ELECTRICAL POWER GENERATION
COMPARATIVE COSTS AND BENEFITS

A ONE-WEEK WORKSHOP FOR HIGH SCHOOL SCIENCE TEACHERS

FINAL REPORT

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ABSTRACT

A workshop covering basic nuclear power generation and the tradeoffs and problems that exist between nuclear power and alternative means to generate electricity was held between August 7th and 11th, 1972 for forty high-school teachers at the Madison campus of the University of Wisconsin. The program was quite successful; a description and evaluation has been prepared and was previously submitted to the Commission (Progress Report C00-2260-1).

The University of Wisconsin 1972 workshop program concluded with a feedback conference in Madison on January 13, 1973. At this conference the overall program was re-evaluated and suggestions were made as to how to improve future workshops. A considerable amount of time was spent discussing the effective use of information and the development of some form of information package for the high school science teachers. This Final Report deals primarily with the feedback conference; suggestions for an improved program have been summarized.

INTRODUCTION

The purpose of this report is to up-date the Progress Report (C00-2260-1) dated August 28, 1972 that was previously submitted. Report (C00-2260-1) included a thorough description of the summer workshop and a detailed program evaluation.

In summary, the one-week summer workshop held at the University of Wisconsin was a live-in type involving laboratories, lectures and discussions. All high school science teachers in Wisconsin and the heads of high school science departments surrounding the Dresden, Zion and Monticello generating stations were invited. One hundred seventeen applications for participation were received; forty teachers attended. A lengthy questionnaire was used to measure success of the program and to determine areas of improvement for future similar workshops.

A feedback conference was held in Madison on January 13, 1973 and attended by 36 of the original 40 workshop participants. The conference was timely and resulted in many worthwhile suggestions for improving the program. These have been presented in the remainder of this report.

DESCRIPTION OF THE FEEDBACK CONFERENCE

The Feedback Conference was held on Saturday January 13, 1973 and attended by 36 (see Appendix A for list of attendees) of the original 40 workshop participants. The primary objective of the conference was to allow for a more meaningful evaluation of the summer workshop as well as to provide a meeting place for the further development of the use of power related information.

Workshop participants were informed of the feedback conference in early December and were asked to fill out a pre-conference questionnaire (Appendix B). Thirty-nine of these were returned and helped to organize the feedback conference in the following way:

Point recurring on returned questionnaires

UW - response

We would like to hear more from the environmentalists' viewpoint.

Reid Bryson, Director of UW-Institute for Environmental Studies: talk on how environmental problems are related to population characteristics and technology.

We are interested in learning more about controlled thermonuclear fusion.

Gerald L. Kulcinski, UW-NE Professor: talk on fusion reactors and their environmental assets.

Bring us up to date on the Point Beach fuel densification and licensing problems.

Short talk by UW-NE senior who worked at Point Beach with the fuel problem for the past 7 months.

Practically all of the participants wanted to discuss at length the use of information

Two hours of discussion Saturday afternoon directed at the development of a scheme for the effective use of power related information.

A Feedback Conference Schedule is attached as Appendix C for further information.

WORKSHOP EVALUATION; IDEAS FOR IMPROVEMENT

The group's ideas about the importance and value of the workshop did not change. All those attending the feedback conference expressed a strong positive feeling about the program's relevance and were using or planned to use the power related information they had received. Those that did not attend the conference did so for personal reasons and not because of disinterest or the feeling that they were being "brain washed".

Because program improvement and information use was discussed at length and no new negative points were brought up concerning this year's workshop, the workshop evaluation presented here will deal with points to consider in developing a future program.

Below are listed strong points about the UW program as well as points that should not be overlooked in the development of a future program. Effective use of information is discussed in the next section.

