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BUILDING NUCLEAR AWARENESS- KINDERGARTEN AND BEYOND

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Educational Directions

ABSTRACT

The intent of this presentation is to highlight the need to be creative in building an awareness of the importance of nuclear energy in our daily lives and offer strategies for accomplishing this task. The role of the educational environment beginning in the elementary grades and extending through high school and into the adult population will be explored.

A wide variety of approaches will be suggested with examples of successful ongoing programs highlighted. Among the areas investigated will be the role of citizen groups, political leaders, professional organizations, industry representatives, health and safety professionals as well as educators. The importance of public involvement and participation as a means of gaining support for existing programs as well as developing new approaches will be stressed.

Suggestions for expanding both governmental agency and nuclear industry roles in helping develop learning objectives as well as classroom materials will be outlined. Such development should foster emphasis in curriculum areas other than just the sciences. Examples will be included to demonstrate the breadth of potential for building a true nuclear awareness across the entire population.

No single approach will fit all community needs but through trial and error as well as building upon the successes of others significant accomplishments will be enjoyed. The importance of teamwork and a total commitment to the effort is essential as well as having a respect for the fellow participants.

By example, those attending this session will discover how they can take back to their communities ideas for either launching or enriching a meaningful program dedicated to Building Nuclear Awareness.

INTRODUCTION

Across the nation there exists a void of any real understanding, on the part of the general population, of anything related to nuclear energy. General attitudes, in many areas of the nation, reflect an anti-nuclear mindset. Several reasons have contributed to such views, they included: the bombing of Japanese cities ending World War II which brings to mind the devastation brought on by the atom, the reports of the Chernobyl accident and the reports of potential radiation exposure from a truck carrying radioactive materials. More recently the damage done by the fires in the Los Alamos area, with the possibility for contaminated run off, is but another example of the public=s lack of knowledge regarding the nuclear environment.

Much of the lack of understanding regarding anything related to nuclear energy stems from the cloud of secrecy that hung over weapons facilities during the Cold War era. The educational environment has failed, for the most part, to adequately promote the study of nuclear energy at the elementary and secondary grades. The media has taken every opportunity to jump aboard the anti nuclear train to highlight problems related to the use of the atom rather than climbing on the train loaded with the vast benefits we receive from that same atom.

As a public it is time that we search for ways to develop an awareness on the part of our youngest to our oldest citizens of the importance of this often misunderstood energy source. The need is great and we must work together to meet the challenge before us if we are to have a better tomorrow.

AREAS OF INVOLVEMENT

Active Citizen Groups

Site Specific Advisory Boards (SSABs) whose attention is directed at the safe restoration of former Cold War era weapons production facility sites are made up of interested citizens representing their communities or state in an advisory role Their mission is insuring the health and safety of those living in proximity to the site, the safe transportation of radioactive materials and promoting an understanding of critical nuclear issues.

To promote an understanding of the common as well as diverse concerns facing all boards, national meetings have been hosted by several individual boards that focused on specific topics. The first such joint meeting with board members and interested citizens was in Las Vegas, hosted by the Nevada Test Site Community Board. Low Level Waste was the focus of the seminar. Position statements developed provided an opportunity for future discussions. A tour of the DOE Waste Management Facility sixty miles north of Las Vegas rounded out the three day conference.

The success of the first joint gathering prompted the Fernald Board to sponsor a transportation workshop held in Cincinnati. In addition to representatives from other boards around the country several transportation specialists served as valuable resources to the discussions. A working paper, an outgrowth of the conference, called for the formation of a committee composed of one representative from each board of to meet at least once a year to develop a plan of action to address transportation issues.

The Oak Ridge and the Rocky Flats boards have both hosted stewardship programs where it became evident that the wide diversity of sites demanded different approaches to reaching decisions on stewardship. Discussions illustrated the concern of all boards regarding the future safety of the sites once restored. The question to be answered: Who is responsible?

Frequently the monthly meetings of an area SSABs are held in neighboring communities so residents can express concerns and learn about the progress being made for site restoration. The programs are

designed to present issues of known concern as well as explain ongoing activities underway on site. The SSABs are but one means of creating an awareness of the problems facing communities across the nation where sites are undergoing restoration or on a potential shipping route for radioactive waste.

