them were distributed on request. The limited studies which have been made also underline the fact that teachers want these materials and use them on receipt. In spite of the fact that we are no longer advertising the unpublished materials, there is a continuing flow of requests for them. More generally, a recent survey of random samples of principals and teachers shows that about half the nation's teachers are teaching about energy (the mean is 8 classroom hours), that 90% of teachers and principals think that energy education is important, and that good, inexpensive materials are much needed (see earlier discussion).

The circulation of this proposal resulted in enough money for NSTA to produce one of the seven collections. The response of the education market to this publication will guide further publication efforts.

C. Summary

The 6 years or so of active support of energy education by the DOE through NSTA achieved most of its goals. There was a massive demonstration that energy/environment/economics topics could be infused into the school curriculum through both social studies and science courses. This infusion took place both directly through teacher use of the DOE supported classroom materials and indirectly through adaptation, excerpting, and reprinting of PEEC materials by other curriculum development groups.

As PEEC became more visible, and as the need for energy education became more apparent in the late 1970's, the project activities became a nucleus around which an energy education community began to coalesce. PEEC aimed some of its activities at giving energy education a professional self-image with a newsletter, conferences, etc. Attendance figures, requests for materials, the network meetings, and the survey results. all attest to at

At the time of this Final Report, the state of energy education seems to be the following.

There are still a number of teachers who are committed to energy education, and it is unlikely that the curriculum will ever again be as empty of E/E/E concepts and issues as it was in 1973-74. These teachers still preserve some connection nationally through Energy & Education and through the large number of presentations on energy still taking place at NSTA and NCSS annual meetings (and NSTA regional meetings). Networking connections between these teachers at the local level are continued by, among other mechanisms, utility-funded workshops.

Support for E/E/E materials and workshops is now obtained largely from the private sector, although some state energy offices continued to have strong energy education programs through 1983. The utilities are the strongest private sector backers, although there is still some strong oil company interest in these programs.

The shortage of E/E/E materials is no longer the central problem it once was. There are now several sets of commercially developed classroom materials available or in preparation. These include the EME⁽⁴⁾ materials, the Energy Source Project,⁽⁵⁾ Energy '80,⁽⁶⁾ Captain Power and Aunt Energina,⁽⁷⁾ on the West Coast, as well as other materials produced by the oil companies, the electric and gas utilities, and the industry trade associations.

⁽⁴⁾ Edward Dalton, President, Energy and Man's Environment, 4980 West Amelia Earhart Drive, Salt Lake City, Utah 84116.

⁽⁵⁾ Ernest Roberson, Project Co-Manager, San Diego Gas and Electric Company, P.O. Box 1831, San Diego, CA 92112.

⁽⁶⁾ John Lord, Project Director, Enterprise for Education, 10960 Wilshire Boulevard, Suite 2134, Los Angeles, CA 90024.

⁽⁷⁾ Robert Johnson, Partner, Innovative Communications, Inc., 2923 North Main Street, Walnut Creek, CA 94596.

Even with unprecedented cooperation and support from the private sector, however, energy education is likely to continue to change drastically over the next years. There are areas in which the energy companies operate with little or no enthusiasm: the environmental and negative social impact of energy policy will be difficult to present objectively; some industries wish to emphasize production over conservation; the nuclear controversy will be difficult to handle in classroom materials; and questions 1, 3, and 5 (see above) fall outside the usual pattern of private sector support.

Energy education, like the energy situation itself, is going through a tumultuous transition in the U.S. But energy education is well underway, and thousands of teachers are participating. The new mood in the country, however, has slowed its momentum as the federal push has weakened.

It may be, however, that the task taken on by those who call themselves energy educators is nearer successful completion than we realize. It may be that we have already demonstrated to teachers that energy themes can fit easily into the curriculum in many places. Perhaps the examples that have been developed will lead to a steady stream of both more and more sophisticated materials from teachers and textbook authors.

Energy has two powerful advantages that may keep it alive in the curriculum even without separate funds for its support.

- The energy problem is perhaps, at present, the most crucial challenge to our species.
- It is pervasive and effects everything we do--and thus all that we teach about.

At least we hope that science educators won't forget it for a while, and that for our students energy will never again be only that nebulous thing conserved in collisions of frictionless pucks and swinging pendula. Energy,

viewed as the necessary input to biological cycles and industrial cycles, energy which is bought and sold, whose amount and quality both need to be measured and conserved, and whose availability effects national and international security, economic welfare, environmental quality, and the quality of life itself, should remain an inescapable connection between science and all the other disciplines. The examples PEEC has produced not only illustrate these connections, but illustrate to students the way the scientific disciplines can illuminate and point toward solutions of social problems. The PEEC classroom packets and similar lessons produced elsewhere could be the leading edge of the more "relevant" teaching desired of a revitalized science education. If this happens, energy education will continue.

PHASE I

RE: ERDA Contract EX-76-C-76-3841
Phase 1

Report on Task Completion

Task #3 - Fact Sheets

"Contractor will compile at least 19 four-page fact sheets on the energy technologies stressed by ERDA-48. These are to be made available free of charge upon request from teachers. 2,000 copies of each are to be prepared for distribution.

The following titles have been produced:

1. Fuels from Plants (Bioconversion)
2. Fuels from Wastes (Bioconversion)
3. Wind Power
4. Electricity from the Sun I (Solar Photovoltaic Energy)
5. Electricity from the Sun II (Solar Thermal Energy Conversion)
6. Solar Sea Power (Ocean Thermal Energy Conversion)
7. Solar Heating and Cooling
8. Geothermal Energy
9. Energy Conservation: Homes and Buildings
10. Energy Conservation: Industry
11. Energy Conservation: Transportation
12. Conventional Reactors
13. Breeder Reactors
14. Nuclear Fusion
15. New Fuels from Coal
16. Energy Storage Technology
17. Alternative Energy Sources: Environmental Impacts
18. Alternative Energy Sources: A Glossary of Terms
19. Alternative Energy Sources: A Bibliography

We have distributed copies to those on our mailing list. These Fact Sheets are now being reprinted by ERDA.

PHASE II

PROJECT FOR AN ENERGY-ENRICHED CURRICULUM

PHASE II

Task Requirements

Task 1: Select Working Groups

completed
7/76

Select 3-working groups (elementary, middle school and high school, with members from science, social studies, humanities). Arrange for their location at University of Maryland, College of Education. Provide them in advance with the fact sheets, the Phase I articles, and the NSTA Energy-Environment Materials.

Task 2: Conduct Working Sessions

completed
7/76

Beginning with an internal planning session, working groups will meet for 1-day with winning teachers from Task 4 (Phase I). In cooperation with Director and Associate Director (and with Steering Committee guidance) each working group will select two energy themes for development into mini-unit during the summer. In all cases mini-units will be designed for insertion at a specific place in a specific course. They will be complete and ready to use. Working sessions to last for three months.

Task 3: Review of Mini-Units

completion
Report
attached

Mini-units will be reviewed by the Director and Associate Director of the project who will provide both content and editorial input at all stages of development. When mini-units have satisfied staff review procedures they will be sent for review to selected teachers. The teacher-author of the idea, if it has been chosen from the competition, will be included as a reviewer, and receive a \$25.00 fee for this service. This final review will focus on the usefulness of the mini-units in actual classroom use.

Task 4: Mini-Unit Production

completion
Report
attached

1,000 copies of each mini-unit package will be prepared for broader testing. Each package will include, in "spirit-master" and file folder format, a teacher's guide of approximately 12 pages and a student activity text of approximately 8 pages.

Task 5: Planning of Phase 3

completed
11/76

Steering group shall meet to plan implementation, testing, evaluation and revision of mini-units.

RE: ERDA Contract EX-76-C-10-3841
Phase 2

Report on Task Completions

Task #3 - Review of Mini-Units

"Mini-units will be reviewed by the Director and Associate Director of the project who will provide both content and editorial input at all stages of development. When mini-units have satisfied staff review procedures they will be sent for review to selected teachers. The teacher-author of the idea, if it has been chosen from the competition, will be included as a reviewer, and receive a \$25.00 fee for this service. This final review will focus on the usefulness of the mini-units in actual classroom use."

The following teachers have reviewed the mini-units:

James Carpenter
Largo Senior High School
505 Largo Road
Upper Marlboro, Maryland

Joyce Dandridge
Central Area Office
Prince Georges County Public
Schools
Upper Marlboro, Maryland

James V. DeRose
Head of the Department of Science
Marple-Newtown Schools
120 Media Line Road
Newtown Square, Pennsylvania 19073

Dr. Henrt Heikkien
Assistant Professor of Chemistry
and Secondary Education
The University of Maryland
College Park, Maryland 20742

Barry W. Jamason
248 Cheshire Court
Voorheesville, New York 12136

Marilyn D. Lucas
Chemistry Teacher
Euclid Senior High School
711 E. 222nd Street
Euclid, Ohio 44123

Dr. Robert Ridkey
Science Teaching Center
The University of Maryland
College Park, Maryland 20742

Dr. Emmett Wright
Science Teaching Center
The University of Maryland
College Park, Maryland 20742

Task #4 - Mini-Unit Production

"1,000 copies of each mini-unit package will be prepared for broader testing. Each package will include, in "spirit-master" and file folder format, a teacher's guide of approximately 12 pages and a student activity text of approximately 8 pages."

1,000 copies of each of the six units have been produced and distributed. Additional copies have been printed and disseminated

PHASE III

PHASE III
ENCLOSURE II

SCOPE OF WORK FOR PHASE 3

Analysis and Planning

- Completion
Report attached*
1. A. Conduct a study, including literature search and meetings with consultants, to determine the answer to the following questions:
 - a. What are the 30-40 most important Energy/Education/Economics (E/E/E) themes which should be a part of the K-12 students' learning experience?
 - b. Where are the spots within the K-12 curriculum where these themes can be introduced and will be most likely to be used as a part of existing curricular goals?
 - B. Compile the results of the study into a draft report, "Energy Curriculum Overlap Matrix" (ECON).
- Completion
Report attached*
2. A. Establish a Steering Committee with spokesmen from various segments of education, industry, public interest groups, etc., and meet with them to obtain advice and make sure that all points of view are adequately represented.
 - B. Present draft ECON Report to Steering Committee and revise, selecting packet goals for summer writing workshops. Present fifty (50) copies of the revised ECOM Report to ERDA.

Field Test

- Completion
Report
attached*
3. A. The following materials developed by the Summer 1976 Working Group are to be field tested by at least 100 teachers in actual classroom use.
 - a. Elementary School

The Energy We Use	Grade 1
Community Workers & The Energy They Use	Grade 2
 - b. Junior High (Middle School)

Energy, Engines, and the Industrial Revolution	Grade 8
Transportation and the City	Grade 8-9
 - c. Senior High School

Agriculture, Energy and Society	Grade 10-12
The 55 MPH Limit: How A Bill Becomes A Law	Grade 9-11-12

B. NSTA will develop and provide an evaluation instrument for field testing.

- Completion Report
attached* 4. A. Revise Summer '76 materials according to classroom test results.
B. Submit materials to ERDA for final review.

- Completion Report
attached* 5. NSTA will plan and secure commitments for field testing of Summer '77 materials from approximately 200 test schools.

Publication

- Completion Report
attached* 6. NSTA is to provide ERDA with 100 copies of the six units as revised in Task 4. ERDA reserves the right to offer the copyright to NSTA or a commercial publisher as specified in ERDA Manual Appendix 3207, and/or to publish and disseminate the material through government channels.

Journal Articles

- Completion Report
attached* 7. The involvement of the teaching community will be stimulated through periodic articles in professional journals. At least one article will be placed, if necessary at NSTA expense, in each of the following: Science and Children, The Science Teacher, The Journal of College Science Teaching (NSTA), Social Education (NCSS), and if possible without cost in other journals such as Today's Education (NEA), Learning, The Instructor, Teacher, and Grade Teacher, as well as various newsletters. Ten (10) copies of each article published shall be provided to ERDA.

Workshops

- Completion Report
attached* 8. A. The NSTA will stimulate teacher involvement by conducting workshops on energy education at the NSTA Annual Meeting (March 1977; at Cincinnati, Ohio).
B. Four similar workshops will be offered to NCSS conventions and other organizations such as AAAS. If these groups are willing, NSTA will assist in such workshops.

Completion Report 9. attached The NSTA will plan and conduct at least 10 inservice workshops in various school districts.

Completion Report 10. attached A. The NSTA will prepare a Workshop Handbook which will enable local school district personnel to conduct energy education inservice workshops.

B. The Workshop Handbook will be revised according to actual workshop experience.

Completion Report 11. attached The NSTA will publish 300 copies of the Workshop Handbook and distribute them to science and social studies supervisors on request. Twenty copies will be sent to ERDA.

Develop New Materials

Completion Report 12. attached A. The NSTA will select and hire 12 teachers from appropriate grade levels and disciplines and conduct an eight week working session during the Summer of 1977, providing necessary guidance and direction, supervision, office equipment and space, clerical support, etc. This group is to produce eight to ten new packets, according to the goals in the ECOM Report (Task 2).

- B. The materials will be reviewed by teachers and produced in sufficient quantity and quality for field testing by approximately 200 test schools. Twenty (20) copies of each packet shall be provided to ERDA.
- C. This group will produce four to five draft instructional packets during the first four weeks of the working session.

Completion Report 13. attached A. The Summer 1977 working group will produce four to five draft instructional packets during the second four weeks of the session.

B. Each of the instructional packets will be reviewed by at least three non-project teachers.

Implementation Plans

14. The NSTA will meet with educational publishers to discuss these materials, and energy education in general. The goal of this meeting will be: (1) to encourage publishers to begin to include important E/E/E themes in their own products, and (2) to obtain their advance in presenting those materials to the educational market.

Final Report

- Completion Report
attached
15. At the end of 12 months, NSTA shall submit a summary of activities for the entire period, including a list of publications issued during the total term of the contract and copies of any not previously submitted, as well as a comprehensive evaluation of progress in the area of research supported by the contract.

RE: DOE (ERDA) Contract #EX-76-C-10-3841

Phase III

Report on Task Completion

Task #1:

- "A. Conduct a study, including literature search and meetings with consultants, to determine the answer to the following questions:
 - a. What are the 30-40 most important Energy/Education/Economics (E/E/E) themes which would be a part of the K-12 students' learning experience?
 - b. Where are the spots within the K-12 curriculum where these themes can be introduced and will be most likely to be used as a part of existing curricular goals?
- B. Compile the results of the study into a draft report, "Energy Curriculum Overlap Matrix (ECOM)."

The development described in Task 1 has been an integral part of the PEEC effort. It is now complete and was discussed at the most recent PEEC Steering Committee meeting, 26 May 1978.

The Draft Report which is called for in Part B of Task 1 has been completed. It is submitted as an attachment to the Task #2 statement which accompanies this one. It consists of the following sections (included with each section title is a brief description of its contents).

- I. Introduction (How the analysis of E/E/E topics proceeded; the role of consultants, etc.)
- II. Summary of Existing Packets
 - A. Grade-Range Matrix (Grade levels covered by the fifteen existing packets)
 - B. Energy Topic Matrix (The correlation of grade ranges, existing packets, and the major E/E/E topics)

II. (continued)

C. Energy/Social Studies/Science Content of Existing Packets (a one-page summary of each existing packet which describes its coverage of energy, social studies, and science topics)

III. Major Concepts for Energy/Environment/Economics Education (A descriptive listing of major E/E/E ideas which should receive attention in the K-12 curriculum)

IV. Conceptual Structure in Science Instruction (A listing of the major conceptual schemes in K-12 science instruction with a breakdown by topic; examples at the primary, intermediate, middle and secondary level)

V. Social Studies Concepts and Topics by Grade Level (A listing of the social studies topics that are prominently considered in various grade levels)

VI. Proposed Packets (A listing and brief description of some of the packets proposed for development during the remainder of the project)

VII. New Energy Topic Matrix (The matrix of II-B updated to include the newly proposed packets)

This draft report represents the work of PEEC staff over the past year. The extent of the literature search is indicated to some extent in the introductions to items IV and V of the attached draft report. The study benefitted from discussions with several consultants including:

Dr. Joseph M. Cirrincione
University of Maryland

Dr. Helenmarie Hofman
University of Virginia

Barry W. Jameson
New York State Department of Education

Dr. Ronald G. Klietsch
System Factors, Inc.
St. Paul, Minnesota

Dr. F. James Rutherford
New York University

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Dale Wescott
Solar Energy Education Project
State University of New York

The section "Major Concepts for Energy/Environment/Economics Education has been discussed with several individuals and groups. The participants at the Planning Conference for the Regional Energy Education Network in Boulder, Colorado, 17 March, 1978 were invited to comment on it. It was also sent to the following energy content experts for comment:

Kenneth Boulding
Institute of Behavioral Science
University of Colorado

Wilson Clark
Energy Advisor
Governor's Office, California

Paul P. Craig
Director, Council on Energy & Resources
University of California

Goéry Delacôte
Laboratoire Interuniversitaire De Recherche
Sur L'Enseignement Des Sciences Physiques Et De La Technologie
Universite Paris VII

John Gibbons
Director, Environment Center
University of Tennessee

Denis Hayes
World Watch Institute
Washington, D.C.

Alvin M. Weinberg
Director, Institute for Energy Analysis
Oak Ridge Associated Universities

In its present form the Major Topics for E/E/E is our basic working document, but it is subject to revision based on our continuing experience.

We consider the study and analysis described in Task 1 as an ongoing task. We have, however, now completed enough of those activities specified in the task description to consider the basic requirements as having been met.

RE: DOE (ERDA) Contract #EX-76-C-10-3841

Phase III

Report on Task Completion

Task #2:

- "A. Establish a Steering Committee with spokesmen from various segments of education, industry, public interest groups, etc. and meet with them to obtain advice and make sure that all points of view are adequately represented.
- B. Present draft ECOM Report to Steering Committee and revise, selecting packet goals for summer writing workshops. Present fifty (50) copies of the revised "Energy Curriculum Overlap Matrix (ECOM)."

Two Steering Committee Meetings have been held during the past year, one in June 1977 and one on May 26, 1978. The members of these two groups are listed in attachments 1 and 2.

