NUCLEAR POWER AFTER CHERNOBYL

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ABSTRACT

The Chernobyl accident has had a significant impact on the perception of nuclear power throughout the world. The Soviet reactor program has resumed, but delays in programs of other nations have occurred. Even though the implications of the accident to the U.S. program are small because of differences in design and operating practices, some have used the occasion to attempt to demand special safeguards, impractical emergency plans, or to shut down plants. The media has a special responsibility to ensure that the complete facts are available to allow informed public opinion. Resumption of the nuclear option in the United States will require resolution of institutional issues and development of standardized designs.

CHERNOBYL'S REPERCUSSIONS HAVE HIT SEVERAL EUROPEAN COUNTRIES

The accident was first revealed to the world when high radiation levels were detected in Sweden. The transnational nature of nuclear power was dramatically illustrated. Now that the radiation releases from the reactor and their dispersion are well known, and the doses have been calculated, conclusions about health impacts can be revisited.

The death toll has remained at 31. These were all plant workers. Some died of burns as well as intense radiation. There were other workers who received elevated exposures; none have died. The Soviets are following the physical histories of the exposed populations.

No radiation exposures high enough to produce any detectable health effects were received outside the Soviet Union. The only health effects are those calculated by statistical models, which may or may not be real, but will never be proven to be relatable to the releases.

Food was withdrawn. People were examined. And, nuclear power programs were reexamined. Sweden, Germany, Italy, and Switzerland may be curtailing their programs. Taiwan has delayed a decision; so has the People's Republic of China.

SOVIET ACTIONS

In the Soviet Union, where the accident occurred and people were evacuated from their homes, they have made decisions too. No more RBMK-type reactors will be ordered. On the other hand, all RBMK's under construction will be completed, and the national plan for nuclear power will not be changed.

The Chernobyl Site and Surroundings

Once operators could resume their duties at the undamaged units, the Soviets proceeded to restart Units 1 and 2. They accomplished this in less than eight months, and perhaps could have done it sooner, except that personnel were needed for work on "localization" at the damaged Unit 4. There were no public hearings.

Unit 3 is right next to Unit 4, so some special effort is required to isolate its equipment and get it ready to restart. However, restart is set for "early 1987."

Why the hurry? One could say that there is no reason to take any longer. They do not need to reproduce the fiasco of taking six years to restart TMI-1. The fact is that the USSR needs the generating capacity. Their electric energy supply system must grow to meet the needs of the people and the plans of the government. Without 4000 MW of capacity they had counted on, the danger of capacity shortages is very real. And since distances are large, the complete loss of the Chernobyl site has left the Ukraine in a precarious position.

And just to add evidence, The New York Times reported on January 27, 1987, that "The Soviet Union agreed to cut its oil exports to help OPEC increase world oil prices." The USSR has been exporting 3.5 million barrels a day, about half to the West, and needs both the cash and higher prices. However, the same article reports that the severe winter and the loss of Chernobyl had already led Western analysts to expect a cut in exports.

It had been assumed that an accident such as Chernobyl would make the site uninhabitable. However, experience during the handling of the accident showed

that personnel could work on site, difficult jobs could be accomplished, and that tasks could be done under monitoring and scheduling. Workers are housed nearby, and a new housing facility has been built well within the original evacuation zone. The Soviets said that the original zone was rather arbitrary, and was basically chosen so as to evacuate the general population in the entire region. Now the town of Pripyat is "95% clean" and almost all the remaining activity is imbedded in the roofs of houses. In the Spring, they will begin disposing of the roofs!

Differences Between RBMK and U.S. LWR

The problems in the basic design of the RBMK were well known in the West. Both the U.K. and Canada carefully considered the concept and rejected it, mainly because of the potential for positive void coefficient, the lack of real containment, and the hardware complexity and cost were unattractive compared to LWR's or CANDU's.

The RBMK is not designed for defense-in-depth; it cannot cope with combinations of problems, multiple tube failures or prolonged loss of pumps or emergency power.

Differences in Regulation, Training, and Institutional Structure

But even more striking to Western observers is their system for review, approval, and management of abnormal operations or tests. A basic contributor to the accident was the combination of inadequate planning and review, lack of understanding by the operators of the risks in the test, and the fact that at the time the operators were responding to two masters, not one. The test was called "an electrical test" and was not questioned enough on reactor safety. And after the test procedure was begun, the load dispatcher took control again, but no one properly considered the consequences of the changes they caused. Interestingly, Soviet reactor operators have the equivalent of college degrees. They can (and do) question and modify procedures and recommendations from their upper management. In the United States, changes are made only under very rigid controls.

U.S. REPERCUSSIONS

Offers of International Cooperation: Secretary, DOE, and Chairman, NRC

Last September, the Secretary of Energy signed two IAEA conventions on behalf of the United States Government designed to provide early international notification in the event of a nuclear accident and to provide assistance to nations affected by nuclear accidents. The two conventions codify actions and intentions that have been U.S. practice. The capabilities that the U.S. DOE has to respond to a radiological problem, at the request of an affected country's government, will be offered. These range from radiological data collection, evaluation, and assessment, to the provision of technical expertise in areas such as radiation monitoring, damage control and decontamination.

