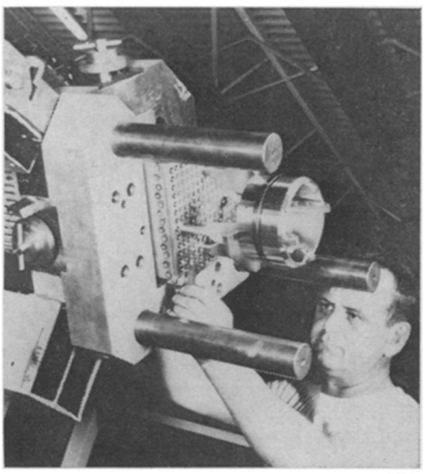
NUCLEAR RADIATION

Down to what's practicable



AEC

Fuel element: First line of defense.

The construction of nuclear power plants has run into stiffening opposition from individuals, organizations and even states. Minnesota has gone so far as to take a nuclear power plant owner to court because the state wants to impose more stringent standards of radioactive release on it than those of the Atomic Energy Commission. At stake is whether or not a state has the right to set its own radiation emission standards.

Hurried along to some extent by the Minnesota case, the AEC last week proposed new amendments to its regulations governing radioactive effluents in water-cooled reactors, the major type of reactor now being operated, built and planned. The regulations in essence direct nuclear power plant operators to reduce their radioactive emissions to levels "as low as practicable."

Present regulations require that the plants meet specific limits that are based on annual, whole body exposure: 5,000 millirems for occupational workers, 500 millirems for any one person in the population and an average of 170 millirems for a representative sample population group. These limits are about to be reviewed by the Federal Radiation Council (SN: 3/28, p. 311) and the suggestion has been made that they could be lowered.

The proposed amendments would in no way change these limits; as long as a plant keeps within the limits, it can continue to operate. Although there was some talk that the new amendments were a prelude to a forthcoming reduction in radioactivity limits, AEC Commissioner James T. Ramey states flatly, "This is not true." The proposed amendments are aimed primarily at the future, he says, when new equipment and plant design will permit new plants to reach lower levels than at present. The amendments would also act as tools to make sure that today's plants continue to operate well within the present limits.

In effect, the AEC regulations express, with more force than a verbal or written recommendation, the agency's determination to keep radiation levels as low as it thinks is practicable, regardless of what the published limits are. They also deflate the argument of those who say the limits are too liberal.

In practice, the nuclear power industry actually keeps the exposures to radioactivity down to a small fraction of the limit. As Lester O. Rogers, director of the AEC's division of radiation protective standards, boasts, "The actual releases are generally less than a few percent of the limits." This has prompted some individuals to seek reduction in the present standards; the operating experience gained as more power plants have come on line in the last few years has shown that lower levels are practical.

By practicable, the AEC does not mean possible. What is practicable will be determined mainly by the existing state of technology and cost. It might be possible to reduce radioactivity well below the present levels, but at a prohibitive cost. In that case, the AEC would probably agree that such a level was not practicable.

The present release levels—whether safe or not—have been achieved through the design and fabrication of the fuel elements and the waste treatment and handling systems in the power plants. The first line of defense in containing radioactive effluents is the nuclear fuel elements themselves, which consist of the fuel material packed into pellets and stacked end to end within cladding-metal tubes of zirconium or stainless steel alloys. Most of the radioactive fission products are contained within the fuel elements, but some leak to the water coolant, mostly through small cladding defects.

There are three sources of radioactive contamination of the coolant: gases, which get in through pinhole breaks or by diffusion; corrosion products, which come from corroded metal parts of the cooling system; and nongaseous fission products such as barium, iodine and cesium.

The radiation of most of the gases is short lived; the gases are retained from 30 minutes to over 30 days until they decay to acceptable radioactive levels. They are then vented into the atmosphere. Krypton 85, however, has a half-life of 11 years, so holdup methods are inapplicable. Being insoluble, it comes out of the coolant and is released into the air. Its quantities are regarded as insignificant by the AEC in terms of exposure.

Another special problem is tritium gas, with a half-life of 12 years. It is converted to tritiated water and so must be eliminated by the occasional bleeding of the closed cycle cooling system into a stream or lake. There it is supposedly diluted to harmless quantities, but environmentalists are uneasy over this point.

The corrosion and nongaseous fission products are removed by conventional treatment: filtration, precipitation, ion exchange and evaporation, which concentrates the liquid into a slurry that is solidified and eventually buried off site in steel drums (SN: 3/28, p. 312). Trace amounts of corrosion and fission products remain in the treated coolant and are released into rivers and streams. □

ENVIRONMENT

After the teach-in

The environmental quality issue has brought together some strange bedfellows. President Nixon gave prime attention to it in his State of the Union message and later pronouncements (SN: 2/14, p. 168). But student activists who bitterly oppose the President on the Vietnam War and other issues are also complaining about environmental degradation, and virtually everyone in between is on the bandwagon.

The questions are whether the issue can sustain widespread interest and whether the disparate elements now involved will eventually split off into the old factions. Student groups plan a nationwide teach-in on the environment for April 22. The response so far is enthusiastic and cuts across political lines, they say. But what will happen after April 22?

Denis Hayes, the 26-year-old Harvard law student who is coordinating the teach-in activities from a Washington, D.C., office, is convinced that the issue will not die. Although he admits that post-teach-in plans for his organization are not firm, he says that tangible, visible and well-publicized pollution will create outrage on the local level that will continue to be felt on all levels.

"An awful lot of tragic things are now being well publicized," he says. "We could almost have an oil spill of the week, for example. And there was the river in Ohio that caught fire. These things will keep people stirred up." The indications are that he may be right.

Environmental action at the University of Montana in Missoula, a small city at the confluence of several remote mountain valleys, has attracted more followers, on and off campus, than any issue ever, says Dr. C. C. Gordon, a university environmental scientist. Some 35 students of a student body of 7,300 were peace activists before the environmental issue became popular, he says.