The first of these meetings (June 1977) was focussed for the most part on content rather than on the analysis featured in the task description above. In the morning, however, a small subset of the Committee participated in a review of the PEEC materials and plans and gave suggestions for their improvement. The make up of this smaller group is indicated on the attached list.

The afternoon session focussed on the energy/environment/economics issues themselves. Unfortunately, the meeting coincided with a time of heavy involvement in similar meetings. The community of energy experts were deeply involved in a series of governmental or quasi governmental studies connected with the Administration's energy policy. As a result, last minute cancellations from the original Steering Committee list left it top heavy with energy industry representation and economists. Although the afternoon discussion was profitable, it did not produce, as we had hoped it would, the material for a useful review article on energy.

The meeting was followed by a press conference for members of the educational press. Some 30 people accepted invitation and engaged in a discussion of E/E/E topics with Steering Committee representatives. Several articles on energy education resulted.

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Steering Committee Meeting, 26 May 78

The report and review of the PEEC planning and analysis took place at the meeting in late Spring 1978. The list of participants, the memorandums of invitation and instruction, and the Agenda are shown in attachment #2. As should be clear from the participant list, representation was about equally divided among education directors from the energy industries, representatives from public interest groups, and professional educators.

About one third of the meeting was devoted to general comments on the nine existing draft packets. (Specific comments were also presented on the packets themselves). The rest of the time was used to discuss the proposals for new packets and the overall program design. We received much useful input from this meeting and present, as attachment 3, the Steering Committee minutes.

We consider the May 26 meeting as the most useful one we have had. Different points of view on the energy crisis were presented, but there were large areas of consensus. We were particularly pleased with the overwhelmingly positive response to PEEC materials.

We consider the work described in Task 2 as finished. The PEEC Interim Report has now been carefully studied and revised by staff and its major components considered by the Steering Committee. We are prepared to provide the 50 copies to DOE as specified. A single copy is attached to this task completion statement and the rest will be sent on request.

Project for an Energy-Enriched Curriculum

Writing Session
University of Maryland
Summer 1979

PARTICIPANTS LIST

Mary B. Crum
Denmark-Olar Senior High School
Denmark, South Carolina

Barbara Graves
Waldorf, Maryland

Edward Hall, Jr.
Wayland High School
Wayland, Massachusetts

Barnard Lebowitz
Bowie, Maryland

Ellen Nelson
Herndon, Virginia

Karen O'Neil
Central High School
East Corinth, Maine

Marshall Peterson
Columbia, Maryland

John Roeder
The Calhoun School
New York, New York

Susan L. Thompson
The Montessori School of NW Connecticut
Litchfield, Connecticut

Lester Wallinga
Calvin Christian School Assoc.
Grand Rapids, Missouri

Project for an Energy-Enriched Curriculum

Writing Session
Portland State University
Summer 1979

PARTICIPANTS LIST

Roxie Dever
Kelly Walsh High School
Casper, Wyoming

John Flenniken
Lincoln High School
Portland, Oregon

Ron Hirsch
Belchertown, Massachusetts

Elizabeth Horsch
Kelly Walsh High School
Casper Wyoming

Sarah Hubbard
Portland, Oregon

Jackie Johnson
Aurora, Colorado

Robert Jones
University of Houston at Clear Lake City
Houston, Texas

Marcia Liberati
Central Linn High School
Halsey, Oregon

Cherie McGrew
Portland, Oregon

Ray Taylor
Oak Harbor, Washington

Project for an Energy-Enriched Curriculum

Writing Session
Iowa State University
Summer 1980

PARTICIPANTS LIST

Margaret Angell
Plymouth-Carver High School
Plymouth, Massachusetts

Stephen Caruso
Lincoln Junior High
Mt. Prospect, Illinois

Kenneth Frazier
Edwards Elementary
Ames, Iowa

Edward C. Hall, Jr.
Wayland High School
Wayland, Massachusetts

Bernard Hollister
Willowbrook High School
Villa Park, Illinois

Diana Margotto
Washington Junior High
Breen Bay, Wisconsin

John Sekara
Cloonan Middle School
Stamford, Connecticut

James SmithLiberty, Indiana

David Tamburri
O'Hara Junior High School
Pittsburgh, Pennsylvania

Lester Wallinga
Calvin Christian Junior High
Wyoming, Michigan

Suzanne Kelly
Meeker Elementary School
Ames, Iowa

Project for an Energy-Enriched Curriculum

Teacher Education Packets Writing Session

Millersville State College

Millersville, Pennsylvania

Summer 1980

PARTICIPANTS LIST

Dr. Lynn W. Glass
Iowa State University
Ames, Iowa

Dr. Dean R. Brown
Colorado State University
Fort Collins, Colorado

Mr. Joe Rousseau
Millersville State College
Millersville, Pennsylvania

Dr. Robert Otto
Western Kentucky University
Bowling Green, Kentucky

Dr. Rodney Allen
Florida State University
Tallahassee, Florida

Dr. Robert E. Horvat
State University College
Buffalo, New York

Dr. Joy S. Lindbeck
University of Akron
Akron, Ohio

Dr. Janet Miller
Old Dominion University
Norfolk, Virginia

RE: DOE (ERDA) Contract #EX-76-C-10-3841

Phase III

Report on Task Completion

Task #5

"NSTA will plan and secure commitments for field testing of Summer '77 materials from approximately 200 test schools."

Attached please find a list of the test schools which have received our summer '77 materials. On this list there are also records of the contacted teacher, the type of school, and the materials sent. We also include with the documentation the various cover letters that were sent to the schools.

This list of schools is based almost entirely on commitments received in writing from teachers. We have these letters on file and they can be inspected at your convenience.

We also attach an overall tally of the numbers of the various packets which were mailed.

RE: ERDA Contract #EX-76-C-10-3841
Phase III

Report on Task Completion

Task #7 - Journal Articles

"The involvement of the teaching community will be stimulated through periodic articles in professional journals. At least one article will be placed, if necessary at NSTA expense, in each of the following: Science and Children, The Science Teacher, The Journal of College Science Teaching (NSTA), Social Education (NCSS), and if possible without cost in other journals such as Today's Education (NEA Learning), The Instructor, Teacher, and Grade Teacher, as well as various newsletters. Ten (10) copies of each article published shall be provided to ERDA."

The following three articles have been published:

"An Energy-Rich Curriculum - Help Us Evaluate It!" by John M. Fowler in the December 1976 issue of The Science Teacher.

"Energy is Elementary" by Helen H. Carey in the May 1976 issue of Science and Children.

"Some Guidelines for Energy Programs" by King C. Kryger in the September/October 1977 issue of Today's Education.

An article entitled "The Energy Elephant," by John M. Fowler has been accepted for publication in the November 1977 issue of The Journal of College Science Teaching.

Ten copies of the published articles and of a preprint of the "Energy Elephant" article are enclosed.

An announcement was carried in the November/December 1976 issue of the newsletter "The Social Studies Professional" of the National Council for the Social Studies. (We chose this newsletter instead of Social Education because it reached a larger audience.) Announcements or articles were also carried in:

Nation's Schools Report (December 1976)

Inter-Change (Population Education Newsletter - January 1977 issue)
NASSP Newsletter (National Association for Secondary School Principals - January 1977 issue)

The Instructor (February 1977)

EE Report (Environmental Education Report - February 1977 issue)
Spectator (National Association of Elementary School Principals - February/March 1977 issue)

The Illinois Council for the Social Studies Newsletter (March 1977)

Re: ERDA Contract E(49-1)-3841

The work for the following task has been completed:

Task 8 - Workshops

A. The NSTA will stimulate teacher involvement by conducting workshops on energy education at the NSTA Annual Meeting (March 1977, at Cincinnati, Ohio). (Fall 1977).

1. Three workshops were conducted at the NSTA Annual Meeting, March 25-29, 1977, in Cincinnati, Ohio. Workshop titles and presenters are listed below:
 - a. Energy and the Community: Two Instructional Packets for Elementary Schools (Elementary) - Helen Carey and Olivia Swinton.
 - b. Two Science/Social Studies Packets on Energy for Junior High Schools (Junior High) - Helen Carey and Bette Johnson.
 - c. Two Packets of energy/Environment/Economics Activities for High Schools (Secondary) - Helen Carey, John Day, and Rob Snyder.

All three workshops were presented to overflow crowds and some 150 copies of the Instructional Packets were distributed.

- d. Council of State Science Supervisors - A talk given by King C. Kryger on the Project for an Energy-Enriched Curriculum materials.

B. Four similar workshops will be offered to NCSS conventions and other organizations such as AAAS. If these groups are willing, NSTA will assist in such workshops.

1. The following workshops were offered to other professional organizations including the NCSS:
 - a. NCSS Annual Convention, Washington, D.C., November 7-10, 1976. Helen Carey and King C. Kryger set up a booth, distributing copies of "Energy Education and the 'Wolf' Criers" and some 300 copies of the Energy Education flyer "Why Teach Energy?". They also compiled some 350 names for a mailing list for the Project for an Energy-Enriched Curriculum.
 - b. NCSS regional Meeting, Boston, Massachusetts, March 10, 1977. Rob Snyder presented the Instructional Packets to a group of 40-50 Social Studies Teachers.
 - c. National Council for Geographic Education. San Francisco

Instructional Packets.

4. Annual Meeting of the American Association of Physics Teachers, Chicago, Illinois, February 7-10, 1977. John M. Fowler presented a talk "More Energy in the Precollege Curriculum" and distributed Instructional Packets and Fact Sheets.
5. Annual Meeting of the American Physical Society, Washington, D.C., April 25-29, 1977. John M. Fowler gave a talk and lead a discussion session on "Physics Education and the Triple E Crisis: Energy-Environment-Economics."

In addition to these presentations, King C. Kryger is co-hosting a workshop on May 7, 1977 in Salt Lake City, Utah, with Energy & Man's Environment - addressing 100 teachers and is conducting a talk on May 12, 1977 to the Wisconsin Board of Vocational, Technical and Adult Education on "Energy Problems and Educational Policy Needs" using NSTA's Project for an Energy-Enriched Curriculum as a model. NSTA's Project for an Energy-Enriched Curriculum will also play a lead role in the forthcoming CEDAR Conference on June 22-24, 1977.

Task #9

The NSTA will plan and conduct at least 10 in-service workshops in various school districts.

1. Fairfax County, 2-4-77, Helen Carey, King Kryger, John Fowler - with Mr. Ted Gates, Science Supervisor, Fairfax County Schools - in-service workshop.
2. Fredericksburg, 2-21-77, King Kryger, Helen Carey - with Ms. Dorothy Burnside, Office of Professional Growth, Fredericksburg City Public Schools - in-service workshop at James Monroe High School.
3. Springfield, Illinois, 2,3 and 4, 1977 with Don Roderick, Science Supervisor, Illinois Department of Education, Helen Carey, Olivia John Day, King Kryger. Two Day Energy-Education workshop for teachers, supervisors and others.
4. West Virginia, 4-15 and 16, 1977, King Kryger - with Mr. Robert Seymour, Science Supervisor, W. Va. State Department of Education - Energy Education workshops in conjunction with the W. Va. Science Teachers Association.
5. Utah, 5-6 and 7, 1977, King Kryger - with Ed Dalton, EME Regional Director and Briant Farnsworth - Granite School District - Teachers-in-service workshop - Joint venture w. EME.
6. Baltimore, 3-15-77, Helen Carey, Betty Johnson - with Constance Tate, Science Supervisor, Baltimore City Schools - in-service workshop.
7. Prince George's County, 2-17-77, Helen Carey - with Mr. Lawell Hinchlitt, Principal, Buck Lodge Junior High - in-service.
8. Maryland State Convention of Middle School Principal, 10-14-76, Betty Johnson.
9. Dougherty County Georgia School District, 3-8-77, John Fowler, in-service workshop for K-12 science teachers.
10. Colorado-Springs, 3-5-77, King Kryger - with John Akey - NSTA President-elect - E Colorado School District #12 - Teacher-in-service workshop.
11. Denver, 3-7-77, King Kryger - with John Brennan, Science Supervisor, Denver Public Schools - Teacher-in-service.

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Phase III

Report on Task Completion

- Task #10 A. The NSTA will prepare a Workshop Handbook which will enable local school district personnel to conduct energy education inservice workshops.
- B. The Workshop Handbook will be revised according to actual workshop experience.
-

The Energy Education Workshop Handbook accompanies this task report. The Handbook outline was prepared and presented to the NSTA and NCSS Representatives at the Regional Energy Education Network (REEN) Meeting in Boulder, Colorado, 16 March, 1978. The Handbook was developed into rough draft form. It was presented to a working group at the Project for an Energy-Enriched Curriculum's Practitioners Conference, 14-16 December, 1978. The revision of the Handbook was begun. A few requests have been filled to supply the draft Handbook to persons holding workshops or conferences (see attached list).

The completed camera-ready Handbook is for the purpose of introducing the NSTA's energy curriculum packets and to assist classroom teachers, curriculum supervisors, department heads and community organizers in planning and teaching about energy.

The Handbook consists of the following sections:

1. Purpose of This Handbook
2. Checklist for Planning an Energy Workshop
3. Learning and Teaching About Energy
4. Energy Is Interdisciplinary
5. Infusing Energy Topics Into Traditional Subjects
6. Adapting PEEC Materials to Regional Interests
7. Evaluation and References

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Phase III

Report on Task Completion

Task 11: The NSTA will publish 300 copies of the Workshop Handbook and distribute them to science and social studies supervisors on request. Twenty copies will be sent to DOE.

The Energy Education Workshop Handbook has gone through a considerable period of drafting and testing and is now in final form. During the drafting period we sent 50 copies of the final draft to many of the people who worked closely with us over the period of PEEC activities. We have printed 250 additional copies and they have been sent out on request to a large number of educators who have responded to our description of the Workshop Handbook in the June 1979 issue of Energy & Education. Camera-ready copy of the Handbook is provided with this Task Completion Report.

Re: ERDA Contract E(49-1)-3841

The work for the following task has been completed:

Task 12

- A. The NSTA will select and hire 12 teachers from appropriate grade levels and disciplines and conduct an eight week working session during the Summer of 1977, providing necessary guidance and direction, supervision, office equipment and space, clerical support, etc. This group is to produce eight to ten new packets, according to the goals in the ECOM Report (Task 2).
- B. The materials will be reviewed by teachers and produced in sufficient quantity and quality for field testing by approximately 200 test schools. Twenty (20) copies of each packet shall be provided to ERDA.
- C. This group will produce four to five draft instructional packets during the first four weeks of the working session.

The summer workshop teachers, their grade levels and disciplines are listed in Appendix 1. These teachers received a packet of material in advance of their employment and have now worked for four weeks in space provided by the Department of Physics, University of Maryland. They are supported by Project staff, a secretary/research assistant, and a part-time artist.

Four instructional packets are now in rough draft form. Their titles and grade levels are:

Energy and Transportation	Grade 3
History of Energy in the U.S.	Junior High School
Energy Resources in the West	Senior High School
National Energy Policy	Senior High School

These draft materials are included as Appendix 2.

The packets will be completed and sent out for review during or after the summer working session and ERDA will be provided 20 copies of the final drafts.

RE: EPDA Contract E(49-1) -3841

Report on Task Completion

Task 13 A. "The Summer 1977 working group will produce 4 to 5 draft instructional packets during the second 4 weeks of the session."

The summer workshop teachers have produced the following set of energy curriculum materials:

<u>WORKING TITLE</u>	<u>GRADE LEVEL</u>
Energy Networks	4
Energy Mathematics	7-9
Two Gulfs	8-9
The National Energy Policy	11-12

These draft materials are included in the Appendix.

Task 13 B. "Each of the instructional Packets will be reviewed by at least 3 non-project teachers."

This task cannot be completed until the materials receive a preliminary proof reading and are duplicated in sufficient quantity.

Until such time as Task 13 B. can be completed NSTA is requesting that EPDA allocate 90% of the payment to be received under the Task 13 heading.

DOE Contract #EX-76-C-10-3841
Phase III

Report on Task Completion

Task #15: At the end of 12 months, NSTA shall submit a summary of activities for the entire period, including a list of publications issued during the total term of the contract and copies of any not previously submitted, as well as a comprehensive evaluation of progress in the area of research supported by the contract.

The period covered by this 12 months summary is the year 1977. All of the work that was required by the "work statement" has been completed and recorded in Task Completion Reports. This final report will, therefore, only summarize the PEEC activities in 1977.

1977 was essentially the beginning of the curriculum development effort. This Phase III proposal was the first time that we looked at the possible structure of the whole four years of activities. As was described in detail in the proposal and the flow chart that accompanied it, we saw PEEC activities as going forward under 8 general headings: Analysis and Planning, Materials Development, Trial Use and Evaluation, Grassroots Involvement, Workshops and Institutes, Meetings and Conferences, Adult Education, and Implementation.

The Analysis and Planning activity, of course, is an ongoing activity and is fed by many of the other activities, in particular by the Steering Committee meetings. The major output of this activity was the list of major concepts in energy/environment/economics education which was submitted with the Interim Report that accompanied Task 2. Along with this major concept list we provided an outline of the skills development in science education and in social studies education. The list of major concepts has been the central planning document for PEEC activities. We have elaborated it with a matrix which shows where the concepts are covered in the various packets and refer to that matrix for suggestion of where new packets are

needed. This matrix has thus grown with each year's activities. We do not considered either the list of major concepts or the materials that accompany it complete and continue to circulate them and to receive suggestions from the growing list of people who are involved in PEEC activities.

Materials Development proceeds in a separate fashion and during the period of Phase III we readied for publication materials from the Summer of 1976 and created 9 new packets during the Summer of 1977. An important part of the cycle is review, testing and evaluation. We circulated the draft packets to a group of reviewers selected both for pedagogical and content expertise. We also, as was described in the Task Completion Report for Task #3, distributed several thousand copies of each of the six Summer 1976 packets to teachers along with a brief evaluation instrument and received a considerable and useful response to that mailing. Based on the response on the reviews that we received, the 1976 materials were revised and submitted to the Department of Energy for printing.