UW-Program Strong Points:

- 1) Financial allowance for participants
- 2) Method used for choosing participants (maximize geographical coverage with particular attention paid to areas surrounding electrical power plants)
- 3) Laboratory on reactor operation and characteristics
- 4) Trip to nuclear generating station
- 5) Informal gathering - picnic
- 6) Length of daily program (approx. 8 hr./day)
- 7) Breadth of topics covered and caliber of speakers

- 8) Handout material and material sent to participants
- 9) Detailed evaluation questionnaire filled out during workshop
- 10) Notification of attendance sent to local newspapers and school officials
- 11) The importance of a feedback conference for maximizing ideas for information use and for the dissemination of additional material of particular interest. Participation in this was enthusiastic and greater than expected.
- 12) Continued contact with participants after conclusion of programs to disseminate updated information and to continue cross-fertilization of participant ideas by distributing to other participants a given participant's related material on information use techniques

OTHER POINTS TO BE CONSIDERED IN THE DEVELOPMENT OF FUTURE WORKSHOPS

- 1) Send out pre-workshop background information packet
- 2) A two week workshop (one week for the development of information use techniques)
- 3) Credit for the (1-2 credits) workshop
- 4) Speakers at night, lunch, and breakfast
(A schedule that varies from day to day)
- 5) Adequate environmentally oriented anti-power viewpoint coverage
- 6) Trip to conventional coal, gas or oil power plant
- 7) Large amounts of time for discussion
- 8) Talks on effective use of information and the use of related material in high school.
- 9) Attitude and knowledge examinations before and after the workshop
- 10) Additional handout material i.e., a package of generally related information to be given to all participants the day the workshop begins; notes on all lectures; copies of slides presented; detailed information bibliography; list of people willing to supply information from his or her field of expertise (within the state)
- 11) Solicit local utilities, large nuclear power companies such as General Electric, Westinghouse, Babcock and Wilcox, Combustion Engineering, etc., The American Nuclear Society, Atomic Energy

Commission, Atomic Industrial Forum, Businessmen for the Public Interest, The Sierra Club, etc., in advance for relevant handout material.

- 12) List of related films available for use from American Nuclear Society, Atomic Energy Commission, Utilities, Sierra Club etc.
- 13) A plan for continued relevant information flow to participants after workshop conclusion

FEEDBACK CONFERENCE EVALUATION THE EFFECTIVE USE OF INFORMATION

The feedback conference was considered essential by all who attended. It should be an integral part of programs like the UW-"Electrical Power Generation --- Comparative Costs and Benefits" workshop held this past summer. Many thought it was the most important single day of the program.

The conference's purpose was to update information provided the previous summer, re-evaluate the program with constructive suggestions and to discuss the effective use of information. In regard to the latter point, the following summary was prepared.

Method of Information

Use Discussed

Written handout material on specific subjects

Bibliographies of pertinent books and current articles and a list of local people willing to discuss the issues.

Films and Slides

University organized seminars around the state on the topic of ecology and power.

Important Points of

Discussion

The participants indicated that this form of information was the most attractive and easily used. It could be readily modified and integrated into their particular (teaching) approach. They requested as much handout material as possible and that the workshop director continue to send information for as long as possible.

These topics were brought up several times - This information would undoubtedly be helpful and used.

These forms of teaching aids rate highly with students and should be made available to the high school science teachers.

This received some support. However, it was felt that a program of more depth was needed - one that would reach more students over a longer period of time.

Tour programs coordinated with a nearby large power generating station.

A generalized minicourse *
available for use by all

The utilities are usually very willing to take part in a program of this sort. A trip like this puts some of the current power related problems into perspective for the high school student and is very worthwhile.

At the conclusion to the summer workshop the response to this was positive and enthusiastic. In fact, several of the participants actually developed such courses. One of these (enclosed) was distributed to

all the participants prior to the feedback conference and discussed at some length at the conference. The interest was to generalize the minicourse. It was concluded by practically all that generalized minicourses are rarely used even if available. This is because it is difficult to adopt a general technique for material presentation; people like to integrate information into a program they themselves have developed. Therefore, a wealth of subject material and teaching aids such as slides or films would be more beneficial to a diverse group of high school science teachers than a generalized minicourse. The idea would be to integrate whatever information a teacher thought was particularly relevant with his own information and approach to a general subject.

