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UPTON REPLIES: Rosalyn Yalow faults the BEIR V committee's review of the study by Lars-Erik Holm and colleagues¹ for failing to note that the risks of thyroid cancer were higher in patients who had been given diagnostic doses of iodine-131 because they were suspected to have thyroid tumors than in those who had been given the radionuclide for other diagnostic purposes. The criticism is unfounded. In its discussion of these patients, the committee stated: "Sixty-eight percent of the cancers occurred among [the] 31% of the subjects who had received a diagnostic dose of ¹³¹I because of suspected thyroid cancer. Of these 34 cases, 15 cancers (44%) became clinically apparent 5-9 years after exposure, suggesting that they were occult at the time of the ¹³¹I diagnostic procedure. In summary, the results of these studies do not support the conclusion that diagnostic doses of ¹³¹I significantly increase the risk of thyroid

cancer."

Yalow also criticizes the BEIR V committee for not citing the 1968 report by Eugene L. Saenger and colleagues,² who observed no excess of leukemia in patients treated with iodine-131 for hyperthyroidism. The BEIR V committee was charged with updating rather than duplicating earlier reviews and was asked not to attempt an inclusive summary of the entire literature. The Saenger study had been discussed by the BEIR I committee in its 1972 report.³ Moreover, the BEIR I report pointed out that the Saenger study "did not have the power to detect an increase in acute leukemia of 1-2 cases per 10⁶ per rad, independent of underlying risk."

Yalow's criticism of the BEIR V committee's review of studies on the occurrence of cancer among participants in nuclear tests overlooks the committee's conclusion that "the most likely explanation is that the observed excess cases of leukemia are random overestimates of the risk coefficients." Thus Yalow's assertion that the report should have noted the possibility that the excesses "were simply consequences of small-number statistics" is unjustified.

Finally, Yalow's implications to the contrary, the BEIR V report states explicitly that accumulation of a given dose of low-linear-energy-transfer radiation over a period of weeks or months, as opposed to minutes or hours, can be expected to reduce the resulting risk "appreciably, possibly by a factor of 2 or more," and that "there may be no risks from exposures comparable to natural background irradiation." Furthermore, the report explains in detail the rationale for the committee's risk estimates and the attendant uncertainties. The use of nonthreshold dose-response models for mutagenic and carcinogenic effects of radiation is not unique to the BEIR V risk assessment but has been general practice throughout the world for many years.^{3,4}

In summary, therefore, Yalow's criticisms are unwarranted and perplexing.

I should add that I have discovered, to my distress, that I made an error in my August article. In the last column of the first row of table 4, the number should be 4, not 17; that is, the 790 deaths from cancer projected to result from a single, brief exposure of 100 000 people to 0.1 sievert constitute approximately 4% of the roughly 20 000 cancer deaths from other causes that would be expected to occur "naturally" in the same population within its lifetime.

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Nuclear Regulation and Public Perception

John H. Gibbons and Peter D. Blair state in their article "US Energy Transition: On Getting from Here to There" (July, page 22) that in addition to the cost of nuclear power relative to other alternatives, "three major obstacles stand in the way of a new generation of nuclear power plants in the US: slow licensing procedures; sluggish commercial development, along with a notable lack of acceptance of advanced reactor designs by industry, government and the public; [and] stalled decisions relating to nuclear waste disposal." I suggest there is another obstacle.

First, however, I disagree with the statement that slow licensing procedures are one of the obstacles to the new generation of nuclear power plants. In 1989 the US Nuclear Regulatory Commission (of which I am a commissioner) issued its new Part 52 rule, "Early Site Permit; Standard Design Certifications; and Combined Licenses for Nuclear Power Plants." The new standard reactor design certification process is similar in concept to the Federal Aviation Administration's airframe design certification procedure and differs significantly from the commission's earlier, Part 50 licensing process. In place of the two-step Part 50 process, the Part 52 rule adopts a one-step licensing process that results in the issuance of a

certified design of a standardized reactor. The licensing review of the standardized design is performed once, resulting in a Final Design Approval and a design certification for the particular standardized reactor. Thereafter a utility or other commercial entity would simply reference a previously certified design when applying for a license to construct and operate a nuclear plant. The only new information to be considered would be the applicant's site-related information, in that site data affect certain assumptions made in the previously certified design.

The Part 52 process is intended to simplify and speed licensing procedures in comparison with the old, Part 50 process. It will also permit public participation in the licensing process in advance of construction, so that safety concerns and emergency planning issues can be debated well in advance of construction activity.