During Summer 1977 the sequence was begun again. We developed nine new packets:

Energy and Transportation	Grades 3-5
Networks: How Energy Links People, Goods and Services	Grades 4-5
Bringing Energy to the People: Ghana and the U.S.	Grades 6-7
Two Energy Gulfs	Grades 6-7
Mathematics in Energy	Grades 7-8
Energy Transitions in United States History	Grades 8-9
Energy in the Global Marketplace	Grades 9-11
Western Coal: Boom or Bust?	Grade 11
U.S. Energy Policy: Which Direction?	Grades 11-12

These packets were sent out for review and were placed with the required number of test teachers. The results of the tests and reviews guided us in the preparation of these materials for final printing.

While the production of materials is the central focus of the PEEC activity, we've also been deeply involved in activities that will make these materials known to the teaching community and make it possible for them to use them. As reported in the Task Completion Reports for Tasks 7 and 8, we gave workshops at the annual NSTA meeting in March 1977 at Cincinnati, Ohio, at the NSTA Area Conventions and at selected conventions of the National Council for the Social Studies (NCSS). Workshops were also given for the National Council for Geographic Education, a talk was given at the annual meeting of the American Association of Physics Teachers, and at the annual meeting of the American Physical Society.

The PEEC staff was also invited to present our materials to several other groups such as Energy and Man's Environment, the Wisconsin Board of Vocational-Technical Adult Education, etc. In addition to the publicity and the hands-on involvement of teachers that is accomplished through workshops, the PEEC staff published several articles in journals and a description of our materials and the project have been carried in a wide number of educational newsletters. These were summarized in the Task Completion Report for Task #7.

As PEEC gained experience with workshops, we began to develop an outline of a Workshop Handbook, which would be useful to workshop leaders who desired to direct a half-day or full-day workshop on energy education using the PEEC materials as examples. Although this Handbook was not completed during the year of Phase III operation, it was begun during the 1977 period and grew slowly and carefully as we gained experience through 1978. It is now in print and is very much in demand by workshop leaders.

In summary, 1977 was the formulative year of the PEEC operation. It was during this year that we began to refine our techniques for producing, testing, evaluating, and revising our materials. It was also during this year that we were able to put down, in first draft form, the list of major concepts in energy/environment/economics education, the hidden curriculum against which we match our packet development. In 1977 we began major outreach activities, not only to NSTA and NCSS meetings, but to several other educational associations as well and began to reach an even broader audience through journal articles and announcements in educational newsletters.

1977 was a year of experimentation with workshop styles and content and that experimentation lead to the production of the Workshop Handbook. PEEC ended the year 1977 with a firm notion of where it was going, with six packets in final print, and nine more in the final stages of revision and headed for the printer, and most importantly, it ended 1977 recognized as the national leader in energy education curriculum development.

PHASE IV

PHASE IV
ENCLOSURE I
SCOPE OF WORK

Task

1. Design regional structure and hold conference of regional representatives.

The project staff will develop a regional energy education network consisting of NSTA representatives drawn, in large part, from the 12 NSTA District Directors and 10 to 12 nominees provided by the National Council for the Social Studies.

These regional representatives will be assembled for a meeting of 1 to 1-1/2 days length in Fall-Winter 1977-78. At this meeting they will be provided with background information on energy education and asked to design the energy education regional network and suggest its functions. A summary report of this meeting will be provided to participants and to the project officer at the Department of Energy.

2. Prepare Summer '77 materials for publication and distribute to test schools.

At least 8 of the 10 draft units prepared during the writing session at the University of Maryland, July-August 1977 will be delivered as camera-ready copy to the appropriate project officer at the U.S. Department of Energy during Fall 1977.

The NSTA will publicize in its journals and newsletters (and in other similar outlets) the availability of these draft materials. In addition, the NSTA will distribute the draft materials to approximately 200 test schools.

3. Publish articles in educational journals.

The project staff will prepare articles and arrange for their publication in at least two journals, magazines, or newsletters other than those published by the NSTA during school year 1977-78.

Task

4

Presentation at NCSS Annual Meeting and NSTA Area Conventions

A talk or workshop on the Project for an Energy-Enriched Curriculum (PEEC) will be given at the NCSS Annual Meeting (November 1977 at Cincinnati, Ohio) and at the three Area Conventions of the NSTA during Fall-Winter 1977. (Only two of these, the meeting in Birmingham, Alabama in November at Boston, Massachusetts in December 1977 fall in the period of this contract.)

A similar presentation will be made to, at least, one other meeting of an education association during this time.

5

Steering Committee Meeting.

A meeting of a Steering Committee made up of ten persons knowledgeable in energy and in education processes will meet for one day sometime during Spring 1978. The Committee will review the existing PEEC materials. They will also be asked to provide a critique of an outline of the units proposed for development during the remainder of the program. A brief report of this meeting will be circulated to participants and the appropriate program officer at the U.S. Department of Education.

6

Presentation at NSTA Annual Meeting and NCSS Regional Meetings

A talk or workshop on the PEEC materials will be arranged at the NSTA Annual Meeting, Washington, D.C., March 1978.

We will also arrange and help organize "contributed papers" sessions at the 5 NCSS Regional Meetings during Spring 1978.

7

Revise Summer '77 Materials

Suggestions from test schools and other sources will be compiled and used to guide the revision of the Summer 1977 draft materials. The PEEC staff will revise at least 8 of the ten draft units from Summer 1977 and prepare them for publication. Camera-ready copy will be delivered to the appropriate program officer at the U.S. Department of Energy by September 30, 1978.

Task

8 Plan Summer 1978 Writing Sessions.

During Spring 1978 the PEEC staff will arrange for writing session facilities at both the University of Maryland and the University of Colorado. We will recruit and select 10 teachers for each session and prepare a set of preliminary guidelines for their use.

9 Practitioners Workshop on Energy Education.

The NSTA will hold a 2-1/2 day workshop on energy education during Spring 1978. The 60 or so participants will include representatives from groups developing curricular material on energy, as well as teachers and administrators with experience in energy education. The conference will produce a report on the state-of-the-art in energy education and make recommendations for future directions of development.

10 Summer '78 Writing Session, Part 1.

The PEEC staff will conduct a four-week writing session at the University of Maryland during June and July of 1978. Ten teachers from science and social studies and with appropriate grade level experience will be assembled to produce instructional units on energy/environment/economics topics. A minimum of 4 such units will be available in rough draft form at the end of the session.

11 Summer '78 Writing Session, Part 2.

The PEEC staff will conduct a four-week writing session at the University of Colorado during July and August 1978. Ten teachers from science and social studies and with appropriate grade level experience will be assembled to produce instructional units on energy/environment/economics topics. A minimum of 4 such units will be available in rough draft form at the end of the session.

PROJECT FOR AN ENERGY-ENRICHED CURRICULUM

PHASE I

Task Requirements

Task 1: Prepare Articles

An 8-page article is to be prepared for NSTA and NCSS journals which will (a) review the energy choices and their background; (b) state the opportunities and challenges of energy education and suggest ways teachers can meet and take advantage of them; (c) announce a competitive teacher participation program for the development of mini-units on energy topics. A similar shorter article will be prepared for the NEA journal. These articles shall be submitted to ERDA for clearance.

Task 2: Placement of Articles

Contractor will, at his expense, if necessary, have the articles (once cleared by ERDA) published in the official journals of NSTA, NCSS and NEA. 5,000 reprints of each of these articles are to be made available free to those who request them.

Task 3: Fact Sheets

Contractor will compile at least 19 four-page fact sheets on the energy technologies stressed by ERDA-48. These are to be made available free of charge upon request from teachers. 2,000 copies of each are to be prepared for distribution.

Task 4: Judging Entries and Making Awards

Select the ten best mini-unit entries, and invite winning teachers to meet with the Phase 2 workshop participants for one day. The next 20 winning entries will be among those teachers selected as mini-unit reviewers.

Selection and award criteria shall be based upon:

- a. originality;
- b. appropriateness of mini-unit to course setting; and
- c. success of mini-unit in achieving important energy-education goals.

Completion
Report
attached

Task 5: Preplanning for Summer Workshop

Select and bring together a steering committee of ten qualified educators to plan the details of the summer working group.

RE: DOE (ERDA) Contract #EX-76-C-10-3841

Phase IV

Report on Task Completion

Task #1 - Design regional structure and hold conference of regional representatives

"The project staff will develop a regional energy education network consisting of NSTA representatives drawn, in large part, from the 12 NSTA District Directors and 10 to 12 nominees provided by the National Council for the Social Studies.

These regional representatives will be assembled for a meeting of 1 to 1-1/2 days length in Fall-Winter 1977-78. At this meeting they will be provided with background information on energy education and asked to design the energy education regional network and suggest its functions. A summary report of this meeting will be provided to participants and to the project officer at the Department of Energy."

The regional structure for energy education has been established. It consists of 12 NSTA representatives (the Directors of the 12 NSTA Districts) and 12 NCSS representatives.

A planning meeting was held at the University of Colorado on March 16-17. A full report of this meeting is attached. It includes a list of attendees and a summary of the discussion which took place and the recommendations which were received. Communication with the regional representatives continues.

RE: DOE (ERDA) Contract #EX-76-C-10-3841

Phase IV

Report on Task Completion

Task #2 - Prepare Summer '77 materials for publication and distribute to test schools.

"At least 8 of the 10 draft units prepared during the writing session at the University of Maryland, July-August 1977 will be delivered as camera-ready copy to the appropriate project officer at the U.S. Department of Energy during Fall 1977.

The NSTA will publicize in its journals and newsletters (and in other similar outlets) the availability of these draft materials. In addition, the NSTA will distribute the draft materials to approximately 200 test schools."

The following nine titles of classroom materials produced during Summer '77 have been prepared in draft form. Six of these are in print, camera-ready copy of the other three have been delivered to the program officer.

Energy and Transportation	Grade 3
Networks: How Energy Links People, Goods, and Services	Grades 4-5
Two Energy Gulfs	Grades 6-7
Bringing Energy to the People: Ghana and the U.S.	Grades 6-7
Mathematics in Energy	Grades 7-8
An Energy History of the United States	Grades 8-9
Energy in the Global Marketplace	Grades 9-11
The New Westward Movement	Grade 11
U.S. Energy Policy - Which Direction?	Grades 11-12

The test school list has been completed and the materials delivered to them (see invoice #15 for a list of schools and materials sent). The three packets not yet in print were copied in-house for test school distribution.

The new materials have been advertized by a brochure (5,000 copies distributed) attached, by an article in Energy & Education, and in several other publications. Copies of some of these are also attached.

RE: DOE (ERDA) Contract #EX-76-C-10-3841

Phase IV

Report on Task Completions

Task 3: Publish articles in educational journals

The project staff will prepare articles and arrange for their publication in at least two journals, magazines, or newsletters other than those published by the NSTA during school year 1977-78

Task 15: Publish articles in educational journals

The project staff will prepare two articles on energy education for publication during school year 1978-79. At least one of these articles will be in other than an NSTA journal.

For payment purposes the task of dissemination was split in two. At least two articles in the Spring and two in the Fall were anticipated. We have met the total requirement of the two tasks even though the distribution in Spring and Fall was somewhat different than was originally planned. Copies of the articles which were either published or accepted for publication during the period covered by the Phase IV contract are attached.

RE: DCE (ERDA) Contract #Ex-76-C-01-3841

Phase IV

Report on Task Completion

Task #4 - Presentation at NCSS Annual Meeting and NSTA Area Conventions

"A talk or workshop on the Project for an Energy-Enriched Curriculum (PEEC) will be given at the NCSS Annual Meeting (November 1977 at Cincinnati, Ohio) and at the three Area Conventions of the NSTA during Fall-Winter 1977. (Only two of these, the meeting in Birmingham, Alabama in November and Boston, Massachusetts in December 1977 fall in the period of this contract.)

A similar presentation will be made to, at least, one other meeting of an education association during this time."

NCSS Annual Meeting, Cincinnati, Ohio

Tuesday	November 22, 1977 10:30 - 12 Noon	State Social Studies Specialists	King Kryger
Thursday	November 24, 1977 9:00 - 12 Noon	Science and Society Committee	Elizabeth Lark
Friday	November 25, 1977 10:30 - 12 Noon	Workshop Session - "Energy and Education"	Elizabeth Lark Helen Carey

NSTA Area Conventions

Boston, Massachusetts	Saturday, December 3, 1977	King Kryger
"Interdisciplinary Energy Materials for the Classroom"		
Birmingham, Alabama	Friday, November 11, 1977	Helen Carey
"Energy Education, K - 12"		
Winnipeg, Manitoba CANADA	Friday, October 21, 1977	Helen Carey
"Classroom Materials on Energy K - 12"		

In addition to these presentations, the PEEC materials were the focus of the workshops or talks listed below during Fall/Winter 1977-78.

- February 14, 1978 Meeting co-hosted by the Idaho State Department of Education and the State Department of Energy: "Interdisciplinary Energy Materials for the Classroom" King Kryger
- March 4-6, 1978 Georgia Science Teachers Association, Winter Conference, Athens, Georgia; Pioneer Cooperative Education Service Agency, Cleveland, Georgia; "Energy: Its Impact on America", University of Georgia Helen Carey
- March 18, 1978 Philadelphia Environmental Education Conference Helenmarie Hofman
- December 14, 1978 Interdisciplinary Workshop, NSTA/NCSS Math and English, Worcester, Massachusetts Elizabeth Larkin

RE: DOE (ERDA) Contract #EX-76-C-10-3841

Phase IV

Report on Task Completion

Task #5 - Steering Committee Meeting

"A meeting of a Steering Committee made up of ten persons knowledgeable in energy and in education processes will meet for one day sometime during Spring 1978. The Committee will review the existing PEEC materials. They will also be asked to provide a critique of an outline of the units proposed for development during the remainder of the program. A brief report of this meeting will be circulated to participants and the appropriate program officer at the U.S. Department of Education."

A Steering Committee for PEEC met on May 26, 1978. A full report of this meeting, including minutes, was submitted with Invoice #20 as a part of the task completion report of Task #2, Phase 3. Please refer to that report for documentation.

DOE (ERDA) Contract #EX-76-C-10-3841

Phase IV

Task Completion Report

Task #6 - Presentation at NSTA Annual Meeting and NCSS Regional Meeting

"A talk or workshop on the PEEC materials will be arranged at the NSTA Annual Meeting, Washington, D.C., March 1978.

We will also arrange and help organize "contributed papers" sessions at the 5 NCSS Regional Meetings during Spring 1978."

Workshops at the elementary, middle school/junior high, and secondary level were held at the NSTA Annual Meeting, April 7-10, 1978. The times and presenters are listed below.

Elementary	Saturday, April 8, 1 pm	Helen Carey
Middle School/ Junior High	Sunday, April 9, 9 am	Helen Carey, Helenmarie Hofman
Senior High	Saturday, April 8, 1 pm	Elizabeth Larkin, Helenmarie Hofman

PEEC staff member Elizabeth VanderPutten Larkin presented workshops at the NCSS Regional Meetings.* Dates and locations are given below. We also advertised a "contributed ideas" session at each of these (by the attached advertisements) and Ms. Larkin presided over these sessions.

Boston	March 1-4, 1978
Denver	March 16-18, 1978
Orlando	March 30 - April 1
Minneapolis	April 13-15

* NCSS only had 4 Regional Meetings in Spring 1978.

DOE Contract #EX-76-C-10-3841
Phase IV

REPORT ON TASK COMPLETION:

Task #7: Revise Summer '77 Materials

Suggestions from test schools and other sources will be compiled and used to guide the revision of the Summer 1977 draft materials. The PEEC staff will revise at least 8 of the ten draft units from Summer 1977 and prepare them for publication. Camera-ready copy will be delivered to the appropriate program officer at the U.S. Department of Energy by September 30, 1978.

The following materials produced by the Project for an Energy-Enriched Curriculum during the Summer of 1977 have been printed in draft form, tested in class, revised and sent in final camera-ready form to the DOE program officer.

Energy and Transportation	Grade 3
Networks: How Energy Links People, Goods and Services	Grades 4-5
Two Energy Gulfs	Grades 6-7
Bringing Energy to the People: Washington, D.C. and Ghana	Grades 6-7
Energy Transitions in U.S. History	Grades 8-9
Mathematics in Energy	Grades 8-9
Western Coal: Boom or Bust?	Grades 9-11
Energy in the Global Marketplace	Grades 9-11
U.S. Energy Policy - Which Direction?	Grades 11-12

RE: DOE (ERDA) Contract #EX-76-C-10-3841

Phase IV

Report on Task Completion

Task #8 - Plan Summer 1978 Writing Sessions

"During Spring 1978 the PEEC staff will arrange for writing session facilities at both the University of Maryland and the University of Colorado. We will recruit and select 10 teachers for each session and prepare a set of preliminary guidelines for their use."

The PEEC staff invited applications from teachers who wished to write energy materials through an announcement in Energy & Education (see Attachment #1). From the sixty or so responses and from applications and recommendations received in other ways, 9 teachers for the University of Maryland writing session and 10 teachers for the University of Colorado session have been selected. The names, grade level and discipline, and professional address of the teachers selected are shown in Attachment #2.

We had originally selected 10 teachers for the University of Maryland session, however, unfortunately, one of the teachers accepted another job at the last moment, leaving us 1 short. We will use the extra salary money to buy additional time from one or more of our present teachers for work on the packets.

A set of preliminary guidelines was prepared for the teachers and can be seen in Attachment #3.

DOE Contract #EX-76-C-10-3841
Phase IV

REPORT ON TASK COMPLETION:

Task #9 - Practitioners Workshop on Energy Education

The NSTA will hold a 2½ day workshop on energy education during Spring 1978. The 60 or so participants will include representatives from groups developing curricular material on energy, as well as teachers and administrators with experience in energy education. The conference will produce a report on the state-of-the-art in energy education and make recommendations for future directions of development.

NSTA held a Practitioners Conference on Energy Education, December 14-16, 1979, at the University of Maryland, Adult Education Center, College Park, Maryland. A Participants List (Appendix 1), the Conference Agenda (Appendix 2) and the Conference Report (Appendix 3) are attached.

Phase IV

Report on Task Completion

Task #10 - Summer '78 Writing Session, Part 1

"The PEEC staff will conduct a four-week writing session at the University of Maryland during June and July of 1978. Ten teachers from science and social studies and with appropriate grade level experience will be assembled to produce instructional units on energy/environment/economics topics. A minimum of 4 such units will be available in rough draft form at the end of the session."