The Political Scene

Unfortunately many political representatives take positions on nuclear issues without having the true facts. An example of such action took place during the summer of 2000 when an anti- nuclear group, traveling with a mock canister, stopped in Las Vegas for a rally. A United States Senator, opposed to the Yucca Mountain project, compared an accident with a truck carrying spent fuel assemblies to that of an oil tanker explosion and fire, that had been a recent event, some miles south of the city. Spent fuel is solid and will not explode. The tanker carried gasoline. What conclusion could those participating at the protest arrive at after hearing such a statement? To further add to the untruth the exhibit bore the name: Mobile Chernobyl. Unfortunately no one of stature in the community with knowledge of transporting nuclear materials was available to refute these untruths.

Scientists, engineers, health and safety specialists and transportation experts must assume responsibility for helping educate political representatives at the local, state and national levels regarding nuclear issues. This could be accomplished by developing fact sheets addressing frequently asked questions, encouraging the political representatives to tour nuclear sites, attend seminars and even enroll in continuing education courses that focus on nuclear energy topics. The nuclear industry must become active participants in providing resources to bring about political awareness of the importance of this energy form. The benefits of working to bring the political leaders up to speed on nuclear topics will far out weigh the small expense of doing so.

Professional Groups

Local chapters of professional associations such as the American Nuclear Society, American Welding Society, Society of Nuclear Medicine to name but a few could do much to enrich the learning environment of most communities. By making it known that their organization stands ready to provide speakers at civic group meetings, neighborhood coffees, at school assemblies or in individual classrooms these organizations could be a focal point to building and understanding of the countless technologies using nuclear materials to improve society. By working with local libraries, a nuclear reading and viewing section could be developed and packed with films, periodicals, technical materials and listing of web sites offering additional information on nuclear applications. Representatives could even provide guided tours of facilities, conduct demonstration and have hands on activities for those interested.

The Media

Too often all forms of the media only look for the sensational events of an area. A bank robbery, train wreck, fire or a school shooting. Such items rightly need to be reported but what about the hundreds of

positive events taking place that few hear about. Water leaking from a white box containing low level radioactive waste en-route from Ohio to Nevada drew untold media coverage. The amount of water was almost unmeasurable and it was found to be harmless, yet stories swept across the country and shipments were halted for over a year. How often do we see pictures or read about the dynamics of a nuclear power plant? Are stories written about how such facilities reduce the Agreen house effect@, the answer: seldom if ever. A story explaining the nature of the cloud reaching skyward from the cooling towers at a nuclear generating would help citizens to understand that it is harmless water vapor and contains no radioactive materials from the reactor. Such an article could do much to build an appreciation for this type of electricity production and eliminate existing fears.

Who is to blame for poor coverage of nuclear issues? The Department of Energy has avoided publicity about many of its activities years on end. Stories about the positive activities taking place at nuclear installations should be feature stories. Naturally a classified area might need to be protected but time should be taken to inform the media in a way that will have them working hand in hand with all parties involved. By keeping the public informed in an interesting manner the media will establish credibility with all parties. A trusted and informed media can be one of the best vehicles in building awareness of nuclear issues of public concern or interest.

The Nuclear Industry and Governmental Agencies

The nuclear industry has an obligation to carry out its assignment be it government mandated or following the direction of its board to develop a product, conduct research, build a facility or provide electrical energy for a community. Countless other missions may be part of the tasks assigned. Because of the countless federal mandates many branches become involved. It may be regulating a nuclear power plant or overseeing the shipment of radioactive waste. Each of the many branches of government or site contractors or a producer of some technological device containing nuclear materials has both an opportunity and obligation to gain public support for the activities for which they are responsible.

Honesty and a forthright right approach is a must when dealing with the public if there is hope of gaining their support. An example of a successful approach was used by the public affairs staff of the WIPP project. Confronted with public opposition to the shipment of TRU Waste on the highways of New Mexico the need for an outreach we quickly recognized. Much of the public concern was in the northern part of the state thus it was evident that these people had to be met on a personal basis.

An outreach center was established in Santa Fe near the Capitol, the need to work with legislators was critical to paving the way to public support. Meetings were held in neighboring communities, house-to-house visits became a very important tool in the building of acceptance of the WIPP project. Public support grew from this approach and resistance is low because of personal one on one contacts.

