Radioactive waste: Perceptions of risk

How dangerous is a nuclear-waste storage site? According to a poll conducted by the Battelle Human Affairs Research Centers in Seattle, most people rate such sites as more dangerous than a liquefied-natural-gas storage facility, a coal-fired powerplant or an oil refinery — and roughly in the same league as a toxic-waste dump. Only nuclear engineers perceive risks associated with nuclear technologies as tame, and perhaps that helps explain why they have a credibility problem, Battelle's Stanley Nealey told nuclear engineers last week at the Waste Management '82 meeting in Tucson, where he presented survey results.

Even during the Three Mile Island accident in 1979, surveys "found that the public was as concerned about waste management as it was about reactor safety and the escape of radioactivity into the atmosphere," note Nealey and coauthor William Rankin in their Battelle survey. Nealey, a social psychologist, explains that the pair chose to zero in on nuclear-waste facilities because "almost as many supporters of nuclear-power development are concerned about nuclear wastes as are the opponents of nuclear power. It's also a hostage issue in the sense that until radioactive-waste problems can be solved, a lot of people say, 'Let's not go ahead with nuclear power.'"

Along with two other Battelle social psychologists, Michael Lindell and Timothy Earle, the researchers developed a questionnaire survey and then polled six groups of respondents nationally: nuclear engineers, chemical engineers, environmentalists, science writers, residents of six large U.S. cities, and residents of six smaller communities in which potentially hazardous industrial facilities were already located. Respondents first ranked eight types of potentially hazardous facilities in terms of the severity of risk they posed (see table), then rated 10 potential nuclear-waste-management issues in terms of relative importance. Finally, each was asked to choose among three options for siting radioactive wastes.

What the researchers found, Nealey told SCIENCE NEWS, is that "nuclear engineers are out of step, as it were, with the perceptions of these other groups. That is not to say that they ought to get in step," he added, "but my point in talking to this group of essentially nuclear engineers [in Tucson] was to point out that to communicate effectively with the general public — and that includes some other people with technical credentials — you need to recognize that your perceptions are quite at variance with theirs." He cautioned not to treat others "as though they're crazy or ill-intentioned just because they hold other views — views only reflect the way one sees the world. That may be based on a good deal of misunderstanding and lack of information," he noted, "but there's also a reservoir out there of just different views."

Aside from nuclear engineers, all groups polled showed close agreement, ranking nuclear-waste and nuclear-power facilities among the three most severe hazards. Nuclear engineers were alone in rating coal more hazardous than everything but the toxic-waste dumps.

There was less agreement over rankings for different radioactive-waste issues. Though leakage of liquids from storage tanks headed everyone's list of worries, only nuclear engineers rated transportation accidents second highest; others tended to put the four remaining categories relating to containment breaches higher on their lists. Trailing all other concerns was the subject of waste-storage costs.

Every group showed a strong preference (roughly 50 percent) for restricting placement of high-level wastes to two or three national repositories. But for low-level wastes, storage in six or 10 regional sites was the preference only among environmentalists, journalists and engineers. State-by-state containment ranked first among the residents of general communities or cities already familiar with hazardous facilities.

Nealey says it's clear that most people view nuclear facilities together with toxic dumps as unique and severe "high risk" hazards. And rightly or wrongly, respondents perceive these risks "as somewhat mysterious," as involving corporations and even as unfamiliar to scientists. Unless these perceptions are modified, Nealey and Rankin predict, most people given the option of having a radioactive-waste facility sited near them will reject it. —*J. Raloff*

Gould laser patent ruled valid—so far

A federal court decision handed down on March 1 ruled valid Gordon Gould's patent for an optically pumped laser amplifier. It's a triumph for Gould, who has been credited with coining the acronym "laser"—light amplification by stimulated emission of radiation. As a result of the ruling, General Photonics Corp. of Santa Clara, Calif., must pay royalties of 5 percent of the selling price for every optically pumped laser it has sold since 1977, the date Gould's patent was issued. In addition, it must pay eight percent on all future optically pumped laser sales. But the ruling handed down by U.S. District Court Judge Samuel Conti in San Francisco is not necessarily the last word regarding Gould, vice president of Optelcom, Inc. in Gaithersburg, Md.

As Judge Conti noted in his ruling, General Photonics had "the legal burden of overcoming the presumption of validity," yet the firm "offered no credible evidence to rebut this presumption." No patent expert testified in General Photonics' defense, Conti noted. Nor did the firm prove, as it had claimed, that the invention had been made and patented, previous to Gould's first claim, by Charles Townes and Arthur Schawlow — California physicists who shared a 1964 Nobel prize for their contribution to the laser's development.

"There was no defense put forward ... whatsoever," says Robert van Roijen, president of Control Laser Corp., "so all the arguments against the Gould patent are still available to us." And provided Gould's patent-infringement case against Control Laser — largely waged by Refac Technology Development in New York, sole licensing agent for Gould's patents — is not thrown out, those arguments should get their day in court later this year.

In challenging the validity of Gould's 1977 patent, Control Laser will focus on two major issues. Explains van Roijen, "The prime argument in this case, and about every case in patent law, is whether [the patent] will teach someone skilled in 'the art' to build the device. And we believe," he told SCIENCE NEWS, "that Mr. Gould's patent does not do that....It wasn't until Dr. [Theodore] Maiman independently built one that we actually had a laser," van Roijen says.

More interesting is Control Laser's second line of defense — "the Martian atmosphere argument." Under U.S. law, one cannot patent a natural phenomenon. And Control Laser asserts that the finding of a natural laser in the Martian atmosphere — reported last year in SCIENCE by Michael Mumma and colleagues at the Goddard Space Flight Center and University of Maryland — indicates Gould's patent should be ruled invalid.

In a letter to SCIENCE NEWS last year, Mumma described his group's discovery of "the first naturally occurring laser" — a 10 micrometer (μm) infrared carbon-dioxide laser — which "is optically pumped by the sun in a region located 75 kilometers above the surface of Mars. Its brightness is truly staggering." The laser operates throughout the day-side of the planet, Mumma says, and "the total power radiated by all lines in the 9μm and 10μm laser bands exceeds 10^{12} watts! In layman's terms, this is equivalent to 1,000 large hydroelectric plants.

It is interesting to note that terrestrial aurorae are accompanied by very intense molecular emission near 4.3 μm," he adds, "suggesting that a search for lasers in the earth's atmosphere is warranted."

According to van Roijen, Control Laser will not rely on the Martian atmosphere argument as its primary defense because "the courts always have a very hard time accepting a new theory." —*J. Raloff*