The summer workshop teachers, their grade levels and disciplines are listed in Appendix 1. These teachers worked for four weeks (June 20-July 19, 1978) in space provided by the Department of Physics, University of Maryland. They were supported by Project staff, a secretary/research assistant, and part-time artist.

Five instructional packets are now in rough draft form. Copies of these packets are included as Appendix 2. These packets are to be considered as evidence of work done and are not yet intended for review. Packet titles and grade levels are:

Energy and Investment	Grades 11-12
Critical Thinking	Grades 9-12
Energy in the Less Developed Countries	Grades 10-12
Nuclear Energy	Grades 11-12
Bioconversion	Grades 10-11

RE: DOE (ERDA) Contract #EX-76-C-10-3841

Phase IV

Report on Task Completion

Task #11 - Summer '78 Writing Session, Part 2

"The PEEC staff will conduct a four-week writing session at the University of Colorado during July and August 1978. Ten teachers from science and social studies and with appropriate grade level experience will be assembled to produce instructional units on energy/environment/economics topics. A minimum of 4 such units will be available in rough draft form at the end of the session."

*** !

The summer workshop teachers, their grade levels and disciplines are listed in Attachment 1. These teachers worked for four weeks (July 24-August 18, 1978) at the University of Colorado in space provided by the Department of Education. They were supported by project staff, a part-time secretary, and a part-time artist.

A total of six packets were prepared in rough draft form during that workshop. Packet working titles and suggested grade levels are:

1. There's Enough Energy, But...	Grades 11, 12
2. Solar Energy	Grades 6, 7, 8
3. Coal	Grades 7, 8, 9
4. Energy for the Future	Grades 11, 12
5. Energy and Water	Grades 9, 10, 11
6. Growth	Grades 7, 8, 9

We enclose first drafts of four of these - numbers 1, 2, 3, and 5 from the list above. These packets are to be considered as evidence of task completion and are not intended for review.

DOE Contract #EX-76-C-10-3841
Phase IV

Report on Task Completion

Task #12: The PEEC staff will distribute the draft materials from Summer '78 to at least 9 test schools. Results of these trial uses will be collected, discussed with participating teachers and will guide subsequent revisions.

Attached is a list of the selected field test sites for the Summer 1978 PEEC materials. These records include the test teacher's name, school address, and the title of the materials being tested.

Also attached are copies of examples of cover letters, evaluation requests and forms. We have on file the written commitment from these teachers to field test the specified materials.

DOE Contract #EX-76-C-10-3841
Phase IV

Report on Task Completion

Task #13: At least 8 draft units prepared during the writing sessions at the University of Maryland and the University of Colorado during June-August 1978 will be prepared in form satisfactory for classroom trial use. Three copies of each of these will be delivered to the appropriate project officer at the U.S. Department of Energy for review and comment.

The teacher/writers from the 1978 summer writing sessions produced the following packets:

There is Enough Energy, But...

Solar Energy

Bioconversion

Coal

Energy for the Future

Energy and Water

Energy as an Investment Choice

Exponential Growth

These materials have been put in rough draft form for field testing. Three copies of each of the above titles have been delivered to the appropriate project officer.

Report on Task Completion

Task 14: Presentations at NCSS Annual Meeting and NSTA Area Conventions

A talk or workshop will be arranged for the NCSS Annual Meeting in Fall 1978. The PEEC staff will also arrange and monitor "contributed paper" sessions at the three NSTA Area Conventions in Fall and Winter 1978. A talk or workshop will be arranged for one other meeting of an educational association during this same time period.

It was not possible to arrange for a presentation at the NCSS Annual Meeting in 1978. Workshops and "contributed paper" sessions were held at the three area meetings of NSTA (Milwaukee - November 2-4; Anaheim - November 16-18; and New Orleans - November 30-December 1). In addition to these three meetings, PEEC staff addressed the following other meetings during Fall 1978.

<u>Meeting</u>	<u>Place</u>	<u>Date</u>	<u>Staff</u>
National Council of Teachers of Mathematics Regional Convention	Louisville, KY	October 19-20, 1978	Helenmarie Hofman
Fall Workshop and NHSTA Annual Meeting	Manchester, NH	October 21, 1978	Helen Carey
School Science and Mathematics Assoc. National Convention	Des Moines, IA	November 2-4, 1978	Helenmarie Hofman
National Middle School Assoc. Annual Con- ference	Pittsburgh, PA	November 9-11, 1978	Helenmarie Hofman
Middle/Junior High School Science Education Conference for Local Decision Makers	Albany, NY	November 16-17, 1978	Helenmarie Hofman

Report on Task Completion

Task 16: Regional Workshops

Through the regional network described in Task 1, sites for four regional workshops will be selected. The 20 or so participants at each workshop will be selected by the regional representatives. They will be supervisors or other administrative personnel and will be expected to use the workshop experience to run their own in-service programs for teachers.

Four regional workshops were arranged through the joint efforts of the regional representatives and the PEEC staff. These four, along with the workshop organizer, are listed below.

<u>Region</u>	<u>Organizer</u>	<u>Location</u>
Northwest	Sam Mitchell	North Bend, Washington
Southeast	Rodney Allen	Tallahassee, Florida
Middle East	Joseph Padalino	Dingmans Ferry, Pennsylvania
New England	Sarah Klein	Kingston, Rhode Island

Three of these workshops were held and reports of them are attached. The fourth one, that for the New England region, scheduled to be held in mid-December was, unfortunately, cancelled by its organizers at the last minute due to personal reasons. Since we have, in fact, responded to many more requests for workshops and meeting presentations than originally budgeted, we hope that these activities (a complete list appears with the Task #14 report) along with the three regional workshops reported herein will be accepted as evidence for task completion.

PHASE V

III. Work to be Accomplished

The contractor is responsible for the following tasks, as outlined below and elaborated in the subject proposal, which is attached and made part hereto. Where there is a discrepancy between the proposal and these tasks, this discrepancy takes precedence.

Task 1. Revise Fact Sheets

The 19 Fact Sheets on Alternate Energy Technologies, produced in a previous phase of this contract, will be revised, some will be combined, and four new ones written. Appendix 4 of the proposal lists the 19 old Fact Sheets and 20 new Fact Sheets to be prepared. NSTA will be responsible for obtaining reviews of these Fact Sheets from the following:

- a. environmental experts
- b. industry representatives

Drafts will be presented for DOE technical review, and upon receipt of technical approval by DOE, camera-ready copy will be provided to DOE. Completion in 7 months.

Task 2. Review and Test Summer '78 Materials

At least 8 of the units produced in the summer '78 working group (list attached as appendix I and made part hereto) will each be field tested and reviewed by at least nine classroom teachers. Their comments will be considered by NSTA staff when making the revisions described in Task 6. Completion in 6 months.

Task 3. Plan and Conduct Regional Energy Education Network Meeting

A 1-day meeting of 20 network representatives will be held, to help them plan and seek funding for regional meetings designed to familiarize teachers with the PEEC materials. Report of the meeting will be provided to DOE. Completion in 4 months.

Task 4. Prepare for Summer 1979 Writing Sessions

Tentative themes will be selected and submitted to the PEEC Steering Group for discussion. Teachers will be hired and logistical arrangements will be made. Completion in 6 months.

Task 5. PEEC Steering Committee

A list of at least 10 distinguished energy educators will be submitted to DOE for approval. Upon acceptance, they will be invited to a 1-day meeting to suggest improvements and/or replacements for the topics selected for summer 1979 development. A report of this meeting will be submitted promptly to DOE. Completion within 6 months.

Task 6. Revise Summer 1978 Materials

Utilizing the field test results of Task 2, NSTA will revise the units (at least 8), and submit them to DOE for technical review. Upon receipt of necessary corrections from DOE, NSTA will provide camera ready copy. Completion in 10 months.

Task 7. Conduct First Summer 1979 Writing Session

Convene at least 10 teachers for 4 weeks to produce first drafts of at least units. Completion within 8 months.

Task 8. Conduct Second Summer 1979 Writing Session

Convene at least 10 teachers for 4 weeks to produce first drafts of at least 4 new units. Completion within 9 months.

Task 9. Review and Test Summer 1979 Materials

The units (at least 8) produced in Tasks 7 and 8 will each be field tested and reviewed by at least 9 classroom teachers. Their comments are to be considered in the later revision of these materials. Completion in 12 months.

Task 10. Disseminate Energy Education Information to Other Organizations

- a. Attend and participate in NSTA and NCSS annual meetings, as well as at least 10 other meetings of educational organizations, to inform them of PEEC activities and materials. Completion in 12 months.
- b. Design, construct and ship to these meetings a display panel providing information on PEEC and other DOE-sponsored energy education projects. Design of this panel to be approved by DOE within 2 months.
- c. Submit at least four articles to professional journals on the PEEC activities. Completion in 12 months.

Re: ERDA Contract E(49-1)-3841

The work for the following task has been completed:

Task 3 - Field Test

A. The following materials developed by the Summer 1976 Working Group are to be field tested by at least 100 teachers in actual classroom use.

a. Elementary School

The Energy We Use Grade 1

Community Workers & The Energy They Use Grade 2

b. Junior High (Middle School)

Energy, Engines, and the Industrial Revolution Grade 8

Transportation and the City Grade 8-9

c. Senior High School

Agriculture, Energy and Society Grade 10-12

The 55 MPH Limit: How A Bill Becomes A Law Grade 9-11-12

B. NSTA will develop and provide an evaluation instrument for field testing.

The NSTA has distributed on request, 8152 copies of the elementary packets: "The Energy We Use", Grade 1 and "Community Workers & The Energy They Use", Grade 2. We have also distributed 9036 copies of the middle school packets: "Energy, Engines, and the Industrial Revolution", Grade 8 and "Transportation and the City", Grades 8-9 and 8500 copies of the secondary materials: "Agriculture, Energy and Society", Grades 10-12 and "The 55 MPH Limit: How A Bill Becomes A Law", Grades 9, 11, 12.

With each of our mailings to teachers we included the evaluation form attached as Appendix 1. To date, 189 of these have been returned. Appendix 2 is a compilation of responses to the evaluation items. We also have the complete set of returned evaluations on file for your inspection.

RE: ERDA Contract #EX-76-C-10-3841
Phase III

Report on Task Completion

Task #4

- A. Revise Summer '76 materials according to classroom test results.
- B. Submit materials to ERDA for final review.

Task #6

NSTA is to provide ERDA with 100 copies of the six units as revised in Task 4. ERDA reserves the right to offer the copyright to NSTA or a commercial publisher as specified in ERDA Manual Appendix 3207, and/or to publish and disseminate the material through government channels.

The following materials produced by the Project for an Energy-Enriched Curriculum during Summer 1976 have been printed in draft form, tested in class, revised and submitted in final form to the DOE program office. All but the one indicated by the asterisk are in print and available from the DOE Technical Information Center at Oak Ridge.

The Energy We Use	Grade 1
Community Workers and the Energy They Use	Grade 2
Transportation and the City	Grades 8-9
Energy, Engines, and the Industrial Revolution	Grades 8-9
*Agriculture, Energy, and Society	Grades 10-12
How a Bill Becomes a Law to Conserve Energy	Grades 9,11,12

* This packet is submitted as camera ready copy, ready for printing.

DOE Contract #EX-76-C-10-3841

PEEC-PHASE V

REPORT ON TASK COMPLETION:

Task #1: Revise Fact Sheets

The 19 Fact Sheets on Alternate Energy Technologies, produced in a previous phase of this contract, will be revised, some will be combined, and four new ones written. Appendix 4 of the proposal lists the 19 old Fact Sheets and 20 new Fact Sheets to be prepared. NSTA will be responsible for obtaining reviews of these Fact Sheets from the following:

- a. environmental experts
- b. industry representatives

Drafts will be presented for DOE technical review, and upon receipt of technical approval of DOE, camera-ready copy will be provided to DOE.

The 20 new or updated Fact Sheets have been prepared, have undergone outside review and have been revised. They have been delivered to the DOE and several have had further revision based on DOE reviews.

The Fact Sheets have not been prepared as camera-ready copy as it is our understanding that the DOE does not plan to publish them.

Phase V

REPORT ON TASK COMPLETION:

Task #2 - Review and Test Summer '78 Materials

At least 8 of the units produced in the summer '78 working groups (list attached as appendix I and made part hereto) will each be field tested and reviewed by at least nine classroom teachers. Their comments will be considered by NSTA staff when making the revisions described in Task 6.

Attached is a list of the selected field test sites for the Summer 1978 PEEC materials. These records include the test teacher's name, school address, and the title of the materials being tested.

Also attached are copies of examples of cover letters, evaluation requests and forms. We have on file the written commitment from these teachers to field test the specified materials.

RE: DOE Contract #EX-76-C-10-3841

Phase V

REPORT ON TASK COMPLETION:

Task #3 - Plan and Conduct Regional Energy Education Network Meeting

A 1-day meeting of 20 network representatives will be held, to help them plan and seek funding for regional meetings designed to familiarize teachers with the PEEC materials. Report of the meeting will be provided to DOE.

A Regional Energy Education Network (REEN) meeting was held in Atlanta, Georgia on March 25, 1979. Minutes of this meeting, along with a list of attendees, is attached.

RE: DOE Contract #EX-76-C-10-3841

Phase V

REPORT ON TASK COMPLETION

Task #4 - Prepare for Summer 1979 Writing Sessions

Tentative themes will be selected and submitted to the PEEC Steering Group for discussion. Teachers will be hired and logistical arrangements will be made.

The PEEC staff invited applications from teachers who wished to write energy materials through an announcement in Energy & Education (see Attachment #1). From the 40+ or so responses and from applications and recommendations received in other ways, 10 teachers for the University of Maryland writing session and 10 teachers for the Portland State University session have been selected. The names, grade level and discipline, and addresses of the teachers selected are shown in Attachment #2.

Logistical arrangements have been made for both Project for an Energy-Enriched Curriculum design workshops. The workshop to be held 25 June through 20 July, 1979 at the University of Maryland is to be in the Department of Physics and Astronomy (contact person: Mrs. Sibylle Sampson). The workshop to be held 23 July through 17 August, 1979 at Portland State University is to be held in the Science Education Building (contact person: Dr. Michael Fiasca).

Tentative themes were selected and submitted to the PEEC Steering Group on 8 June, 1979 along with a set of preliminary guidelines (see Attachment #3).

RE: DOE Contract #EX-76-C-10-3841

Phase V

REPORT ON TASK COMPLETION

Task #5 - PEEC Steering Committee

A list of at least 10 distinguished energy educators will be submitted to DOE for approval. Upon acceptance, they will be invited to a 1-day meeting to suggest improvements and/or replacements for the topics selected for summer 1979 development. A report of this meeting will be submitted promptly to DOE.

The PEEC Steering Committee meeting was held on June 8, 1979 at the Cosmos Club in Washington, D.C. A list of the Steering Committee members and a report of this meeting is attached.

PEEC-Phase V

REPORT ON TASK COMPLETION

Task 6: Revise Summer 1978 Materials

Utilizing the field test results of Task 2, NSTA will revise the units (at least 8), and submit them to DOE for technical review. Upon receipt of necessary corrections from DOE, NSTA will provide camera ready copy.

The following units were revised according to field test/review comments, revised again after DOE technical review, and then delivered to the program officer.

"E" the Magnificent

The Natural Laws of Energy

Energy From Coal

Energy for the Future

The Exponential Energy Century

Nuclear Fission

Energy as an Investment Choice

CanMexUs

RE: DOE Contract #EX-76-C-10-3841

Phase V

REPORT ON TASK COMPLETION:

Task #7 - Conduct First Summer 1979 Writing Session

Convene at least 10 teachers for 4 weeks to produce first drafts of at least 4 new units

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The summer workshop teachers, their grade levels and disciplines are listed in Appendix 1. These teachers worked for four weeks (June 25-July 20, 1979) in space provided by the Department of Physics, University of Maryland. They were supported by Project Staff and a part-time artist.

Five instructional packets are now in rough draft form. Copies of these packets are included as Appendix 2. These packets are to be considered as evidence of work done and are not yet intended for review. Packet titles and grade levels are:

ENERGY FOR PRESCHOOLERS	Grades NK-1
ENERGY, THE THREAD OF LIFE	Grades 3-5
ENERGY AND THE AUTOMOBILE	Grades 9-12
LONG RANGE & GLOBAL EFFECTS OF CO ₂	Grades 9-12
CANADA, MEXICO AND THE UNITED STATES: ENERGY MIX OR MIX-UP?	Grades 6-9

RE: DOE Contract #EX-76-C-10-3841

Phase V

REPORT ON TASK COMPLETION

Task 8: Conduct Second Summer 1979 Writing Session

Convene at least 10 teachers for 4 weeks to produce first drafts of at least 4 new units.

The summer workshop teachers, their grade levels and disciplines are listed in Appendix 1. These teachers worked for four weeks (July 23-August 17, 1979) in space provided by the Portland State University. They were supported by Project Staff and a part-time artist.

Five instructional packets were produced during this session:

Energy Conservation as a Political Issue	Grades 7-9
Appropriate Technology for Energy Production	Grades 9-12
Energy Flows Through Natural Systems	Grades 9-12
Critical Thinking on Energy	Grades 9-12
Less Developed Countries and Energy	Grades 9-12

Copies of four of these packets are included as Appendix 2 (the fifth packet will follow). These packets are to be considered as evidence of work done and are not yet intended for review.

DOE Contract #EX-76-C-10-3841

Phase V

Task 9: Review and Test Summer 1979 Materials

The units (at least 8) produced in Tasks 7 and 8 will each be field tested and reviewed by at least 9 classroom teachers. Their comments are to be considered in the later revision of these materials.

Attached is a list of the selected field test sites/reviewers for the Summer 1979 PEEC materials. These records include the test teacher's/reviewer's name, address, and the title of the materials being tested or reviewed.

We have received numerous requests from university Professors to have their students - undergraduate as well as graduate - test our draft materials. A "Center" category has been established for faculty teaching methods courses. The Professor receives the packets and evaluation forms, then discusses PEEC in class, distributes the packets to the students, and follows up on the classroom testing of the materials. The Center Professor provides our office with the feedback from the testing.

The minimum number of students in a Center is 15 and ranges up to 75 (see attached Center list for those in operation. There are five more that will be put into operation.) These Centers are providing valuable information that will be used in the 1980 methods manuals writing session.