Open communication channels between participants.

The feedback conference was effective in doing this. Lists of attendees and their addresses were made available to all participants. The Dept. of N.E. is temporarily acting as a collection and dissemination station for information any participant feels would be of value to others. This appears to have much support.

* A recent article entitled "NSTA Conducts Nuclear Energy Survey for AIF" appearing in The Science Teacher, Volume 39, Number 9, December 1972 and available from the Atomic Industrial Forum, Inc. substantiates these comments.

APPENDIX A

Name and Address	Affiliation Town/State	Subject Area
Anderson, Jeffrey 1305 Sherman Ave Madison, Wi	Central High School Burlington, Illinois Box 103 60109	Chemistry, Physics Physical Science
Barton, Robert L. 5303 54th Ave. N. Mpls, Minn 55429	Robbinsdale Sr. High Mpls., Minn	Physics
Broihier, Charles E. 2832 92nd Street Sturtevant, Wi 53177	Horlick H.S. Unified Sch. Dist. #1 Racine County	Biological Science
Christianson, Ron 611 7th Street Waunakee, Wi 53597	Waunakee Public School	Chem, Phys. Sc., Advanced Science
Cordiner, William Route #3 4024 38th Avenue Kenosha, Wi	Tremper High School	Physical Sc., Earth Science
Davidson, Daryl Route #1 Belleville, Wi 53508	LaFollette High School Madison, Wisconsin	Earth Science, Engineering Concepts (ECCP)
de León, Grata Necedah, Wisconsin 54646	Necedah High School	Mathematics, Physics
DudKiewicz, Leonard A. 3008 N. Church Rd. Cedarburg, Wi 53012	Homestead High School Science Department Head Mequon, Wisconsin 53092	Biology, Environmental Science
Erdman, William R. High School Plainfield, Wi 54966	Tri-County Area Schools	Physical Science, Chemistry, Physics
Erickson, Ronald D. Route 2 835 Cardinal Drive Cedarburg, Wi. 53012	Washington High School Germantown, Wi	Physics, Physical Science, Environmental Studies
Genskow, Roy 4808 N. Woodburn Street Milw., Wi 53217	Shorewood High School	Chemistry, Biology

Name and Address	Affiliation Town/State	Subject Area
Hepp, Amiel 1005 Washington Algoma, Wi 54201	Algoma High School	Physics, Chemistry, Biology
Hover, Ralph 1616 Grenham Place Rockford, Il 61107	Rockford Auburn High School	Environmental Issues
Jensen, Fred L. 105 Ellen Street Rothschild, Wi 54474	D.C. Everest High School	Physical Science, Biology
Johnson, Douglas A. 5701 Anchorage Ave. Madison, Wi 53705	Memorial High School	Physics
Jung, Dwight 9733 W. Hampton Ave. Apartment 14 Milw., Wi	Nicolet High School	Physics, Physical Science
Keck, C.W. 103 Cimarron Lake Elmo, Minn	North St. Paul, Maplewood	Physical Science
Kracht, Donald W. 219 E. Market Street Burlington, Wi 53105	Waterford Union High School	Chemistry, Physics General Science
Krizensky, Robert Star Route #2 Rhineland, Wi 54501	Rhineland High School	Conservation
Kurtz, Randy 5404 Mathews Road-209 Middleton, Wi	Middleton High School	Resource Manage- ment, Man's Environment

