refinements remain to be made, I do not believe they will have any further significant impact.

The free-in-air dose calculations are, however, only one link, albeit a very important one, in a chain of four links that determine the ultimate radiation dose to the exposed population. The other three links are the amount of radiation that escapes the weapon, the attenuation of the free-in-air radiation through houses or buildings that contained the subject population, and the further attenuation of the shielded radiation through the tissues of the body to the particular organ in question. It is the latter two links which I believe must be revised, not the Livermore free-in-air dosage results (the second link), before conclusions about the absolute toxicity of gamma rays can be reached.

Possibly my insufficiently clear articulation of the facts in the preceding paragraph was the cause of the incorrect statement attributed to me, which in turn had the unfortunate result of casting doubt on the accuracy of the Livermore calculations. Such result was in no way my intention nor did it jibe in any way with my beliefs.

The other important error is that this whole subject revolves around initial radiation effects, and not radioactive fallout as stated.

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The four letters under the general title "Radiation estimates" (3 July, p. 6) probably caused readers, in addition to myself, to wonder what has become of the traditional objectivity of scientists. Authors of these four letters seem to be searching diligently to show why the risk of exposure to low-level ionizing radiation is not greater than has been reported in the BEIR III report using the T65 dose estimates. Using the table of neutron and gamma-ray doses at 2 kilometers from the epicenter of the Hiroshima nuclear detonation given in the letter from Loewe and Mendelsohn, I arrive at the opposite conclusions from those stated or implied in the four letters. If we apply an RBE (relative biological effectiveness) of 20 to the neutron (n) absorbed dose (rads) to obtain the dose equivalent (rems) as suggested by the International Commission on Radiological Protection, and the correction of a gamma building transmission factor of 1/1.6 as given in the letter from Loewe and Mendelsohn, the dose equivalent at Hiroshima is less by a factor of 2 than that reported for T65D or used by BEIR III. Likewise, the dose equivalents at Nagasaki are less by a factor of 2 when one applies this 1/1.6 factor. Thus, it would seem the risk of cancer from low-level exposure may be greater than that given in BEIR III by at least a factor of 2. This conclusion in reference to the Hiroshima data depends critically on the use of $RBE_n = 20$ for total carcinogenesis by neutrons. Of course, no value for RBE_n can now be derived from the Japanese data because of the low neutron doses, but a vast amount of data from other studies of alpha and neutron exposures suggests that RBE_n probably is equal to about 20 and certainly not less than 10. An additional reason why the new data from Lawrence Livermore National Laboratory suggest a larger cancer risk than used in the BEIR-III report is the fact that the slope of the gamma-ray dose curve versus distance at Hiroshima is less than that assumed in T65D, so the control group used in the T65D and Atomic Bomb Casualty Commission studies probably received more dose than has heretofore been assumed.

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Komanoff's Projections

Colin Norman (News and Comment, 8 May, p. 652) apparently gives some credence to Charles Komanoff's latest projections of nuclear and coal power costs (*1*). In recent energy economics debates my adversaries admitted that they were basing their case on Norman's article alone and had never seen Komanoff's book itself. Studies by perennial antinuclear activists call for more than simple reporting, even if it takes a couple of weeks to obtain a critical review.

As in previous writings, Komanoff uses questionable assumptions and selects a proxy variable that projects the answer he wants. A few years ago it was unit size: he said then that the larger a generating unit was, the worse it would run (*2*). He still claims this is valid, but a look at the data shows it is not. This time he chooses "sector size," the total installed capacity, nuclear or coal. By fitting the publicly available data with these proxy variables and extrapolating into the future the nuclear numbers project upward faster than those for coal.

The point is that none of these Komanoff-type analyses deal with the real problem. We will need more nuclear plants and more coal plants to meet the legitimate demand for electricity in the United States. We would require many new plants even if we did not have to build to replace obsolete units and substitute for oil and natural gas. Whatever we build will be very expensive and will be paid for with badly inflated dollars. Long lead times mean even more uncertainty. Who can predict the regulatory climate for coal or nuclear? The costs will rise further, and the biggest factors will continue to be delays, escalation, and inflation.

Utilities need diversity. They need the option to choose between fuel types. Nobody builds the "average" plant; decisions of such magnitude have many unique factors.

The political climate has effectively removed nuclear power from the marketplace for the past few years. However, those utilities that chose to build nuclear plants years ago and have those plants in operation today (other than Three Mile Island) are continuing to achieve substantial savings for their customers. For example, Commonwealth Edison's six large nuclear units (*3*) averaged 1.7 cents per kilowatt-hour in 1980; our six large coal units 3.6 cents per kilowatt-hour. If one arbitrarily set the capacity factors for all the units at 60 percent and doubled the carrying charges (in answer to the argument that four of the six nuclear units were turn-key jobs), coal costs of 3.4 cents per kilowatt-hour would still exceed those for nuclear of 2.6 cents per kilowatt-hour. Carrying charges for the LaSalle 1 plant, when it comes on-line in 1982, will be about 4 cents per kilowatt-hour, but the cost of fuel oil alone for the 9 percent of Edison's 1980 energy that came from oil (some of which LaSalle will displace) averaged 6 cents per kilowatt-hour. Estimates for new coal plants with scrubbers point toward even higher costs.

The United States and the rest of the world will need expensive new coal plants and nuclear plants as well. Claims that statistical projections should preclude the use of either technology call for healthy skepticism.

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References

1. C. Komanoff, *Power Plant Cost Escalation* (Komanoff Energy Associates, New York, 1981).
2. ———, *Power Plant Performance* (Council on Economic Priorities, New York, 1977).
3. A. D. Rossin and T. A. Rieck, *Science* **201**, 582 (1978).

Erratum: In the Research News item on evoked potentials entitled "Testing babies for neurological problems" (17 July, p. 322), the affiliation of Ivan Bodis-Wollner was incorrectly given as Albert Einstein College of Medicine. It should have been Mount Sinai School of Medicine.