Also attached are copies of examples of our cover letters, evaluation requests and forms. We have on file the written commitment from these teachers to field test the specified materials.

DOE Contract #EX-76-C-10-3841

Phase V

Task 10: Disseminate Energy Education Information to Other Organizations

- a. Attend and participate in NSTA and NCSS annual meetings, as well as at least 10 other meetings of educational organizations, to inform them of PEEC activities and materials.
- b. Design, construct and ship to these meetings a display panel providing information on PEEC and other DOE-sponsored energy education projects.
- c. Submit at least four articles to professional journals on the PEEC activities.

-
- a. PEEC staff attended the NSTA Annual Convention in Atlanta, Georgia, March 23-27, 1979 and the NCSS Annual Meeting in Portland, Oregon, November 20-23, 1979. In addition to these meetings, PEEC staff addressed the following other meetings during 1979:

<u>Meeting</u>	<u>Location</u>	<u>Date</u>	<u>Staff</u>
Mississippi Science Teachers Association	Jackson, MS	March 12	Helenmarie Hofman
Wisconsin Society of Science Teachers	Greenlake, WI	April 27-28	Helenmarie Hofman
National Association for Environmental Education	Blacksburg, VA	May 5-7	Helenmarie Hofman
NSTA/PEEC Energy Education Materials Workshop	Portland, OR	August 13	PEEC Staff
South Carolina Science Council	Columbia, SC	October 5-6	Helenmarie Hofman, Julia Fellows
National Council of Teachers of Mathematics	Cleveland, OH	October 12-13	Helenmarie Hofman
NSTA Regional Convention	Portland, OR	October 12-13	Helen Carey

<u>Meeting</u>	<u>Location</u>	<u>Date</u>	<u>Staff</u>
NSTA Regional Convention	Hartford, CT	October 24-27	Julia Fellows
National Middle School Association	Dearborn, MI	October 31-November 3	Helenmarie Hofman
Mississippi Science Teachers Association	Gulfport, MS	November 2-3	Julia Fellows
School Science and Mathematics Association	Kansas City, MO	November 1-3	Helenmarie Hofman

See Attachment 1 for reports of ^{the major} ~~all these~~ meetings.

- b. A display panel measuring 98 inches long by 93½ inches high was ordered and delivered by Nomadic Structures, Inc. of Temple Hills, Maryland. The panel framework is constructed of aluminum tubes which interconnect. When folded up, the panel measures 30 inches in height, 8 inches in diameter. One pull and the whole frame rises and expands to fill the dimensions above and can be easily placed on a long table.

Panels providing information on PEEC and other DOE-sponsored energy education projects snap onto the framework. These panels are made of polyvinyl chloride. They roll up easily without cracking and are very durable. Lettering on each panel has been silk-screened with appropriate paints which adhere to the polyvinyl.

The display panel with case/frame weighs 22 lbs. It will be shipped or carried to meetings such as NSTA and NCSS annual meetings, as well as other meetings of educational organizations to inform them of PEEC activities and materials.

- c. The completion of Section c, Task 10 was completed for the academic year 1979-80 with the following four articles. Copies of the articles which were either published or accepted for publication during the period covered by Phase V are included as Attachment 2.
1. Fowler, John M. "The Nuclear Equation." Voter, Vol. XXIX, #2, pp. 1-6, Summer 1979.
 2. Hofman, Helenmarie. "The Role of Educators in Today's Energy Problem." Chemistry in the Two-Year College, Vol. XX, 1979.
 3. Hofman, Helenmarie. "Energy Crisis - Schools to the Rescue Again." School Science and Mathematics, in press, 1980.
 4. Fowler, John and Helen Carey. "Energy and the Social Studies: A Match That Works." The Social Studies, in press, 1980.

PHASE VI

III. Work To Be Accomplished

The contractor is responsible for the following tasks, as outlined below and elaborated in the subject proposal, which is attached and made part hereto. Where there is a discrepancy between the proposal and these tasks, this description takes precedence.

Task 1. Revise Summer 1979 Materials for Publication

The 10 packets listed below were developed in draft in summer 1979, and field tested in the previous phase of this project. At least 8 will be revised according to the field test results, and camera-ready copies will be submitted to DOE. The packets are:

"E" the Magnificent Magician	Grades NK-1
Energy: The Thread of Life	Grades 3-5
Canada, Mexico and the United States: Energy Mix or Mix-Up?	Grades 6-9
Energy Conservation as a Political Issue	Grades 7-9
Less Developed Countries and Energy	Grades 9-12
Appropriate Technology for Energy Production	Grades 9-12
Energy Flows in Natural Systems	Grades 9-12

Critical Thinking on Energy Grades 9-12

Fossil Fuels and the Greenhouse Effect Grades 9-12

Energy and the Automobile Grades 9-12

Task 2. Disseminate Energy Education Information

NSTA will make energy education presentations at the following meetings:

- A. 1980 NSTA Annual Meeting, Anaheim, California
- B. 1980 National Council of Social Studies Annual Meeting, New Orleans, Louisiana
- C. 3 regional meetings of National Council of Social Studies
- D. 6 meetings with state or regional National Science Teachers Association groups
- E. 3 other meetings at appropriate education association conventions
- F. Washington, D.C. meeting with directors of Washington board educational associations
- G. Washington, D.C. meeting with directors of community organizations

NSTA will also produce at least 4 journal articles, no more than 2 of which are NSTA journals.

Task 3. Prepare Report and Annotated Index

Prepare a report summarizing the experience in energy education gained by PEEC, and its interconnections with other similar activities. Outline suggested implementation, dissemination and follow-up strategies. Include an annotated subject matter index to NSTA and other DOE energy education materials. Submit this draft to outside review.

Task 4. Steering Committee Meeting

Assemble a group of at least 10 experts for a 1 1/2 day meeting to discuss implementation/dissemination strategies. Candidate topics for the summer writing session will also be developed.

Task 5. Prepare for Summer 1980 Writing Session

Arrange for site and facilities for two writing sessions, and select writers.

Task 6. Regional Training Session for Workshop Leaders

Conduct 4 regional training sessions for selected leaders at supervisory level, based on PEEC's Workshop Handbook.

Task 7. Summer 1980 Writing Session No. 1

Conduct a 4-week writing session of 10 teachers to produce at least 4 draft curriculum packets.

Task 8. Summer 1980 Writing Session No. 2

Conduct a 2-week writing session of 8 teacher trainers to produce 5 expanded course outlines for education methods courses based on PEEC and other DOE materials.

Task 9. Review, Revise and Test Summer 1980 Materials

The materials developed in Tasks 8 and 9 will be polished and field tested according to the procedures described in the proposal.

Task 10. Practitioners Conference 1980

PEEC will provide planning leadership and staff for the working sessions of the 3rd Annual Practitioners Conference, to be funded by TVA.

Task 11. Revise and Update Report

The report and index drafted in Task 4 will be revised and updated after review comments have been received, camera-ready material will be submitted to DOE.

Task 12. Regional Energy Education Network

At least 24 regional network persons (half Science, half Social Studies) will be selected, and are to serve as information disseminators. They will attend one of the training sessions described in Task 7.

1. The following Tasks as identified in Contract No. DE-AC05-80IR10984 are hereby deleted in their entirety:

Task 1, Phase VI	Revise Summer 1979 Materials.
Task 1, Phase VII	Revise Summer 1980 Materials.
Task 2, Phase VII	Tests - provide pre and post test items for all appropriate lessons.
Task 8, Phase VII	Infusability Analysis.
Task 10, Phase VII	Substitute Teacher Packet.
Task 13, Phase VII	Revise the energy-related microcomputer programs.
Task 14, Phase VII	The PEEC staff will manage the production of at least 15 interdisciplinary packets on energy education during 1981.

2. All references to a final report are hereby deleted.
3. Paragraph (c) - Consideration of ARTICLE I - STATEMENT OF WORK AND CONSIDERATION, is hereby reduced by \$48,245, from \$618,700 to \$570,455.

The Contractor hereby releases and forever discharges the Government from all liability, and from all claims and demands which the Contractor now has or may hereafter have under the contract insofar as it pertains to that portion of the contract set forth in item 1. above.

6

DOE Contract #DE-AC05-80IR10984
Phase VI

TASK COMPLETION REPORT

Task 2. Disseminate Energy Education Information

"NSTA will make energy education presentations at the following meetings:

- A. 1980 NSTA Annual Meeting, Anaheim, California
- B. 1980 National Council of Social Studies Annual Meeting, New Orleans, Louisiana
- C. 3 regional meetings of National Council of Social Studies
- D. 6 meetings with state or regional National Science Teachers Association groups
- E. 3 other meetings at appropriate education association conventions
- F. Washington, D.C. meeting with directors of Washington board educational associations
- G. Washington, D.C. meeting with directors of community organizations

NSTA will also produce at least 4 journal articles, no more than 2 of which are NSTA journals."

PEEC staff attended the NSTA Annual Convention in Anaheim, California, March 21-24, 1980 and the NCSS Annual Meeting in New Orleans, Louisiana, November 19-22, 1980. In addition to these meetings, PEEC staff addressed the following other meetings during 1980:

RE: DOE Contract #

Phase VI

REPORT ON TASK COMPLETION

Task ⁴~~5~~: Steering Committee Meeting

We have found these Steering Committee meetings extremely useful to us in the past and have held them in advance of the summer writing sessions in order to get comments on and criticisms of our packet plans for the summer. Since our packet production in Summer 1980 will be somewhat reduced from the past, we hope in the 1980 Steering Committee meeting to get a considerable focus on questions of implementation/dissemination, and to receive suggestions for the activities that are necessary for an orderly completion of the PEEC process and for follow-up activities. Since this is a somewhat larger charge than we usually give the Steering Committee, we anticipate a 1-1/2 day long meeting in May of 1980.

The PEEC Steering Committee meeting was held on June 9-10, 1980 at the Twin Bridges Marriott in Washington, D.C. A list of the Steering Committee members and a report of this meeting is attached.

Task 5: Prepare for Summer 1980 Writing Session

Arrange for site and facilities for two writing sessions, and select writers.

The PEEC staff invited applications from teachers who wished to write energy materials through an announcement in Energy & Education (see Attachment #1). From the 25+ or so responses and from applications and recommendations received in other ways, 10 teachers for the Iowa State University writing session have been selected. The names, grade level, discipline, and addresses of the teachers selected are shown in Attachment #2.

Logistical arrangements have been made for the Project for an Energy-Enriched Curriculum design workshop. The workshop to be held 23 June through 23 July, 1980, in Ames, Iowa, is being hosted by Dr. Lynn Glass.

Tentative themes were selected and packet outlines were submitted to the PEEC Steering Committee on 9-10 June, 1980 (see Attachment #3).

Logistical arrangements have also been made for the Project for an Energy-Enriched Curriculum's development of "Expanded Course Outlines for 'Methods' Courses." This workshop will be held 21 July-1 August, 1980, at Millersville State College in Millersville, Pennsylvania, and is being hosted by Dr. Robert Labriola, Director, Stayer Research and Learning Center, Millersville State College. Eight educators from eight states with backgrounds in Science, Social Studies and Mathematics and with experience in elementary and high school levels have been selected. (See Attachment #4.)

Methods Course Outlines were also submitted to the PEEC Steering Committee on 9-10 June, 1980 and can be found in Attachment #5.

REPORT ON TASK COMPLETION

Task 6. Regional Training Session for Workshop Leaders

Conduct 4 regional training sessions for selected leaders at supervisory level, based on PEEC's Workshop Handbook.

NSTA's Project for an Energy-Enriched Curriculum has completed a series of four regional training sessions for selected leaders in energy education at the supervisory and state level. The local and the dates of these workshops were:

Boston, Massachusetts	March 5, 1980
Denver, Colorado	April 30, 1980
Washington, DC	October 27, 1980
Orlando, Florida	November 19, 1980

The primary function of these workshops was to encourage participants to provide inservice training on energy for teachers and educators in their regions. The workshops focused on workshop procedures, sources of funding and current materials. The NSTA/PEEC materials were considered in detail. Workshop methods described in PEEC's Workshop Handbook were presented.

These workshops also provided an opportunity to bring together regional leaders in energy education. Among those invited to these workshops were representatives of the State Offices of Education and Energy Agencies, members of the NSTA/NCSS Regional Energy Education Network, representatives of Energy and Man's Environment, and members of the Department of Education/Education Commission of the States energy education network.

Agendas and lists of participants of each of these workshop follow.

RE: DOE Contract #DE-AC05-80IR10984

Phase VI

REPORT ON TASK COMPLETION

Task 7. Summer 1980 Writing Session No. 1

Conduct a 4-week writing session of 10 teachers to produce at least 4 draft curriculum packets.

The summer workshop teachers, their grade levels and disciplines are listed in Appendix 1. These teachers worked for four weeks (June 25-July 24, 1980) in space provided by the Iowa State University, Ames, Iowa. They were supported by project staff and a part-time typist.

Five instructional packets are now in rough draft form. Copies of these packets are included as Appendix 2. These packets are to be considered as evidence of work done and are not yet intended for review. Packet titles and grade levels are:

THE ARITHMETIC OF ENERGY CONSERVATION
(Grades 4, 5, 6)

ENERGY IN THE FUTURE
(Grades 5-7)

ENERGY CONSERVATION: AN INTERNATIONAL COMPARISON
(UNITED STATES, SWEDEN, WEST GERMANY, AND JAPAN)
(Grades 7-9)

EXPLORING FOR ENERGY
(Grades 7-9)

MAKING DECISIONS ABOUT SYNFUELS
(Grades 11, 12)

Phase VI

REPORT ON TASK COMPLETION

Task 8. Summer 1980 Writing Session No. 2

Conduct a 2-~~233k~~^{Week} writing session of 8 teacher trainers to produce 5 expanded course outlines for education methods courses based on PEEC and other DOE materials.

Seven teacher educators from the science, social studies and mathematics disciplines worked during the time between July 21 and August 1, 1980. (See attached list of participants.*) The writing session site was The Stayer Research and Learning Center, Millersville State College, Millersville, Pennsylvania. The session was hosted by Dr. Robert Labriola, Center Director. The staff support for this writing session was the Associate Project Director and the Research Assistant.

The writers produced five packets for infusing energy education into teacher education courses and programs. Enclosed are two copies of each of these packets. These packets are in rough draft form--they are to be considered as evidence of work done and are not yet intended for review of any type. Packet titles are:

ENERGY IN SECONDARY SCHOOL SCIENCE TEACHER EDUCATION

ENERGY IN ELEMENTARY SCHOOL SCIENCE TEACHER EDUCATION

ENERGY IN SECONDARY SCHOOL SOCIAL STUDIES TEACHER EDUCATION

ENERGY IN ELEMENTARY SCHOOL SOCIAL STUDIES TEACHER EDUCATION

ENERGY IN MIDDLE/JUNIOR HIGH SCHOOL MATHEMATICS TEACHER EDUCATION

*One writer was called away due to illness of a member of his immediate family.

REPORT ON TASK COMPLETION

Task 10. Practitioners Conference 1980

PEEC will provide planning leadership and staff for the working sessions of the 3rd Annual Practitioners Conference, to be funded by TVA.

The Third Annual Practitioners Conference on Energy Education was held at TVA's Land Between the Lakes Conference Center on 13, 14, 15 November 1980. As required in the task description, the NSTA called and conducted a planning meeting at the conference center on October 16 and 17 (a list of the members of the planning groups is attached). The NSTA staff took the leadership in developing the full plans for the conference, in accepting applications and making invitations and the NSTA staff played a significant role in leading the conference activities.

The conference was attended by 70 participants including staff of NSTA and TVA. Of these participants, 25 were classroom teachers and including that 25, there were 40 who could accurately be described as educators. A list of participants is enclosed.

A full set of the proceedings of the conference is in preparation and will be supplied to the Department of Energy when they are completed.

REPORT ON TASK COMPLETION

Task 12. Regional Energy Education Network

At least 24 regional network persons (half Science, half Social Studies) will be selected, and are to serve as information disseminators. They will attend one of the training sessions described in Task 6.

In 1980 the Regional Energy Education Network (REEN) was made up of 21 representatives. (Regions I, IX and X did not have social studies representatives.) Attached is a list of the REEN representatives and their regions. In lieu of one REEN meeting for the network representatives as held in the past, four regional meetings were held. Seventeen REEN representatives attended one of the four leadership workshops (see Task 6 Report).

The network people were very active in 1980. They represented PEEC at a number of regional energy conferences held by the USOE. We have been represented by network people at 8 regional social studies meetings, 9 Wisconsin social studies teacher sectional meetings, 7 environmental/outdoor education workshops, 5 energy workshops for teachers (including one in Alaska), 1 state energy conference, 1 National Association for the Secondary School Principals national convention, 1 NSTA convention, and 1 ERIC energy education workshop. These representatives continue to provide PEEC with information on what's happening in the field of energy education, as well as respond to requests for information on energy education materials. Some even duplicate PEEC materials and send them to teachers, e.g., George Conom, Region VII. Region I, Ted Kaltsounis, assisted in the mailing of PEEC sample materials to State Social Studies Council Presidents. Jim Eckenrod, Region XII, co-edited "Running on Empty" for the California Council of Social Studies journal, The Social Studies Review.

The regional representatives were provided with money to cover secretarial services, mailing and some travel. The REEN UpDate, an informational newsletter, was provided to representatives. In turn, some representatives circulated the UpDate, e.g., John Padalino, Region II. (See Attached September 1980 issue of the REEN UpDate.)

PHASE VII

WORK TO BE ACCOMPLISHED

PROJECT FOR AN ENERGY ENRICHMENT CURRICULUM (Phase VII, 1981)

Statement of Work

(See Proposal for further elaboration and background.)

Task 1: Revision of Summer 1980 Materials

Revise according to field test reports and submit final drafts of at least eight of the packets developed in the summer 1980 writing session as described in proposal. Proofread galleys and make necessary corrections.

Task 2: Tests

Prepare a set of pre- and post-tests, each containing a minimum of 10 items, for 12 of the printed packets and 22 of the draft packets, as described in proposal. Field test, revise and submit to DOE.