NRC Finds Current Licensing Basis Holds

The NRC has concluded that the licensing basis for commercial LWR's holds. So has the IAEA and the International Nuclear Safety Advisory Group (INSAG). INSAG's first conclusion is: "On careful review of the status of understanding of the source term for severe accidents to LWR's and the associated implications for risk, we find no need for new immediate corrective action to improve the safety of existing LWR's. The evidence remains strong that these nuclear powerplants are a safe means of generating electricity."

Chernobyl IS DIFFERENT, and the differences were essential contributors to the accident. That does not mean that no lessons are available from Chernobyl. Whenever an airliner crashes, the FAA investigates and makes the findings known. There are always lessons, and the worst error would be a failure to study them. The next worst would be to panic and undermine the technology for the wrong reasons.

Governors with Impacted Plants Seize Opportunity

For anti-nuclear activists and politicians running on a platform of opposition to nuclear power, Chernobyl was the justification they had been looking for. TMI, despite the scare stories, had proved that defense-in-depth works and that containment buildings do protect the health and safety of the public. At Chernobyl, the worst really had occurred. Forget the differences! The opportunity to demand special safeguards, impractical emergency plans, or simply to shut plants down was at hand. It is like calling for the shutdown of the Washington METRO because of the AMTRAK crash.

Just before the close of the 99th Congress, Representative Markey submitted a bill to give State Governors veto power over nuclear plants in their State or within ten miles of it. In January, his bill was joined by one from Senator Moynihan. With all of the efforts and achievements on safety, his statement says: "In the world of 1987, a world that has learned of Three Mile Island and Chernobyl, nuclear safety must be the first thought, not an afterthought."

In Ohio, Governor Celeste asked the NRC to delay full power licenses for Perry and Davis-Besse, and withdrew his State's support for the emergency plans that had previously been approved. He cited Chernobyl and the earthquake at Perry, and claimed that "Both incidents raise legitimate concerns about the adequacy of evacuation plans."

Why is There Public Support Without Any Technical Basis?

The Washington Post carried an interesting op-ed column on Sunday, January 25, titled "Turkey's Radioactive Tea." Amy Schwartz of the Post's editorial staff, visited Turkey, where tea is sipped day and night. She writes, "It rained along the black sea coast after Chernobyl, and onto some of Turkey's main cash crops: tea, nuts and tobacco. In December a liberal Istanbul newspaper, acting on tips that some exported tea had been rejected abroad, sent samples to a West Berlin technical institute for testing and bannered the results on the front page: radioactivity levels were "dangerously high," and no one should drink it. The public controversy was deafening." Schwartz continues her article, with the recollection of the newspaper editors secretly enjoying their tea: "The truly weighty onus is on those now protecting us from Chernobyl-type disasters."

In the United States every effort has been made to design our nuclear plants so that they will not cause harm to the public. But what about those editors? Schwartz says, "The newspapers continued their clamor...conflicting experts were found...one story a day...."

The solid scientific opinion says there is no danger, but one inflammatory article started the public clamor, and the papers do not have the courage or the desire to straighten out their readers. Isn't the onus on them too?

Comparison with Waste Management Program

Is this story any different than that of the Waste Management Program? Can a way be found to dispose safely of the high-level wastes that have been created? The public has been told how carefully the job will be done, so that by now everyone out there believes that this is the toughest technological challenge humanity has ever faced! That overstated view is repeated over and over!

Some evening the network news will show the first waste capsule being loaded into the first repository. Will this make the issue dissolve and go away? Probably not. Its concerned groups will follow it and anything about it, and will not let it rest. Because if they do, they will have given up their best weapon against nuclear power, a weapon even better than the safety issue.

THE NEED FOR POWER AND WHAT GOVERNMENT DOES

Planning and Building in the United States and the USSR

For almost 100 years, utilities have been supplying electricity to Americans. It is possible to analyze growth patterns, and show that growth was spurred by the availability of economical electric power. It really cannot be proven that growth will wither if building powerplants does not resume. But it is quite possible that it could happen, and once diagnosed, the disease would be well-advanced.

In a centrally-planned economy, government can decide to build, and go ahead. It may plan poorly, and overbuild or underbuild. So can the United States because many individual and corporate decisions determine the future. But, also, there are checks and balances, regulations and requirements in the United States. With regard to nuclear power, enough impediments have been put in the way to effectively stop the good technology we invented and developed.

As noted above, the USSR needs more powerplants, and not because it has not made the decision to build them. They recognized the need, perhaps late, but were constrained by their own lack of capability to design and build. One of the reasons the RBMK was built for civilian power stations was because until a few years ago, the Soviets did not have the facilities in which to manufacture pressure vessels for 1000 MW PWR's. Now they do, but they will still finish the RBMK's.

What is the Role of DOE?

Since the Government does not make the decisions to build plants in the United States, what should its role be? It should assist industry by developing advanced technology and working to remove barriers that constrain what people will need to have.