Ground water is a major concern for communities west of Paiute Mesa on the Nevada Test Site. Department of Energy personnel frequently hold town hall type meetings to discuss what is being done to

study potential ground water contamination and explain the result of countless tests. Such approaches away from governmental facilities results in larger numbers of people attending the meetings as well as feeling freer to voice real local concern. Comments such as, A I really understand that they are trying to find solutions,@ or ANow I am aware that something is being done to protect us from contaminated drinking water.@ are heard following these type of information meetings.

Meeting such as just mentioned should include fact sheets, ample video materials, a question and answer segment as well as time for public comments. Note should be made that answers to question and response to comments will be forthcoming either in a mailing or at the next meeting. No question should go unanswered.

Unfortunately the masses do not trust the government to give truthful answers and this must be corrected if acceptance is to be gained. An approach that has done much to improve the tenor of community meetings is to have a potluck type supper with speakers and guest resource people sitting among the patrons. Interestingly enough the entire atmosphere changes to make the guest feel part of the crowd and the community discovers that their visitors are truly interested and concerned for their well-being.

Health and safety issues are important to all involved with nuclear activities. Because the public frequently has little understanding or has been misinformed regarding anything nuclear it becomes the task of both the industry and the government to develop programs that will help citizens better understand the circumstances that they may be facing as a community regarding a local nuclear situation. Receiving accurate information is all anyone should expect. There is no reason that they should be denied data regarding their health and safety. For too long things regarding the federal government and anything nuclear have been hidden from public view, thus causing rumors to spread like wildfire.

IMPACTING THE EDUCATIONAL ENVIRONMENT

A 1950s Michigan Effort

In the mid 1950s the Michigan Department of Public Instruction selected 30 Michigan science teachers, from around the state, to develop a nuclear science curriculum for high schools. The group participated in a crash course, at the University of Michigan. designed to give the group a view of nuclear science. Instructors in the many phases of nuclear science bombarded the group with information that would allow them to return to their local districts to conduct teacher workshops, developed instructional plans with their classes and try different approaches with fellow teachers as a way of refining instructional techniques. Over several months ideas, lesson plans and content was developed that would build an understanding of the importance of nuclear energy in society. All of the ideas were sent to the state to be incorporated into a curriculum guide entitled Nuclear Science in the Classroom, Though not perfect it was an early attempt to introduce an awareness of nuclear energy into the high schools of Michigan.

Availability of Textbooks

Reviewing science texts in a university school of education curriculum library only one high school series contained anything significant dealing with nuclear energy. That covered the following:

Nuclear Changes

- What is Radioactivity?
- Nuclear Fission& Fusion
- Dangers and Benefits of Nuclear Radiation

The Structure of Matter

- What are compounds?
- How does structure affect properties?
- Atomic structure
- Families of element

Nothing was available at the elementary level. The librarian indicated that many of the publishers had not sampled the library in any curriculum area or grade level. We should not conclude that nothing is being published regarding nuclear energy just because one university curriculum center had only one dealing with nuclear energy.

State Departments of Education

In checking with several state departments of education only one was able to verify that guidelines for a chemistry program had been written, and this not approved at the time of inquiry nine months ago. The rough draft did contain the following areas of emphasis related to nuclear energy:

- Atomic Structure.
- Matter & Energy
- Interactions of Matter
- Properties of Solutions - including Acids and Bases

It would be unfair to suggest that nothing is being done in the majority of states but it was almost impossible to find anyone at that level, responsible for curriculum, that had any idea of what was being taught, related to nuclear energy in the science areas kindergarten through grade twelve and that included some science consultants.

EFFECTIVE OUTREACH PROGRAMS

Several locations are benefitting from outreach activities hosted by professional groups, university programs and company sponsored efforts.

Fluor Fernald

An outstanding example of a site contractor reaching the local educational environment with materials and talented professional resources is Fluor Fernald of Ohio. Recognizing the importance of building nuclear awareness with the school age population the Public Affairs Department has instituted a program designed to meet this goal. A resource guide for the science classroom that highlights resources in the surrounding communities that will provide speakers, host tours and provide instructional aids. Also included in the guide are many suggested class activities that help to develop an understanding of nuclear energy in the daily lives of everyone.