Task 3: NSTA Annual Meeting

At the 1981 NSTA National Meeting to be held in New York, April 3-6, 1981, provide a well-known speaker on energy at a special session; conduct ^{one} grade level workshop at elementary ^{level, one at} _{one at} middle and high school levels; and staff a booth in the exhibition area using the DOE/PEFC display.

Task 4: National Energy Education Conference

Assist the National Council for the Social Studies to hold a "National Energy Education Conference" in Detroit in November 1981. NSTA will provide a well-known speaker, 3 grade level workshops, a poster session, and will staff the DOE/PEFC booth.

Task 5: Other Dissemination Activities

Make at least 6 presentations at educational conferences other than NSTA and NCSS. Submit energy education articles to at least two journals other than NSTA, copies to DOE.

Task 6: National Energy Education Day (NEED)

Recruit volunteer high school science and social studies teachers to serve as NEED contacts in their schools. Send them certificates plus free material useful for NEED.

Task 7: Fourth Practitioners Conference

Assist in the planning and implementation of a "Fourth Practitioners Conference on Energy Education." (Conference contingent on availability of non-DOE support.)

Task 8: Infusability Analysis

Produce an analysis of the infusability of PEEC materials into all major science and social studies texts. Submit for publication in NSTA and NCSS journals, copy to DOE.

Task 9: Steering Committee

Conduct a one-day meeting of at least 10 experts from private sector, environmental groups, educational community, computer field and government, to review and critique PEEC materials and activities. Submit a report to DOE.

Task 11

12 Arrang for Test Schools.

The PEEC staff will distribute the draft materials from Summer 1978 to 200 preselected Test Schools. The appropriate administrator will agree to provide the NSTA with a report on the experience with the units in exchange for their provision in bulk.

13 Prepare Summer '78 materials for publication and distribute to Test Schools.

At least 8 draft units prepared during the writing sessions at the University of Maryland and the University of Colorado, June-August 1978 will be delivered as camera-ready copy to the appropriate project officer at the U.S. Department of Energy during Fall 1978.

14 Presentations at NCCS Annual Meeting and NSTA Area Conventions

A talk or workshop will be arranged for the NCCS Annual Meeting in Fall 1978. The PEEC staff will also arrange and monitor "contributed paper" sessions at the three NSTA Area Conventions in Fall and Winter 1978. A talk or workshop will be arranged for one other meeting of an educational association during this same time period.

15 Publish articles in educational journals.

The project staff will prepare two articles on energy education for publication during school year 1978-79. At least one of these articles will be in other than an NSTA journal.

Budget allocation _____

16 Regional Workshops.

Through the regional network described in Task 1, sites for four regional workshops will be selected. The 20 or so participants at each workshop will be selected by the regional representatives. They will be supervisors or other administrative personnel and will be expected to use the workshop experience to run their own in-service programs for teachers.

Department of Energy
Washington, D.C. 20585

FEB 2 1979

Dr. John M. Fowler
Director of Special Projects
National Science Teachers Association
1742 Connecticut Avenue, N.W.
Washington, D.C. 20009

Dear John:

I have been advised by our Procurement Office that since the requested changes in tasks 12 and 13 of Contract No. EX-76-C-10-3841 do not involve any changes in the cost or time involved in accomplishing the work, I may permit them. Since they are within the scope and intent of the contract, you are hereby authorized to follow your proposed wording of tasks 12 and 13, as follows:

Task 12: The PEEC staff will distribute the draft materials from Summer '78 to at least 9 test schools. Results of these trial uses will be collected, discussed with participating teachers and will guide subsequent revisions.

Task 13: At least 8 draft units prepared during the writing sessions at the University of Maryland and the University of Colorado during June-August 1978 will be prepared in form satisfactory for classroom trial use. Three copies of each of these will be delivered to the appropriate project officer at the U.S. Department of Energy for review and comment.

Sincerely,

A handwritten signature in black ink, appearing to read "Donald D. Duggan", with a long, sweeping underline.

Donald D. Duggan
Chief
Academic Programs Branch
Education Programs Division

PHASE VIII

Revised

Statement of Work

Payment

Task 1. Grade-Level Packets. The classroom packets developed in the Project for an Energy Enriched Curriculum (PEEC) will be edited and repackaged into 7 collections; one comprehensive collection at the K-3, lower elementary level; one comprehensive collection at the 4-6, upper elementary/middle grades; two collections, one in science and one in social studies, at the 7-9, junior high/middle school level; and three collections, in social studies, physical and life sciences, at the 10-12 senior high school level. Two copies of each will be delivered to DOE. \$21,905*

(Revised Task 1 incorporates Task 14 from VII of Contract No. DE-AC05-80IR10984. *Payment of \$8,000 from Mod. M001 and \$13,905 which was designated for Task 14 under referenced contract.)

Task 2. Revise and Update Selected Packets from the First Printing. The classroom packets developed during 1976 and 1978 have been in print for several years. It appears to us that several of these are in need of substantial revision and updating. We will be guided by existing DOE reviews but propose, in addition, further content reviews, some changes in artwork, and some contracted writing. We will substantially revise up to six of the old packets, provide new data in all 15 packets where feasible, and prepare up to 15 packets for reprinting in either camera ready form or as a manuscript marked for typesetting as required by the DOE Program Officer. 8,000

Task 3. Produce an Index to the PEEC Interdisciplinary Classroom Packets. An index will be prepared which not only references individual lessons by energy topic, but also correlates student skills in science, mathematics, and in social studies with the PEEC lessons. This index will be sent out for review to a variety of teachers and curriculum developers, revised on the basis of the reviews and delivered to the DOE Program Officer. 8,000

Task 4. Dissemination and Publicity. The NSTA proposes to continue to provide presentations and workshops at appropriate meetings of educational organizations in 1981-1982. This final round of presentations will be, for the most part, in the nature of final reports on PEEC. Such final reports will be delivered to the Annual Meeting of the NSTA in Chicago in April 1982, to the Annual Meeting of NCSS in Boston, in November 1982, and to at least two other organizations. 8,000

We also propose to hold a meeting of science textbook authors at the NSTA Annual Meeting and of social studies textbook authors at the NCSS Annual Meeting to make certain that they are fully aware of the PEEC materials and encourage them to adopt these materials in the educational materials that they produce.

Further dissemination, independent of DOE funding will be accomplished through the regional and national meetings of the Energy Education Network which is to be jointly conducted by NSTA and the Education Commission of the States and funded by a consortium of energy companies and the American Petroleum Institute (API).

- Task 5. Microcomputer Workshop at NSTA and NCSS Annual Meetings. \$ 5,000
We propose to give a demonstration workshop presentation at the annual meeting of the NSTA in Chicago in April 1982 of the exemplary software developed during summer 1981. A similar demonstration will be offered at the NCSS Annual Meeting and at least two other national conferences.
- Task 6. Practitioners Conference. The National Science Teachers Association will work with other organizations to plan, arrange for the support of and conduct a Fifth Practitioners Conference on Energy Education in 1982. This will be a small, by invitation working conference of about 60 teachers, materials developers, educators from the private sector and others interested in energy education. The NSTA will contribute staff to planning and directing the conference. A budget item is also included for production in 1982 of the Proceedings of the 1981 Conference. 5,000
- Task 7. (formerly Task 8, Mod. M001) Prepare a report on the extent of penetration and perceived barriers for energy education. NSTA will conduct a study of the extent of penetration of energy education into classroom use, and determine the perceived barriers to further implementation of energy education, especially at the elementary and secondary level, including high school science, social studies, mathematics and home economics classes. 17,250
- Task 8. Revise Summer 1979 Materials. (Formerly Task 1, Phase VI Contract DE-AC05-80IR10984. Revise according to field test results and submit final drafts to DOE of at least 8 packets developed in the summer 1979 writing session. 6,980
- Task 9. Revise Summer 1980 Materials. (Formerly Task 1, Phase VII, Contract DE-AC05-80IR10984) Revise according to field test results and submit final drafts of at least 8 packets developed in the summer 1980 writing session. 7,500
- Task 10. Tests. (Formerly Task 2, Phase VII, Contract DE-AC05-80IR10984) Prepare a set of pre-and post-tests, each containing a minimum of 10 items, for 12 of the printed packets and 22 of the draft packets. Field test, revise, and submit to DOE. 5,000
- Task 11. Infusability Analysis. (Formerly Task 8, Phase VII, Contract DE-AC05-80IR10984) Produce an analysis of the infusability of PEEC materials into all major science and social studies texts. Submit for publication in NSTA and NCSS journals, copy to DOE. 4,860
- Task 12. Substitute Teacher Packets. (Formerly Task 10, Phase VII, Contract DE-AC05-80IR10984) Prepare 3 packets, one each at primary, middle school and high school levels, consisting of one day's worth of activities for substitute teachers. Field test, revise and submit to DOE. 5,000
- Task 13. Field Test Software. (Formerly Task 13, Phase VII, Contract DE-AC05-80IR10984) Field test and polish software previously developed, revise and submit final copy to DOE. 5,000
- Task 14. Final Report. (Formerly Task 7 under Mod. M001) The PEEC Director and staff will produce a final report on the Project for delivery to the Program Officer. The final report will include not only a descriptive listing of materials developed, but also a description of the production models, the testing mechanism and a summary of feedback on use and evaluation. 5,780

The final report will also include such information on the state and needs of energy education as are developed by the various activities in which the NSTA is involved and will conclude with recommendations to the DOE and other funding agencies for the future continuation of a visible and effective national effort in energy education. The final report will be summarized in articles prepared for NSTA and NCSS journals, and for such other journals as are appropriate.

PEEC-Phase VIII

REPORT ON TASK COMPLETION

Task 1: Grade-Level Packets

The classroom packets developed in the Project for an Energy-Enriched Curriculum (PEEC) will be edited and repackaged into 7 collections: one comprehensive collection at the K-3, lower elementary level; one comprehensive collection at the 4-6, upper elementary/middle grades; two collections, one in science and one in social Studies, at the 7-9, junior high/middle school level; and three collections, in social studies, physical and life sciences, at the 10-12 senior high school level. Two copies of each will be delivered to DOE.

The seven collections called for in Task 1 are enclosed. These collections are distinguished by grade level and discipline as specified in the task description. The collection titles, grade level, and discipline focus are shown below.

<u>Grade Level</u>	<u>Discipline</u>	<u>Collection Title</u>
K-3	N/A	WE MAKE CHOICES ABOUT ENERGY
4-6	N/A	YOU AND ME AND ENERGY TODAY AND TOMORROW
7-9	Science	ENERGY RESOURCES, PRODUCTION, AND USE
7-9	Social Studies	INTERACTIONS: ENERGY AND SOCIETY
10-12	Physical Science	ENERGY DELIMITERS
10-12	Life Sciences	ENERGY TRANSFERS
10-12	Social Studies	ENERGY AND SOCIETY: CONFLICTS AND CONNECTIONS

The lessons the collections contain are organized by broad topic as shown in each table of contents. Lessons included in the collections are taken from the 38 completed manuscripts submitted to DOE in fulfillment of several different tasks. YOU AND ME AND ENERGY TODAY AND TOMORROW (the Grades 4-6 collection) also includes some lessons taken from the classroom units How We Make Energy Work and The Energy Dome, produced by NSTA under DOE contract #EC-77-C-01-6083.

DOE Grant #DE-FG05-81ER10264

PEEC-Phase VIII

REPORT ON TASK COMPLETION

Task 2: =Revise and Update Selected Packets From the First Printing

The classroom packets developed during 1976 and 1978 have been in print for several years. It appears to us that several of these are in need of substantial revision and updating. We will be guided by existing DOE reviews but propose, in addition, further content reviews, some changes in artwork, and some contracted writing. We will substantially revise up to six of the old packets, provide new data in all 25 packets for reprinting in either camera ready form or as a manuscript marked for typesetting as required by the DOE Program Officer.

This task description was based on the anticipation that the policy of publishing the PEEC classroom packets would be continued or that PEEC would be able to identify other sources of support for their publication. As a part of further publications it would have been useful to update the packets already in print.

Since no plans for further publication have developed, a decision was reached between the PEEC project director and the DOE program manager not to carry out this task.

No invoice for the \$8,000 designated for this task will be submitted.

DOE Grant #DE-FG05-81ER10264

PEEC-Phase VIII

REPORT ON TASK COMPLETION

Task 3: Produce an Index to the PEEC Interdisciplinary Classroom Packets

An index will be prepared which not only references individual lessons by energy topic, but also correlates student skills in science, mathematics, and in social studies with the PEEC lessons. This index will be sent out for review to a variety of teachers and curriculum developers, revised on the basis of the reviews, and delivered to the DOE Program Officer.

The lessons produced under the PEEC contracts and grants have been organized by grade level and discipline into seven collections (see description in Task 1).

The attached index, submitted in fulfillment of Task 3, provides collection and lesson references of basic energy/environment/economics topics and also provides references to the location of lessons in which basic skills in both science and social studies are developed.

DOE Grant #DE-FG05-81ER10264
PEEC-Phase VIII

REPORT ON TASK COMPLETION

Task 4: Dissemination and Publicity

The NSTA proposes to continue to provide presentations and workshops at appropriate meetings of educational organizations in 1981-1982. This final round of presentations will be, for the most part, in the nature of final reports on PEEC. Such final reports will be delivered to the Annual Meeting of the NSTA in Chicago in April 1982, to the Annual Meeting of NCSS in Boston, in November 1982, and to at least two other organizations.

We also propose to hold a meeting of science textbook authors at the NSTA Annual Meeting and of social studies textbook authors at the NCSS Annual Meeting to make certain that they are fully aware of the PEEC materials and to encourage them to adopt these materials in the educational materials that they produce.

Further dissemination, independent of DOE funding will be accomplished through the regional and national meetings of the Energy Education Network which is to be jointly conducted by NSTA and the Education Commission of the States and funded by a consortium of energy companies and the American Petroleum Institute (API).

John Fowler, Project Director, reported on PEEC accomplishments and products at the following meetings:

American Association of Physics Teachers
Annual Meeting
San Francisco, CA
January 26-28, 1982

NSTA Annual Meeting
Chicago, IL
April 2-5, 1982

International Energy Information Forum and
Workshop for Educators
Gatlinburg, TN
June 10-12, 1982

NSTA Area Convention
Knoxville, TN
October 21-23, 1982

Connecticut Energy Council for Teachers (CONNECT) Meeting
Madison, CT
November 4, 1982

NCSS Annual Meeting
Boston, MA
November 27-28, 1982

Reports were also given at the two National Energy Education Network meetings: Southwest Regional Meeting, Houston, TX, October 28-29, 1982; Norhteast Regional Meeting, Madison, CT, November 5-6, 1982.

DOE Grant #DE-FG05-81ER10264
PEEC-Phase VIII

REPORT ON TASK COMPLETION

Task 5: Microcomputer Workshop at NSTA and NCSS Annual Meetings

We propose to give a demonstration workshop presentation at the Annual Meeting of NSTA in Chicago in April 1982 and of the exemplary software developed during Summer 1981. A similar demonstration will be offered at the NCSS Annual Meeting and at least two other national conferences.

A microcomputer workshop demonstrating the energy-related programs developed by PEEC during summer '81 was given at the NSTA Annual Meeting in Chicago on April 2, 1982. In addition, Ted Hall, who worked on these programs during his tenure as a PEEC staff member, gave workshops at the following meetings:

Michigan Energy Educators Forum
Detroit, Michigan April 24, 1982

NSTA Area Convention
Knoxville, TN October 22, 1982

Energy Forum '82
New Haven, Connecticut October 29, 1982

The Association for Supervision and Curriculum Development
Arlington, Virginia March 23, 1983

While it was not possible to arrange for their display at the NCSS Annual Meeting in 1982, they were displayed, as part of the National Conference on Energy Education, at the 1981 Annual Meeting of the NCSS.

A microcomputer workshop is also scheduled for presentation at the NSTA Annual Meeting in Dallas on April 8, 1983.

DOE Grant #DE-FG05-81ER10264
PEEC-Phase VIII

REPORT ON TASK COMPLETION

Task 6: Practitioners Conference

The National Science Teachers Association will work with other organizations to plan, arrange for the support of and conduct a Fifth Practitioners Conference on Energy Education in 1982. This will be a small, by invitation working conference of about 60 teachers, materials developers, educators from the private sector and others interested in energy education. The NSTA will contribute staff to planning and directing the conference. A budget item is also included for production in 1982 of the Proceedings of the 1981 Conference.

Implementing a recommendation from the Fourth Annual Practitioners Conference on Energy Education (held December 10-12, 1981), the role played by these Practitioners Conferences in energy education has been taken over by the newly formed National Council for Energy in Education (NCEE). Two meetings of the NCEE were held in 1982, on 25 May and 14 December. Minutes of those two meetings are attached. The PEEC staff had the major responsibility for organizing, conducting and reporting the two meetings.

The NCEE has now been formally constituted and an operating procedure for planning and conducting the next meeting set in place.

TASK COMPLETION REPORT

Task ⁷ 8:

Prepare a report on the extent of penetration and perceived barriers for energy education. NSTA will conduct a study of the extent of penetration of energy education into classroom use, and determine the perceived barriers to further implementation of energy education, especially at the elementary and secondary level, including high school science, social studies, mathematics and home economics classes.

The study of the extent of penetration and perceived barriers for energy education is completed. The report "Energy Education in the Schools" is attached. The study was made with the advice of a steering committee which met November 24, 1981. Further advice and comments were gathered by mail and by smaller meeting discussions on August 19, 1982 and October 7, 1982.

The highlights of the report were published as an article in the December 1982 issue of Energy & Education. The report itself has been widely distributed--to date 950 copies have been distributed on request. The results were also reported at the NSTA Area Convention in Knoxville, Tennessee, October 1982 and at several other meetings, including a high level meeting of leaders in the energy education community organized by the Education Commission of the States on March 1, 1983. A summary of that presentation was carried in the ECS newsletter, Energy & Education in the States, in April 1983.

The report is widely hailed as a significant contribution to the improvement of energy education and its results will form a solid foundation of planning for future activities.

PEEC-Phase VIII

REPORT ON TASK COMPLETION

Task 8: Revise Summer 1979 Materials

Revise according to field test results and submit final drafts to DOE of at least 8 packets developed in the summer 1979 writing session.