When this country needs more central station powerplants, a design that is up-to-date, safe, easier to build, operate and maintain, and which has taken advantage of what has been learned through hundreds of commercial reactor-years of operation should be ready. In order for a utility (or any other entity) to commit to the next nuclear powerplant, it must have received a license, a construction permit, or a certification that does at least two crucial things:

1. It must prove to the public that the design has had a full and open safety review within a process that provided the opportunity for participation by all interested parties, and

2. It must give the licensee confidence that the plant can be built, and if built properly, go into operation, without delay from Government at any level.

Today, it is not possible to predict just when that next plant should be ordered, or for that matter, in what region of the country. But it is hard to believe that this need will never come. If the decision to build had to be made today, it would take three or four years AT BEST to complete the design and safety review, and six years AT BEST to build. That means the first kilowatt-hour AT BEST in 1997. And that's the BEST possible case.

It would obviously be longer if any of the delays in licensing that we have come to know in past years were to occur. And, unfortunately, since the licensing process has not been reformed, there is little reason to expect that there will be any relief from interventions, court challenges and unexpected delays. And it is understood that if another reactor accident occurs anywhere in the world, maybe even with no release of radiation, there is the potential for public reaction to stop whatever can be stopped. This means, simply stated, that no utility management would order a nuclear powerplant now.

The needed level of confidence can be reached only by resolving the institutional barriers and developing a standardized design. DOE is working on both. The standardized plant may be the Advanced Light Water Reactor (ALWR). DOE is supporting a program with EPRI, reactor vendors and utilities to develop a plant that does incorporate the experience of the past twenty years. A utility steering committee meets regularly with the NRC to resolve safety issues and discuss design decisions, so that when the design is completed it will meet NRC requirements.

The design will still have to go through a formal licensing process. Perhaps by that time, NRC will be able to offer a "certification." This would mean that any utility desiring to build that same plant could do so without going through another licensing review. To make this work would also require a change in the licensing process to permit a utility to have a site reviewed in advance, by itself, for one or more reactors of a particular power level, for use at an unspecified future time. The utility could then make its decision, get necessary approval of need for power from its State regulators, and have assurance that it would successfully navigate through a brief, predictable NRC process.

Is "certification" the same as "standardization?" No, but each has its role. To be "standard" more than one plant has to be ordered. A design earns the designation, a regulatory agency does not bestow it. But if certification can be established, one or more designs will become standard. And one more point, if it is to work, there must be a mechanism for handling changes without reopening the licensing process. In any big construction project, adjustments and modifications are inevitable. Knowledge is gained;

mistakes are detected. It would be worse to put people under pressure to do things that are not their best because the process is too rigid. Excellence should be the objective, not rigidity. If a change really could impact safety, it could be analyzed promptly, and if it is found to be serious, a process involving public input would have to be utilized.

Downside Risks - Different Now

A number of papers and speeches over the last decade have cited what is called the "downside risks of energy shortages." They are still real, but with plentiful oil and gas, they change a bit. They are:

1. If enough economical coal or nuclear plants are not built, the risk is there of burning expensive oil and gas. The change: oil and gas are cheap, nuclear and coal plants have literally been priced out of the market. If acid rain legislation is passed, and oil and gas prices go up, the old downside risk would come back. But coal and nuclear plants will not, unless the changes discussed above get made.

2. If there are power shortages, the public will demand that Government take over. To waste management experts, this is not an encouraging scenario.

3. If there is not enough supply capacity to supply legitimate needs, electricity would have to be allocated. By whom? Government. This did bother some who argued against utilities for small energy sources. But now there are lots of cogenerators coming, plenty of oil and gas, and an economy that no longer makes much steel, aluminum or other things that consume lots of electricity.

4. The one time we seriously considered reinstituting the draft since Vietnam was when the Iranians cut off oil shipments. This danger of conflict over energy resources is never far away.

THE LONGER VIEW

There is good reason for DOE to conduct an energy security study. It will be out soon, and bears careful study. Energy is not the big buzzword in 1987, but with energy, today may well be 1997. The United States became vulnerable when its energy supply came under foreign domination. Just as lessons were learned from TMI and Chernobyl, the ones learned so painfully from OPEC in the 1970's should not be forgotten. If history is allowed to repeat itself, there is no one to blame but ourselves.

And if the onus is on the engineers, to protect our societies from industrial disasters, is there not also an onus on the news media? If the public is misled because the information provided to them is faulty, incomplete, biased, or contrived, how can good public policy be achieved in a democracy?

At some point, the designers must settle on the design, and that is what they proceed to build. Before they settle, they do their detailed analyses and design engineering, evaluate costs against risks and benefits, and make tradeoffs where necessary. Rarely do they have the luxury of doing this without tight deadlines. But deadlines arrive, and THE DESIGN must be fixed. If it can't be, the project is delayed.

The reporter faces deadlines; this is well recognized. But the concern is that all too often the reporter says he had to get a story. A STORY isn't good enough. Professional excellence demands THE STORY. The onus is on the media too, and it is a real challenge.