The guide is broken into six major science areas with lists of resources available for the given areas Over ninety organizations are available to participate in classroom activities. Activities included are judging of science fair projects, career days, workshop for curriculum development, teacher in service programs, a speakers bureau and an educational tour schedule. In 1999 over15,000 students and teachers participated in the out reach programs.

Community support for the site remediation program underway at Fernald is the result of the dedication of managements to be a partner in education and community growth. Fernald has set an example of what can be done to enhance youngsters learning about an important component of all of our daily lives-nuclear energy. It is an example others might wish to build upon.

Women in Discovery Project

Texas A & M University faculty in engineering, mathematics and science believe that every possible approach should be tried to encourage young men and women to explore careers in these fields. Recognizing that these curricular areas have attracted fewer women than men a project known as@ Women in Discovery@ was created to encourage more interest by women.

The basic goals of the project include stimulating secondary pupils to look to these three fields, to provide teachers with resources and equipment necessary to develop programs designed to encourage more student involvement. The equipment came from the Women in Discovery Project on campus. The Marie Curie exhibit attracted over 6000 visitors before it left campus for a scheduled tour of eight locations. Included were stops in Aiken, SC, the University of Michigan, The American Museum of Science and Technology at Oak Ridge to name but three of the important visits. Once word was out regarding the excitement the exhibit was generating additional requests poured into the university for

expanding the tour Interest was not limited to just junior and senior high school students. Elementary pupils as well as many adults attended the program.

Around Richland Washington

Chapter members of the American Nuclear Society and the Children=s Museum in Richland teamed to develop a program to help teachers learn about nuclear energy and thus be able to work with their students in that subject area. Though the emphasis was 5th grade and above many early elementary teachers were involved in the two hour workshops. Staff at Kennewick College were instrumental in developing the hands on workshops. Basic instruction was presented in the following areas:

- Basic Radiation
- Atomic Structure
- Radiation Damage to Tissues

Demonstration involving shielding materials for Alpha, Beta and Gamma radiation are among the many activities in which teacher participate. Having Geiger counters available for each teacher to use provides realism to the instructional program. Teacher demand for additional workshops has been high because of the success the teacher are having with their pupils in the schools of the area The concept of nuclear training for teachers has expanded to other colleges and universities in Washington state.

The Pahrump, Nevada Harvest Festival

One of the highlights of the festival this past year was the large display depicting some of the nuclear issues facing the community. Designed to inform the visitors on various aspects of nuclear energy as well as educate school age youngsters about atoms in their daily lives. Many hands on activities attracted attention such as the large foam blocks depicting the periodic table, which gave youngsters and adults an opportunity to understand atomic numbers and symbols. Using a Geiger counter to check radiation levels of different materials helped the participants understand that radiation exists all around.

A popular handout for younger children entitled, The Atoms Family, excited many. The coloring book is being widely used by teachers across the country in kindergarten and other early elementary grades because it introduces science at an early level and in a fun way, which youngsters enjoy and understand.

Visitors to the display asked questions of the specialists manning the display. A concern to residents of the community and surrounding areas is ground water contamination resulting from the hundreds of underground nuclear tests at the Nevada Test Site. Charts and photographs added to an understanding of nuclear issues of local concern.

Nuclear Generated Electricity

The excitement shown by groups completing a tour of the giant Palo Verde nuclear generating plant, in the desert, west of Phoenix is a reflection of both how well information was provided and how impressed the visitors were by the safety measure in place. Over hearing comments such as,@ More of our electricity should be produce this way,@ or ABoy am I glad we stopped here, we=ll have to tell our friends about it.@ are common expressions. The Palo Verde facility is but one of many that welcomes visitors across the nation.

Informing the public about the safe and effective means of using nuclear power to produce electricity is also one of the missions several museums located nation wide. The American Museum of Science and Energy is a@must visit@ when traveling near Oak Ridge. Opportunities abound for learning more about the production of electric power and the countless other applications of nuclear energy affecting our daily lives.

WHERE TO FROM HERE?

Pick up a news magazine, a newspaper or watch TV news and there will be a reference about something nuclear. Most will be featuring a protest, an accident or plant shutdown. Protests about shipments of TRU waste from the Rocky Flats facility west of Denver to the WIPP site in New Mexico were common headlines in Denver papers at one time. During the recent national elections the Las Vegas papers were full of political verbiage of how this or that candidate was going to insure that nuclear waste would never reach Yucca Mountain.