I agree with Gibbons and Blair that decisions relating to nuclear waste disposal are required before there can be any revitalization of the nuclear option. Public perceptions of nuclear risks must be addressed. The issues indeed include high- and low-level radioactive waste management, radiological exposure standards and health protection, decommissioning and decontamination of commercial nuclear plants and facilities, and the competence of public officials and regulatory agencies to tackle and resolve these matters. The public and industry perception is that nuclear waste *regulation* itself is not a scrutable, equitable or efficient process.

I believe this disaffection is a chief obstacle—or “root cause,” to use a nuclear industry term—standing in the way of a new generation of advanced nuclear plants. Approximately a year ago the NRC proposed a policy intended to articulate its criteria for making consistent decisions when considering exemptions from some or all regulatory controls for practices involving very low levels of radioactive materials or wastes—a so-called Below Regulatory Concern policy. Practices for which exemptions would be granted, according to this policy, include decontamination of structures and lands, distribution of consumer products (such as smoke detectors), disposal of wastes at other than NRC-licensed facilities, and recycling of slightly contaminated equipment and materials. This BRC policy was unsuccessful, primarily because of public mistrust of the process by which it was established. In July 1991 the commission declared a moratorium on its earlier policy and

initiated a new *consensus-building* process to address BRC issues. I am hopeful that this “experiment,” by invoking greater public participation in developing decisions, will help point the way to establishing the foundation of trust between the public and regulatory authorities that is needed if the public is to accept the role of governmental institutions that are responsible for decisions on matters of future energy supply (including nuclear power).

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GIBBONS AND BLAIR REPLY: For the most part, it appears that Kenneth C. Rogers agrees with us that the prospects for a revitalized nuclear power industry in the US are clouded for a number of reasons. Rogers disagrees that sluggish licensing is a problem on the grounds that the Nuclear Regulatory Commission has proposed a revision in its procedures. The NRC’s proposal has merit, but it is not yet in effect, and industry may lack faith that it will stand up in court without Congressional sanction. Thus, while this proposal is a hopeful sign, the regulatory problem is far from fixed. Furthermore, it would be counterproductive to fix it in a way that would reduce public confidence even further. It is not entirely clear whether the NRC proposal would have that effect. Some industry proposals very likely would reduce public confidence.

As we noted in our article, the order in which the issues facing the nuclear industry are resolved may be very important. On one hand, if there is no progress in resolving the issues of nuclear waste and the perceived safety of current technology, a prolonged debate over licensing reform will be fruitless. If, on the other hand, the nuclear waste issue were resolved and new reactor designs were commercially available and shown to be responsive to public worries, licensing reform might be much easier to achieve.

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Is Immigration Act Alienating Americans?

I would like to comment on the letters on employment in the May 1991 issue (page 99). First, I’d like to thank Kevin Aylesworth for his work and massive efforts to make the government and professional science organizations aware of the employment crisis for scientists and engineers. I would also like to thank APS for allowing Aylesworth to hold a meeting of the Young Scientists’ Network, which some 75 concerned scientists attended, at its spring 1991 conference. Someone needs to help the unemployed and underemployed scientists and engineers.

My husband holds a PhD in physics and since graduating in 1984 has already been laid off once. His prospects of finding another position if he is laid off from his current job are bleak indeed! Since 1988 I have been doing research into the employment problems of scientists, and I can state without a doubt that the employment situation will only get worse beginning on 1 October 1991. Why? Because Congress passed the Immigration Act of 1990, which has several sections allowing businesses to recruit alien workers to make up for “shortages” in the sciences. Few Congressmen had the courage to stand up against this act, which, it has been stated, will force currently employed Americans into unemployment. All interested scientists should send Congressman Jack Brooks of Texas a thank-you note for having the courage to state that what the US lacks is jobs for its scientists, not scientists to fill jobs.

Jon Claerbout of Stanford University wrote in that Stanford’s job fair “turned up 26 students in geophysics to be interviewed by 25 industry recruiters looking for people with MS and PhD degrees.” Claerbout made this statement in support of his claim that there are jobs for those in solid-Earth geophysics. I would like to know if any students who interviewed received job offers from those companies, and at what salaries; if all 25 companies had actual job openings; if those companies had reduced their science staffs since 1988; and if any of the companies are planning to use the Stanford job fair to document that they could not find any qualified American scientists and thus need to hire aliens under the Immigration Act this fall.

I am not a scientist but a third-year law student, and I have spent the last eight months researching the impact the Immigration Act of 1990 will have