Name and Address	Affiliation Town/State	Subject Area
Martin, Gilbert W. 1910 Sunnyside Avenue Highland Park, Ill 60035	Highland Park High School	Physics
McGuire, Robert H. Route #1 Mineral Point, Wi 53565	Belmont Community High School	Physics, Mathematics
McIntosh, Paul 5617 Joylynn Drive Madison, Wi 53716	LaFollette High School	Physics, Nuclear Science, Space Science
Mitchell, Don Route #1 Alice Circle Stoughton, Wi 53589	Stoughton High School	Physics, Physical Science, Advanced Science
Pett, Jack Box 182 Cambridge, Wi 53523	Cambridge High School	Chemistry, Physical Science
Pfeiffer, Carl H. 917 Birchhaven Cr. Monona, Wi 53716	Monona Grove High School	Unified Science
Rehberger, Phillip J. 2547 Oregon Street Oshkosh, Wi 54901	Oshkosh High School	ISCS-3 Physics
Schulz, Eugene F. 114½ W. Main Street Evansville, Wi 53536	Evansville High School	Math, Chemistry
Showers, Robert 2857 St. Ann Drive Green Bay, Wi 54301	East High	MMW, Electronics
Sieger, Edward J. Route 1 Kewaskum, Wi 53040	Kewaskum High School	Mathematics, Physics

Name and Address	Affiliation Town/State	Subject Area
Soderlund, Herbert 2201 Snowbird Avenue Wausau, Wi 54401	Wausau East High School	Astronomy, Physics
Stroessner, Wayne 2139 15th Avenue Monroe, Wi 53566	Monroe High School	Science 9, Biological Sciences Advanced Science
Sweney, Michael J. 145 Forest Ave. Fond du Lac, Wi. 54935	Goodrich High School Fond du Lac	Chemistry, Physical Science
Thompson, George 14200 W. Armour Avenue New Berlin, Wi 53151	Whitnall High School	Chemistry
Uhren, Lloyd J. 230 North Brookfield Rd. Waukesha, Wi 53186	Brookfield Central High School	Chemistry
Zimmerman, Jay A. 9104 W. Park Hill Avenue Milwaukee, Wi 53226	Brookfield Central High School	Physics

Name _____

Date _____

APPENDIX B

FEEDBACK CONFERENCE QUESTIONNAIRE

1. Do you plan to attend the feedback conference? yes _____ no _____
2. Would you like to hear a lecture on a nuclear power related topic that you would like to know more about or that was not discussed in enough depth this past summer?
yes _____ no _____ Topic: _____
3. Would you like to give a talk yourself on a particularly interesting experience of your own related to the information you obtained this past summer at the workshop? (Have you used nuclear power related information in a particularly successful way?).
yes _____ no _____ Topic or situation: _____
4. Have you been working on or did you develop a minicourse in the area of nuclear power generation?
yes _____ no _____ Specifics: _____
5. Would you be willing to work with a group of the participants on the development of a minicourse?
yes _____ no _____ Why? _____
6. Have any questions concerning nuclear power arisen since the summer program that you might like answered?
yes _____ no _____ What? _____
7. How would you like to see the workshop changed for the next go-around?
yes _____ no _____ How? _____

APPENDIX C.

FEEDBACK CONFERENCE AGENDA

"ELECTRICAL POWER GENERATION COMPARATIVE COSTS AND BENEFITS"

Saturday January 13, 1973

13th Floor Lounge, Engineering Research Building

University of Wisconsin-Madison

<u>TIME</u>	<u>ACTIVITY</u>
9:00 a.m.	Check in: Pick up check and information packet
9:15 a.m.	Brief Welcome -- Professor Max W. Carbon
9:20 a.m.	Talk by Professor Reid A. Bryson, Director, Institute for Environmental Studies, University of Wisconsin-Madison
10:20 a.m.	Coffee Break
10:40 a.m.	Mention of handout material Short discussion about Point Beach Situation
11:20 a.m.	Discussion concerning use of information obtained last summer
12:00 p.m.	Lunch as a group at the Union South Talk by Professor Gerry L. Kulcinski on Fusion
1:30 p.m.	Discussion of information utilization The development of a minicourse The development of integrated material
2:30 p.m.	Coffee -- Available
3:30 p.m.	Discussion of how to improve the 1973 Workshop
4:00 p.m.	Breakup