A lack of willingness, on the part of the candidates, to learn the facts about importance of the countless benefits we enjoy because of nuclear energy was evident by their remarks. It is essential that those we select to represent us in congress have the true facts on any issue rather than basing their decision on emotion.

Enriching Learning Opportunities

At the elementary level not enough is being done to develop any understanding of the many types of energy let alone nuclear. Visiting a magnet school, devoted to science and mathematics- grades K-5, in a school district of well over two hundred thousand pupils one would find a void until a slight mention of the word energy until fifth grade. Youngsters beginning before kindergarten demonstrate untold amount of physical as can be verified by their parents. An alert and creative teacher should be able to capitalize on this energy and build upon it. Young children are eager to learn about things around them. What better place could be found to introduce an awareness of energy. Most youngsters have seen pictures of atoms and have questions. Encourage your schools to include something, no matter how simple, about energy.

Consider the following as a potential springboard for classroom activities: Some sample Questions

- Where do you get all of your energy?
- What makes your family car run?
- What heats your home?
- What makes the lights in you room shine?

Classroom Activities

- Have pupils rubs there hands together- what happens?
- Show picture of a water wheel- what makes it turn?
- Ask how many have had an x-ray-
- Talk about why you get a sunburn
- Have pictures of a coal fired electric plant and a nuclear plant
- Arrange for field trips around the community to view energy sources or in use

There are countless activities that will spark and interest including simple experiments, viewing a film or having a guest in to share ideas about some type of energy. By being aware of the forms of energy and how they serve mankind will be important to these youngsters as the make decisions as adults.

Generally, at the secondary school level, it is believed that all science instruction is limited to formal science classes. There are other curricular areas that afford enrichment opportunities for expanding an understanding the role of nuclear energy in a modern and complex society such as ours here in the United States.

Consider the following suggestions as avenues to exploring nuclear understanding through other curricular areas. The suggested activities are only examples of the countless experiences that these academic areas could provide in building nuclear awareness outside of the formal science instruction.

Curricular Area	Possible Class Activities
History	Student reports on the social aspects bombing Japan ending World War II
	Examine the contributions of nuclear pioneers
	Explore the impact of the Chernobyl on the US

Sociology	Have students collect stories about nuclear events affecting society
	Role play a city council meeting in which nuclear shipping routes were being discussed
Economics	Have students prepare reports, make charts and discuss the impact of a local nuclear plant
Health Education	Assign student groups to report on the use of radioactive materials in medical treatments
	Conduct a survey of local food chains to obtain data on food preservation & shelf life as the result of irradiation
	Have guest health personnel discuss emergency techniques available in case of nuclear contamination

And the list could encompass other curriculum areas and student activities could span many more exciting and revealing learning activities. Mock radio programs or TV skits could be an activity for the arts or drama department.

The educational environment has, in general, not been geared to blending learning of one field into that of another. Outside assistance may be needed to accomplish the concept here expressed. It is at this point school curriculum committees may want to search out professionals in the community knowledgeable in specific areas to lend a hand.

IN CONCLUSION

The countless ongoing activities as well as suggestions for reaching the goal of A Building Nuclear Awareness- Kindergarten and Beyond@, herein highlighted are but a few of the many that could be implemented in schools large or small in any community across the nation. It is evident that no one approach will meet the needs of all individuals, organizations or communities. A concerted effort must be launched with everyone working hand in hand if nuclear awareness is to become a reality. Where does the responsibility for such an effort belong?

Following is a partial list of potential participants in this building task, a task that must involve many if success is to be realized. Such an effort must foster respect for the ideas of each participant as they strive

to reach the goals determined by the group to be desirable. Both failures and successes will be realized along the way but in the end encouraging results will be reward for this effort of many.

Nuclear industry	Historical societies	Professional organizations	The media
Scientific community	Health and safety professionals	Civic organizations	Educators
Interested citizens	Labor unions	Transportation industry	Politicians
Governmental agencies	Seniors	Students	
Judicial personnel	Law enforcement		

The challenge is great, the opportunities for success are unlimited, grab the ball and run with a winning team dedicated to ABuilding Nuclear Awareness Kindergarten & Beyond@
End