The following packets were field tested by teachers, revised, and submitted to our Program Officer at DOE:

Energy and the Automobile

The Arithmetic of Energy Conservation

Energy for Tomorrow

Making Decisions About Synfuels

Energy in Less Developed Countries

Energy Conservation: An International Comparison

Energy and Water

Energy: The Thread of Life

PEEC-Phase VIII

REPORT ON TASK COMPLETION

Task 9: Revise Summer 1980 Materials

Revise according to field test results and submit final drafts of at least 8 packets developed in the summer 1980 writing session.

The following packets were field tested by teachers, revised, and submitted to our Program Officer at DOE:

EXPLORING FOR ENERGY

FOSSIL FUELS AND THE GREENHOUSE EFFECT

BIOFUELS

ENERGY CONSERVATION AS A POLITICAL ISSUE

CRITICAL THINKING ON ENERGY

ENERGY FLOWS IN NATURAL SYSTEMS

APPROPRIATE TECHNOLOGY FOR ENERGY PRODUCTION

ENERGY IN SECONDARY SCHOOL SOCIAL STUDIES TEACHER EDUCATION

PEEC-Phase VIII

REPORT ON TASK COMPLETION

Task 10: Tests

Prepare a set of pre- and post-tests, each containing a minimum of 10 items, for 12 of the printed packets and 22 of the draft packets. Field test, revise, and submit to DOE.

Attached are two copies of 32 sets of pre- and post-tests with at least 10 items each. (Tests were constructed only for the 20 draft packets which were finally completed.)

These tests were reviewed and evaluated by teachers (see attached list) and were then revised accordingly.

DOE Grant #DE-FG05-81ER10264

PEEC-Phase VIII

REPORT ON TASK COMPLETION

Task 11: Infusability Analysis

Produce an analysis of the infusability of PEEC materials into all major science and social studies texts. Submit for publication in NSTA and NCSS journals, copy to DOE.

The enclosed report, "Infusion Analysis Report," contains the analysis of the infusability of PEEC material into major science and social studies texts. Also enclosed are copies of letters submitting abridged versions of the report to NSTA's journal, The Science Teacher, and to NCSS's journal, Social Education.

DOE Grant #DE-FG05-81ER10264
PEEC-Phase VIII

REPORT ON TASK COMPLETION

Task 12: Substitute Teacher Packets

Prepare 3 packets, one each at primary, middle school and high school levels, consisting of one day's worth of activities for substitute teachers. Field test, revise and submit to DOE.

The activities for substitute teachers called for in Task 12 have been prepared, tested, and revised. The final manuscript, separated into materials for elementary, middle/junior high, and senior high school students is enclosed.

PEEC-Phase VIII

REPORT ON TASK COMPLETION

¹³
Task 5: Field Test Software

Field test and polish software previously developed, revise, and submit final copy to DOE.

Six supplementary microcomputer programs with energy themes developed by PEEC during the summer of 1981 have undergone field testing and revision and are now being distributed by NSTA and Human Relations Media (HRM). The six programs are:

- Power Grid
- Temperature Grapher
- Personal Energy Inventory
- Home Energy Savings
- Energy Conversions
- Electric Bill

They were distributed for testing to science educators with programs involving groups of teachers as well as to many individual teachers. The testing results therefore are the summarized results from many teachers. These reviewers are listed in Attachment 1.

Revision and final preparation for commercial distribution was carried out by the Technical Education Research Center (TERC) under the direction of Dr. Robert Tinker. TERC and Dr. Tinker hosted the 1981 writing session. This arrangement was described to DOE in my letter of February 3, 1983 asking permission to file for copyright on this software. A copy of that letter and the reply from Donald Duggan, the DOE Program Manager, is attached (Attachment 2).

The six programs are now being sold by NSTA and HRM. An NSTA publications list and an HRM catalogue is included. We also submit the documentations and disks of the six programs.

PEEC-Phase VIII

REPORT ON TASK COMPLETION

Task 14: Final Report

The PEEC Director and staff will produce a final report on the Project for delivery to the Program Officer. The final report will include not only a descriptive listing of materials developed, but also a description of the production models, the testing mechanism, and a summary of feedback on use and evaluation.

The final report will also include such information on the state and needs of energy education as are developed by the various activities in which the NSTA is involved and will conclude with recommendations to the DOE and other funding agencies for the future continuation of a visible and effective national effort in energy education. The final report will be summarized in articles prepared for NSTA and NCSS journals, and for such other journals as are appropriate.

The Final Report required by Task 14 is submitted. In its sections and appendices it provides the material required in that task description. In addition to this written version, final reports on the PEEC program were given as presentations at the 1983 Winter Meeting of the American Association of Physics Teachers (January 26-28, 1982) and the 1983 Annual Meeting of the National Science Teachers Association (April 7-10, 1983).

Articles are being prepared for submission to NSTA's The Science Teacher and NCSS's Social Education.

APPENDIX 1

TASK DESCRIPTIONS

APPENDIX 2

WRITING SESSION SITES AND PARTICIPANTS

Project for an Energy-Enriched Curriculum

Writing Session
University of Maryland
Summer 1976

PARTICIPANTS LIST

John M. Fowler
Project Director
National Science Teachers Association

Helen Carey
Associate Project Director
Martin Luther King Junior High School
Adelphi, Maryland

John Layman
Associate Project Director
University of Maryland

Lenore Bloch
Crestwood Elementary School
Springfield, Virginia

Phyllis Brock
Rockdale County High School
Decatur, Georgia

Barbara Childs
Browne Junior High School
Washington, DC

John Day
Albert Einstein High School
Silver Spring, Maryland

Arthur Goldman
Benjamin Banneker Junior High
Silver Spring, Maryland

Gloria Hill
Largo Senior High School
Cheverly, Maryland

Bette Johnson
Dunloggin Middle School
Baltimore, Maryland

Andrew Pogan
Poolesville High School
Rockville, Maryland

Leon Scipio
Browne Junior High School
Clinton, Maryland

Robert Snyder
Norwell High School
Jamaica Plain, Massachusetts

Olivia Swinton
Washington-Highland Community School
Oxon Hill, Maryland

Rita Sonnelitter
Ridgeview Junior High
Gaithersburg, Maryland

Chris Hatch
O.W. Phair Elementary School
Gaithersburg, Maryland

Project for an Energy-Enriched Curriculum

Writing Session
University of Maryland
Summer 1977

PARTICIPANTS LIST

John M. Fowler
Project Director
National Science Teachers Association

King C. Kryger
Associate Project Director
National Science Teachers Association

Helen H. Carey
Coordinator/Editor
National Science Teachers Association

Evelyn Brown
Fairfax County Intermediate School
Fairfax County, Virginia

John W. Christensen
Cherry Creek High School
Englewood, Colorado

John Day
Albert Einstein High School
Montgomery County, Maryland

Dora Dean
Lakewood Board of Education
Lakewood, Ohio

Charles Durr
Supervisor of Elementary Science
Syracuse Public Schools
Syracuse, New York

Arthur R. Goldman
Banneker Junior High School
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Chris Hatch
O.W. Phair Elementary School
Prince George's County, Maryland

Bettie Johnson
Dunloggin Middle School
Ellicott City, Maryland

Jacquelyn L. Lendsey
Montpelier Elementary School
Laurel, Maryland

Melissa McEwen
Burlington, Iowa

Robert Snyder
Norwell High School
Rocklin, Massachusetts

Olivia Swinton
Washington-Highland Community School
Washington, DC

Kenneth P. Weeden
Friendly Senior High School
Oxon Hill, Maryland

Project for an Energy-Enriched Curriculum

Writing Session
University of Maryland
Summer 1978

PARTICIPANTS LIST

Mary B. Crum
Denmark-Olar Senior High School
Denmark, South Carolina

Billie A. Day
Cardozo High School
Washington, DC

Ronald B. DeMuro
West Deptford Township Middle School
West Deptford, New Jersey

Barbara Graves
Waldorf, Maryland

Robert E. Lewis
Springer Junior High School
Wilmington, Delaware

Charles Norwood
Burke, Virginia

Karen O'Neil
Central High School
East Corinth, Maine

John L. Roeder
The Calhoun School
New York, New York

Howard S. White
McKinley High School
Washington, DC

Project for an Energy-Enriched Curriculum

Writing Session
University of Colorado--Boulder
Summer 1978

PARTICIPANTS LIST

John W. Christensen
Cherry Creek Senior High School
Englewood, Colorado

Dora Dean
The Board of Education
Lakewood, Ohio

Larry Flick
Park-Tudor School
Indianapolis, Indiana

Gary R. Smith
Englewood, Colorado

Marcia E. Liberati
Central Linn High School
Halsey, Oregon

David C. Ulmer, Jr.
General William Mitchell High School
Colorado Springs, Colorado

Beverly Wu
Lakeview School
Oakland, California

Jerry A. Cronk
Arvada, Colorado

Barbara Rowley
Lakewood, Colorado

Task 10: Substitute Teacher Partner

Prepare ^{3 packets, one each} _A at primary, middle school and high school levels, consisting of one-day's worth of energy activities for substitute teachers. Field test, revise and submit to DOE. Proofread galleries as required.

Task 11: Software for High Schools

Conduct a working session for 6 teacher/student programmer pairs to prepare a microcomputer software package of energy simulations, games, projections and computations suitable for junior and senior high school use as described in the proposal. At least 8 draft programs will be submitted to DOE.

Task 12: Software for Elementary Schools

Conduct a two week working session of three educators to develop a pilot micro computer software package of energy related mathematics activities. A draft manuscript containing applications at three separate grade levels (4, 5, and 6) will be submitted to DOE.

Task 13:

Polish and field test the materials developed in Task 11 and 12 according to the procedure described in the proposal. Revise materials according to field test results and submit final manuscripts to DCE.

Read and correct proofs as required.

Task 14:

The PEEC Staff will manage the production of at least 15 interdisciplinary packets on energy education during 1981. This will include providing the printing specifications, proofreading the galleys, and producing a paste-up or "dummy" guide for the printer.

1. The following Tasks as identified in Contract No. DE-AC05-80IR10984 are hereby deleted in their entirety:

Task 1, Phase VI	Revise Summer 1979 Materials.
Task 1, Phase VII	Revise Summer 1980 Materials.
Task 2, Phase VII	Tests - provide pre and post test items for all appropriate lessons.
Task 8, Phase VII	Infusability Analysis.
Task 10, Phase VII	Substitute Teacher Packet.
Task 13, Phase VII	Revise the energy-related microcomputer programs.
Task 14, Phase VII	The PEEC staff will manage the production of at least 15 interdisciplinary packets on energy education during 1981.

2. All references to a final report are hereby deleted.
3. Paragraph (c) - Consideration of ARTICLE I - STATEMENT OF WORK AND CONSIDERATION, is hereby reduced by \$48,245, from \$618,700 to \$570,455.

The Contractor hereby releases and forever discharges the Government from all liability, and from all claims and demands which the Contractor now has or may hereafter have under the contract insofar as it pertains to that portion of the contract set forth in item 1. above.

DOE Contract #DE-AC05-80IR10984

Project for an Energy-Enriched Curriculum

REPORT ON TASK COMPLETION

Task 3: NSTA Annual Meeting

At the 1981 NSTA National Meeting to be held in New York, April 3-6, 1981, provide a well-known speaker on energy at a special session; conduct one grade level workshop at elementary level, one at middle and one at high school levels; and staff a booth in the exhibition area using the DOE/PEEC display.

PEEC staff attended the NSTA Annual Meeting in New York, April 3-6, 1981. The PEEC display panel and a complete display set of all DOE/NSTA-PEEC materials were set up at a booth in the exhibition area in the Hilton Hotel. At least one staff person maintained this booth at all times to answer questions and to distribute materials. Multiple copies (approximately 50 copies each) of all materials in final form were distributed, along with several hundred Publications Lists and Energy & Education newsletters.

A special session--an Energy Headliner--was held on Saturday, April 4th. Denis Hayes, Director, Solar Energy Research Institute, gave a talk entitled "Energy and Education," which ended up with a Question and Answer period. A report on Dr. Hayes' talk is attached.

Three "Energy Seminars" were given--one each at the elementary, middle school/junior high, and high school levels. Reports of these sessions are also attached.

On April 3, 1981 from 4:30-6:30 p.m., a meeting was held to acquaint science textbook authors with trends and needs in energy education and to acquaint them with the DOE and NSTA energy education materials. A similar meeting had been held with social science authors at the Annual Meeting of the National Council for the Social Studies in New Orleans over the Thanksgiving weekend of 1980. A list of the science authors at the New York meeting is attached. Request for materials were filled and considerable enthusiasm for energy as a science topic was shown.

DOE Contract #DE-AC05-80IR10984

Project for an Energy-Enriched Curriculum

REPORT ON TASK COMPLETION

Task 4: National Energy Education Conference

Assist the National Council for the Social Studies to hold a "National Energy Education Conference" in Detroit in November 1981. NSTA will provide a well-known speaker, 3 grade level workshops, a poster session, and will staff the DOE/PEEC booth.

The National Conference on Energy Education, "Energy Education for the 80's," was held in Detroit on November 22, 1981. NSTA assisted the National Council for the Social Studies in planning and carrying out this one-day theme conference as a part of the NCSS Annual Meeting. NSTA announced the call for papers and workshops in its newsletter, Energy & Education, and coordinated the selection and scheduling of these concurrent sessions for the conference. A copy of the conference program is enclosed.

As required in the task description, NSTA provided the major speakers: Dr. Betsy Anker-Johnson, Vice-President for Environmental Activities, General Motors Corporation, who spoke on "Detroit's Response to the Energy Crunch;" Dr. Margaret N. Maxey, Assistant Director of the South Carolina Energy Research Institute and Dr. Dorothy S. Zinberg, Lecturer in Public Policy at the Center for Science and International Affairs of the Kennedy School of Government, Harvard University who spoke on a panel, "Power to the People: Shaping Energy Policies in a Democracy."

NSTA held two one-hour workshops during the conference, "A Microcomputer Workshop on Energy Software for Middle and High School," and "Energy and Education and PEEC: Prospects for 1982." The NSTA staff also manned an exhibit of the PEEC materials in the exhibit hall, at which over 1000 copies of the PEEC/DOE packets were distributed.

NSTA sponsored two receptions during the conference. One was held on the evening of November 21 for conference presenters, at which presenters were able to share their activities in energy education. A reception was held immediately following the conference on November 22 for all participants.

NSTA provided publicity for the conference by printing and mailing 5000 flyers about the conference (a copy of this flyer is enclosed). NSTA also advertised the conference in its newsletter, Energy & Education and its magazines, Science and Children and The Science Teacher. Attendance at the conference included nearly 400 teachers and other educators who are not members of NCSS, clearly a direct result of NSTA's publicity for the conference.

DOE Contract #DE-AC05-80IR10984
Phase VII

REPORT ON TASK COMPLETION

Task 5: Other Dissemination Activities

Make at least 6 presentations at educational conferences other than NSTA and NCSS. Submit energy education articles to at least two journals other than NSTA, copies to DOE.

PEEC staff attended six educational conferences--reports of these conferences are attached (Attachment 1).

PEEC staff also wrote the following three articles during 1981. Copies of the articles which were either published or accepted for publication during the period covered by Phase VII are included as Attachment 2.

1. Fowler, John M. "A Lot of Energy at the NSTA." Contemporary Education, Vol. 52, No. 2, Winter 1981, pp. 73-77.
2. Fowler, John M. "Energy Education and the Environment." Environment Magazine, May 1981, pp. 40-42.
3. Hofman, Helenmarie and Lynn W. Glass. "Three Studies for Evaluating Energy Education Curriculum Materials." To be published in the June 1981 issue of School Science and Mathematics.

Project for an Energy-Enriched Curriculum

REPORT ON TASK COMPLETION

Task 6: National Energy Education Day (NEED)

Recruit volunteer high school science and social studies teachers to serve as NEED contacts in their schools. Send them certificates plus free material useful for NEED.

To help celebrate National Energy Education Day (NEED), we solicited local coordinators through Energy & Education. For these coordinators we prepared a packet of useful energy education materials, including a list of activity ideas, a bibliography of films and a list of reference materials. The packet was mailed to over 3,000 teachers across the country. Teachers who reported their NEED activities to us received a letter of thanks signed by Don Duggan and John Fowler. See enclosed materials.

DOE Contract #DE-AC05-80IR10984

Project for an Energy-Enriched Curriculum

REPORT ON TASK COMPLETION

Task 7: Fourth Practitioners Conference

Assist in the planning and implementation of a "Fourth Practitioners Conference on Energy Education." (Conference contingent on availability of non-DOE support.)

The Fourth Practitioners Conference on Energy Education was held at the National 4-H Center in Chevy Chase, Maryland on December 10-12, 1981. As required in the task description, NSTA participated in the planning and implementation of the conference, which was funded by a contract from DOE to the National Coal Association and contributions from the Edison Electric Institute and the American Gas Association. A list of the members of the planning committee is attached.

Planning meetings for the conference were held on October 5, 19 and December 2. NSTA announced the call for participants in its newsletter, Energy & Education, and coordinated the participant selection committee. NSTA staff provided much of the coordination clerical support for the conference.

The conference was attended by 72 educators from across the country, and 5 support staff members from NSTA, AGA, EEI and NCA. Of these participants, 30 were classroom teachers, and 9 more were supervisors, principals or university professors. A list of participants is enclosed.

The proceedings of the conference will be edited and produced by NSTA. A copy of the proceedings will be supplied to the Department of Energy when they are completed.

DOE Contract #DE-AC05-80IR10984

Project for an Energy-Enriched Curriculum

REPORT ON TASK COMPLETION

Task 9: Steering Committee

Conduct a one-day meeting of at least 10 experts from private sector, environmental groups, educational community, computer field and government, to review and critique PEEC materials and activities. Submit a report to DOE

The PEEC Steering Committee meeting was held on June 8, 1981 at the Edison Electric Institute in Washington, DC. A list of the Steering Committee members, the meeting agenda, and a report of this meeting is attached.

