

vessels were found to be turning brittle faster than expected, chiefly because they contained impurities not meant to be there. In all reactors the steel walls of the vessel are bombarded by neutrons from the fuel. The effect is to raise the metal's nil ductility temperature. This is the point below which the steel loses its distinctive toughness and flexibility. Impurities in the welds have accelerated the aging process, so that some reactor walls are becoming unacceptably brittle. The higher the nil ductility temperature, the more likely it is the vessel will crack under stress.

Second, in reviewing actual records of transients, the NRC found that the scenario for cold water shocking a hot, pressurized vessel was not only plausible; it had happened. (Fortunately, the reactors were not damaged.)

When the NRC voted on 9 December, it decided to do three things:

- Within 6 months the NRC hopes to have a new screening program that will require reactor owners to calculate the nil ductility temperature of their vessels and to project its rate of increase during the life of the plant. An upper limit or "screening criterion" will be set at 270°F for axial welds. If a vessel seems likely to exceed the limit during its lifetime, the NRC wants detailed remedial plans in hand at least 3 years before the temperature limit is reached.

- Some sort of regulatory inducement will be devised to get the Babcock & Wilcox company to provide the NRC with data on the vessels it has sold. Thus far B & W has been uncooperative, perhaps because it is enmeshed in litigation over the reactor at Three Mile Island. As a result, the NRC is uncertain about the exact condition of the B & W vessels.

- The NRC staff will meet with owners of the most endangered reactors to encourage them to take preventive steps immediately. In most cases, this will mean rearranging the fuel to reduce neutron output. Some owners have already made changes. Those who fail to see the merits of this approach may be sent formal notices asking for information, "to enable the Commission to determine whether or not the license should be modified, suspended, or revoked."

Ten plants will be able to reflect on this problem for a few years, but the

NRC staff found that there are eight that will have to act quickly. Four of them will reach the screening temperature in just 10 years. These plants will have to spend something like \$20 million each to make the initial changes and will probably incur a permanent loss in operating efficiency.

There is one high-risk plant, the H. B. Robinson unit 2 reactor in Hartsville, South Carolina, owned by the Carolina Power and Light Company. The NRC staff paper says that this vessel "is so close to reaching the screening criterion" that it may not be enough simply to rearrange the fuel. In December, the plant's owner wrote to the NRC outlining several possibilities for dealing with the problem. However, it still is not clear how this plant can meet the NRC criterion without resorting to drastic remedies, such as cutting back power or shutting down for major renovations.

—ELIOT MARSHALL

Environmental Destruction Hurts India's Development

Any doubts that pollution and environmental degradation are at least as severe in the developing countries as in the industrial world should be dispelled by a recent report on the state of India's environment. "India is rapidly becoming a wasteland. Indians cannot now close their eyes to this continuing degradation of their natural environment," the study concludes.*

Put together by the Center for Science and Environment, an organization based in New Delhi that works on issues related to science, technology, and development, the report is the first major attempt to provide a comprehensive assessment of India's environmental problems. It draws upon information supplied by groups throughout India, and the picture it paints is generally bleak.

In vast regions of the country, land is being degraded by soil erosion, salinity and waterlogging, and desertification, the study documents. More than half of India's agricultural land is threatened by severe erosion, and topsoil washing into rivers and lakes is

**The State of India's Environment 1982*, available from International Institute for Environment and Development, Washington, D.C., \$25.

causing widespread siltation. This, in turn, contributes to flooding: the land area prone to floods has doubled in the past decade, the report states. Moreover, up to half the lands brought under irrigation may eventually have



One of every three persons in the world lacking clean water is an Indian.

to be taken out of cultivation because of salinity and waterlogging, unless remedial measures are taken.

One factor contributing to soil losses in hilly regions is deforestation. The report estimates that more than 1 million hectares are deforested each year and that only about 10 percent of the country is now covered by trees. Each year, the forested area shrinks, the report claims, because reforestation programs are insufficient to keep pace with logging.

Water resources, too, are in a generally dismal state. The report says that 70 percent of the country's rivers and lakes are heavily polluted, mostly with raw sewage, but increasingly with toxic wastes.

The report is not simply a catalog of disaster, however. It examines a range of national and local efforts that have had both beneficial and adverse impacts, and describes the effect of environmental destruction on the lives of people. According to Anil Agarwal, the report's principal author, the report is an attempt to explore the causes and consequences of India's environmental problems and their relation to development policies. The conclusion states: "virtually every ecological niche is occupied by some occupational or cultural human group for its sustenance. Each time an ecological niche is degraded or its resources appropriated by the more powerful in society, the deprived, weaker sections become further impoverished."

—COLIN NORMAN