NATIONAL SCIENCE TEACHERS ASSOCIATION

1742 Connecticut Avenue, NW, Washington D.C. 20009 (202) 328-5800

An Affiliate of the American Association for the Advancement of Science

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Gary E. Downs, NSSA
Iowa State University, Ames

Marvin Druger, SSTA
Syracuse Univ., New York

Stanley Helgerson, TSTA
The Ohio State Univ., Columbus

December 22, 1981

Donald Duggan
Division of University & Industry Programs
Office of Field Operations Management
Office of Energy Research
U.S. Department of Energy
1000 Independence Avenue, S.W.
Mail Stop 3F032
Washington, DC 20585

Dear Don:

Task #11 called for us to work with 6 teacher student pairs* in Summer 1981 to develop microcomputer software packages of energy simulations, games, etc. We carried out the specified functions this summer with 5 teacher-student pairs and a full time NSTA staff person (Ted Hall). Each team was assigned two projects in order to assure a surplus of final products from which to select the desired 8.

Unfortunately, creativity defies precise control and one group, in spite of our assistance and pressure (including delayed payment) did not produce in the end usable programs. Referring to the attached list, the two defaulted programs are "Exponential Growth" and one we didn't even bother to list, which was a simulation/game involving decisions by an OPEC oil minister. We have some parts of "Exponential Growth" and some impressive graphics of the OPEC game but nothing which we deem worthy of pilot testing.

I am, therefore, submitting as completion of Task #11, the discs of the seven programs indicated with an asterisk on the attached descriptive list. Complete documentation accompanies six of these, but we are awaiting completed documentation for the seventh, #VII, "Temperature Grapher." It is promised by mid-January.

Dr. John Fowler, Director
Special Projects
(202) 328-5840

Page Two (2)
Donald Duggan
December 22, 1981

I am hoping that you can accept the materials with explanation as task completion. As you know, this was our most expensive task, the money has already been spent, and NSTA is anxious for reimbursement.

I look forward to discussing this matter with you further.

Sincerely,

John M. Fowler
Director of Special Projects

*The DOE task completion lists 6 teacher/student pairs. This must be a misprint, as the project budget is for 5 such pairs.

P.S. Ted Hall just reminded me that he has already given you a copy of the Apple disc, therefore I am not including another one with this package.

APPENDIX 3
STEERING COMMITTEE

1981 PEEC STEERING COMMITTEE

John Day
Social Studies Resource Teacher
Richard Montgomery High School
Montgomery County Public Schools

Janet Dove
Staff Advisor, Education
American Petroleum Institute

Donald Duggan
Division of University and Industry Programs
Office of Field Operations Management
Office of Energy Research
U.S. Department of Energy

Lynn Glass
Associate Professor
Iowa State University

*Sheila Harty
Education Media Specialist
Center for Study of Responsive Law

Edward Keller
Executive Director
American Association of Elementary School Principals

David Kennedy
Instructional Program Specialist
Superintendent of Public Instruction
Olympia, Washington

Betsy Kraft
Director of Educational Services
National Coal Association

Jonathan Lash
Natural Resources Defense Council, Inc.

Isabelle Laucka
Manager, Educational Services
American Gas Association

*Alan McGowan
President
Scientists Institute for Public Information

Kenneth Mechling
Professor of Biology and Science Education
Clarion State College

Walter Purdy
Manager of Educational Services
Edison Electric Institute

Les Ramsey
Education Services Manager
Atomic Industrial Forum, Inc.

Elizabeth Scott
Associate Director
National Council for the Social Studies

*John Steinbrink
Associate Professor of Education
University of Houston at Clear Lake City

Anthony Suglia
Director, Affiliated Councils Division
Joint Council on Economic Education

*Burton Voss
Professor of Science Education
University of Michigan

*Those unable to attend the Steering Committee Meeting of June 8, 1981.

APPENDIX 4

PACKET TITLES

PROJECT FOR AN ENERGY-ENRICHED CURRICULUM

CLASSROOM PACKETS ON ENERGY

Printed Packets:

How a Bill Becomes a Law to Conserve Energy

Agriculture, Energy and Society

Energy, Engines and the Industrial Revolution

Transportation and the City

Community Workers and the Energy They Use

The Energy We Use

Energy and Transportation

Mathematics in Energy

U.S. Energy Policy: Which Direction?

Energy Transitions in United States History

Networks: How Energy Links People, Goods and Services

Bringing Energy to the People: Washington, D.C. and Ghana

Energy in the Global Marketplace

Two Energy Gulfs

Western Coal: Boom or Bust?

Unprinted Packets:

The Natural Laws of Energy

Biofuels

Coal: Promise and Problems

Nuclear Fission

"E" the Magnificent

Energy: The Thread of Life

Unprinted Packets (continued):

Canada, Mexico and the United States

Energy Conservation as a Political Issue

Energy for the Future

Energy and Water

Energy as an Investment Choice

The Exponential Energy Century

Less Developed Countries and Energy

Appropriate Technology for Energy Production

Energy Flows in Natural Systems

Critical Thinking on Energy

Fossil Fuels and the Greenhouse Effect

Energy and the Automobile

The Arithmetic of Energy Conservation

Energy for Tomorrow

Energy Conservation: An International Comparison

Exploring for Energy

Making Decisions About Synfuels

APPENDIX 5

WRITING TEAMS AND TEACHER REVIEWERS FOR ENERGY SOFTWARE

PAGE 169 DELETED –

Personally Identifiable Information (PII) is protected under FOIA Exemption 6 and, as such, is protected from public release.

PAGE 170 DELETED –

Personally Identifiable Information (PII) is protected under FOIA Exemption 6 and, as such, is protected from public release.

APPENDIX 6

COMMERCIAL DISTRIBUTION OF SOFTWARE

HUMAN RELATIONS MEDIA

175 TOMPKINS AVENUE PLEASANTVILLE, N.Y. 10570 (914) 769-7496
Toll free (800) 431-5050

This is a letter of agreement made this seventh day of December, 1982, between Human Relations Media Center, Inc. (HRM), Technical Education Research Centers (TERC), and the National Science Teachers Association (NSTA) concerning the marketing/selling of six separate microcomputer software programs (The WORKS) tentatively called:

1. Cost of Electricity
2. Power Plant Engineer
3. Energy Conversion
4. Personal Energy Audit
5. Temperature Grapher
6. Home Energy Savings

HRM, TERC, and NSTA in consideration of the promises hereinafter set forth, do hereby mutually agree as follows:

- (1) The WORKS shall consist of six masters which TERC shall supply for six software programs which HRM shall manufacture in disk form. Also, TERC shall supply a manuscript consisting of an overview for teachers, activities for students, and computer program documentation, all of which HRM shall convert into the form of a manual.
- (2) The WORKS shall be copyrighted in the name of NSTA. NSTA grants to HRM the exclusive license to publish and sell worldwide the WORKS under the names of HRM and its divisions—IBIS Media, HRM Science, and HRM Software—to educational institutions and general consumers.
- (3) TERC shall initially provide to HRM, software masters in the Apple II and TRS-80 formats, with the exception of program #5 (Temperature Grapher), which will be initially in Apple II format only. If in the future HRM wishes to publish in additional formats, other arrangements with TERC shall be made. HRM has first rights to any additional formats.
- (4) The exclusive license to publish and sell the WORKS shall revert to TERC and NSTA if HRM fails to advertise or manufacture the WORKS.
- (5) HRM agrees to publish the WORKS at its own expense in such style and manner and at such prices as it shall deem most suitable. HRM shall keep the WORKS in publication so long as it shall deem expedient.
- (6) HRM agrees to pay TERC an advance of \$6,000 against future royalties that TERC may become entitled to.

- (6.1) HRM agrees to pay NSTA a royalty of 10% of all monies received from the sale or rent of the WORKS.
- (6.2) HRM agrees also to pay TERC a royalty of 10% of all monies received from the sale or rent of the WORKS.
- "Monies received" shall be defined as all monies received by HRM and its divisions--IBIS Media, HRM Science, and HRM Software--and from any other source such as dealers, licensees, distributors, or any other selling organization.
- (7) HRM shall provide to NSTA copies of the WORKS at a discount of 20% from the selling price. NSTA can sell copies of the WORKS only at NSTA conventions and meetings and through NSTA publications. NSTA may offer to sell the WORKS to its membership at a 10% discount of the retail prices established by HRM (see paragraph 5). Copies sold by NSTA to non-NSTA members shall be at the full retail prices established by HRM.
- (8) HRM agrees to protect the NSTA copyright by notice.
- (9) HRM may publish or permit others to publish selections from the WORKS for publicity purposes as it may deem appropriate to benefit their sale, without compensation to TERC/NSTA. HRM shall be able to use NSTA's name, TERC's name and Robert Tinker's name and pictures in connection with the advertising and promotion of the WORKS.
- (10) HRM will prepare for TERC and NSTA a semi-annual statement of account to the first day of January or the first day of July immediately succeeding the publication of said WORKS, and prepare similar semi-annual statements for all succeeding periods of six months during which time the said WORKS shall have been sold and render such statements and make payment in accordance therewith on the 15th day of March and the 15th day of September.

Agreed:

Dec 25, 1982
Date

Robert F. Tinker
Technical Education Research Centers

Jan 12, 1983
Date

Bill H. Caldwell
National Science Teachers Association

Dec 21st, 1982
Date

Chas W. Schenck
Human Relations Media Center, Inc.

Department of Energy
Washington, D.C. 20585

FEB 10 1983

Dr. John M. Fowler
Director
Special Projects
National Science Teachers Association
1742 Connecticut Avenue, N.W.
Washington, D.C. 20009

Dear Dr. Fowler:

This is in response to your letter of February 3. We are delighted that the National Science Teachers Association has found a commercial distributor for the six software programs developed as part of the Project for an Energy Enriched Curriculum under DOE Contract number DE-AC05-80IR10984. Our General Counsel has advised us that under the terms of that contract it is quite acceptable for you to copyright these materials in NSTA's name, with the understanding, of course, that the government retains a royalty-free license to publish and/or reproduce them.

We would appreciate receiving a set of these materials for our files, as well as copies of promotional and other materials developed for them. Also, if it is convenient, I would like to be kept posted on how they are received by the public. In supporting the development of these energy education materials it has always been our ultimate goal for them to be used by teachers. We are pleased that this is now possible at no further expense to the taxpayer.

Sincerely,

Donald D. Duggan
Division of University and Industry Programs
Office of Field Operations Management
Office of Energy Research

NATIONAL SCIENCE TEACHERS ASSOCIATION

1742 Connecticut Avenue, NW. Washington, DC 20009 (202) 328-5800

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An Affiliate of the American
Association for the
Advancement of Science

February 3, 1983

Donald Duggan
Office of Energy Research
U.S. Department of Energy
1000 Independence Avenue, S.W.
Mail Stop eF032
Washington, DC 20585

Dear Don:

The NSTA has entered into a contract with Human Relations Media (HRM), a commercial distributor of microcomputer software, which will give them the right to market the six software programs (see below) that were developed by NSTA's Project for an Energy-Enriched Curriculum (PEEC)--DOE Contract #DE-AC05-80IR10984.

1. Cost of Electricity
2. Power Plant Engineer
3. Energy Conversion
4. Personal Energy Audit
5. Temperature Grapher
6. Home Energy Savings

It is our understanding, reinforced by the memorandum of February 22, 1982 to you from Linda J. Shapiro, Office of the Assistant General Counsel for Patents, that these materials can be copyrighted by NSTA. We intend to file for that copyright with the understanding, of course, that DOE has a royalty-free license to reproduce and publish them if they desire to do so.

The contract with HRM, a copy of which is enclosed, is jointly signed with Technical Education Research Center (TERC). TERC, which was the host organization and consultant to the original development project, is presently revising the programs guided by the classroom testing which PEEC provided. TERC is also responsible for editing the documentation to be provided to teachers.

Programs 1, 2, 3, 4 and 6 will be developed in both Apple II and TRS-80 formats. Program #5 will initially be available only in Apple II format.

John M. Fowler, Director
Special Projects
(202) 328-5840

Page Two (2)
Donald Duggan
February 3, 1983

HRM is an experienced and well-regarded software distributor. They can be expected to vigorously market the energy software. In addition, however, NSTA will advertise the programs in its Publications List and at meetings and conventions and will sell the software packages at a discount to its members.

We believe that this arrangement is most favorable for guaranteeing production of these programs and their documentation in an attractive and workable form. We are delighted to look forward to the distribution of these exciting and useful materials to teachers and hope that you will approve this mechanism for accomplishing it.

Sincerely,

A handwritten signature in dark ink, appearing to read "John M. Fowler". The signature is written in a cursive style with a large initial "J" and "F".

John M. Fowler
Director of Special Projects

JMF:dlw
enclosure

U.S. DEPARTMENT OF ENERGY
file
memorandum

DATE

February 22, 1982

REPLY TO
ATTN OF

GC-42

SUBJECT

PUBLICATION OF WORKS PRODUCED UNDER CONTRACT NO. EX-76-C-01-3841

TO

Donald Duggan, ER-44

In response to your memorandum of February 8, 1982, DOE cannot issue an RFP for the commercial publication of works produced under the above-identified contract.

Rule 38 of the Government Printing and Binding Regulations prohibits a department from contracting for the commercial publication of works by a private publisher, prior to their publication by the Government Printing Office. You have indicated that in the present case, DOE is either unwilling or unable to publish (or have GPO publish) certain works produced by the National Science Teachers Association under its contract. Rule 38 therefore applies to those works.

You have also indicated that other works produced under the contract have been published by DOE. Rule 38 does not apply to those works; only DOE policy governs your ability to issue RFP's in those cases.

Under the Rights in Technical Data clause of the contract, copyright in works first produced under the contract resides in the contractor, NSTA, and DOE has a royalty-free license to reproduce and publish copyrightable works first produced under the contract, with a right to sublicense. The Printing and Binding Regulations do not prohibit DOE from granting copyright sublicenses under the contract to interested third parties. As the Printing and Binding Regulations do not, in any event govern the actions of Government contractors, and as the contract places no restrictions on NSTA, NSTA is of course free itself to issue copyright licenses to third parties, and to publish or contract for publication of works produced under the contract.

For your further information on the subject of copyright, I enclose two circulars published by the Copyright Office. If I can be of any further assistance in this matter, please do not hesitate to contact me.

Linda J. Shapiro
Patent Attorney
Office of the Assistant General
Counsel for Patents

Enclosure

APPENDIX 7

USE OF PEEC MATERIALS

Permissions

Ellen Schwartz
Ministry of Energy, Mines and Resources
Galena Bay via
Revelstoke, B.C. V0E 1X0

Permission to use ideas from Transportation and the City, Energy, and Transportation, and Networks: How Energy Links People, Goods, and Services, in unit being written for the Canadian federal government.

Government Institutes, Inc.
4733 Bethesda Avenue, N.W.
Washington, DC 20014

Permission granted to reproduce the Fact Sheet Alternative Energy Sources: A Glossary, for inclusion in The Energy Reference Handbook, 3rd edition, written by Sullivan/Heavner/Schumann.

Sally Werbin
Assistant Workbook Coordinator
Penton Learning Systems
420 Lexington Avenue
Suite 2846
New York, NY 10017

Permission granted to reprint Fact Sheet #10: Energy Conservation: Industry, to be used in Methods of Energy Conservation.

J.G. Davis
Education Officer
Elementary Education Branch
Ministry of Education
Ministry of Colleges and
Universities
Toronto, Ontario M7A 1L2

Permission granted to reproduce a drawing from Award Winning Energy Education Activities, in a document entitled "Energy in Society, Part II" (for Ontario teachers in the Intermediate and Senior Divisions to assist them in teaching about energy resources and conservation.)

Bernadelle Toser
Project Energy Resource Guides
Cooperative Education Service
801 West Highway 10
Stevens Point, WI 54481

Permission to use a chart from Agriculture, Energy and Society, in an energy education resource guide for use in central Wisconsin schools.

Patricia Ramsey
Project NIFTY
Des Moines Public Schools
1800 Grand Avenue
Des Moines, IA 50307

Permission to reprint the activity entitled "The World Room" from the packet Exponential Growth.

Jennifer Johns
Research Associate
Behavioral Research Division
Institute for Applied Research Services
The University of New Mexico
Albuquerque, NM 87131

Permission to use the activities in Unit 4, of the packet Transportation and the City, to be used in a two volume energy curriculum entitled Energy Horizons.

Lillie Murdock
Chief, Information Service
Energy Division
North Carolina Dept. of Commerce
Raleigh, NC 27611

Permission to duplicate the statistical data and charts contained in "Energy Facts, 1978," which appeared in the May 1979 issue of Energy & Education. For use in an article of the monthly newsletter Energy Issues.

Pam Kolack
Assistant Workbook Coordinator
Penton Learning Systems
420 Lexington Avenue
New York, NY 10017

Permission to reprint Fact Sheet #10: Energy Conservation: Industry, for use in seminar entitled "Industrial Energy Management."

Jack G. Davis
Education Officer
Curriculum Branch
Ministry of Education
Toronto, Ontario M7A 1L2

Permission to reprint an illustration from Energy and Transportation, in a document entitled "Curriculum Ideas for Teachers," for distribution to Ontario teachers in Primary Divisions to assist them in teaching about Energy Resources and Conservation. Also, permission to use a diagram from An Energy History of the United States, for use in document entitled, "Energy in Society, Part II."

Mary Lynne Bowman
Research Associate
ERIC/SMEAC
The Ohio State University
Columbus, OH 43212

Permission to use the summary of the New York City blackout from Networks: How Energy Links People, Goods and Services, for use in the ERIC publication, Energy Activities for the Classroom. Permission to use an activity from The Energy We Use and Transportation in the City.

Scott Sklar/Joan Melcher
The National Center for
Appropriate Technology
Butte, Montana

Permission to use "Shut Down by
Tin Lizzie" from Transportation
and the City.

Jacqueline Johnson
1925 South Vaughn, #418
Aurora, Colorado 80014

Permission to use "Who's Got the
Batteries" from Energy in Less
Developed Countries. Material to
be used in learning materials for
Social Science Educational
Consortium (SSEC), Boulder, Colorado
(publication date: September 1981).

Dr. Juanita A. Manalo
Assistant VP, Science and Technology
Phillipines Women's University
Taft Avenue
Manila, Phillipines

Permission to use some units and to
be able to pattern their curriculum
units after the model set by PEEC.

Tom Raynor
Edison Electric Institute
1111 19th Street
Washington, DC

Permission to use graphs and
questions from Energy in the Global
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Montgomery County Public Schools
850 Hungerford Drive
Rockville, Maryland 20850

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grade pilot computer literacy unit.