Nuclear Energy - an Ethical Choice

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Purpose

In the course of the Panel on Nuclear Fuel Wastes there were several submissions on, or including, the ethical aspects. Early in the proceedings I submitted my own views[1], appending my paper on the subject, "*The Geometry of Nuclear Energy: Getting the Right Angle on the Ethics*", Canadian Nuclear Society Bulletin, 13, 3, published in 1992. Later, the Panel issued an Issues Paper in which the first Issue was "Ethics": I responded in another submission[2]. Among other participants who contributed submissions on this issue the most prolific was Professor Peter Timmerman, either as co-author on behalf of the Canadian Coalition for Ecology, Ethics, and Religion (CCEER) or as consultant to the United Church of Canada (UCC). I reviewed all available submissions (not just those on ethics), more than 500, and submitted my comments to the Panel where they are in the public domain. Several of those relevant to ethics[3] can be read on the internet.

In reviewing these submissions I was struck by how various individuals, all presumably sincere, could arrive at such different conclusions. In searching for an explanation I found many submissions rife with errors and misunderstandings. This is understandable in members of the public exposed to media that constantly repeat myths[4] refuted in previous inquiries. It is simply unethical in academics who pontificate without taking the time to research the vast literature on nuclear energy. As Josh Billings put it:

"*It is better to know nothing than to know what ain't so.*"

As a result of my participation with the Panel, and four other nuclear-energy inquiries, of reviewing about thirty other nuclear-energy inquiries (AECL Report-10768, 1993), and of decades of interaction with the public on nuclear energy, I included a chapter on ethics[5] in my book "*Decide the nuclear issues for yourself: NUclear need not be UNclear*", published on the internet in 2000. Since then I have crystallized my thinking into ten universal principles of practical ethics and then applied them to test nuclear energy.

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[1] http://www.magma.ca/~jalrober/eisrev2.htm

[2] http://www.magma.ca/~jalrober/eisiss.htm

[3] http://www.magma.ca/~jalrober/nuceth.htm#Panel

[4] http://www.magma.ca/~jalrober/Chapter14.htm

[5] http://www.magma.ca/~jalrober/Chapter13.htm

Principles

These principles, accompanied by brief explanations, are similar to Euclid's axioms in geometry, i.e., statements that cannot be proved but are self-evident to most people. Even if my principles are not self-evident, at least their explicit statement permits rational discussion.

P.1 Principle of No Absolutes. Nothing is absolutely ethical, only more or less ethical. "*Thou shalt not kill*" is an absolute but there is general agreement that killing can sometimes be justified, e.g., in self-defence and in war. Much of the criticism of individual technologies implicitly demands guarantees of absolute safety, something that no human activity can promise. When any technology is examined in isolation it is always possible to find aspects to criticize, including some related to ethics.

P.2 Principle of Alternatives and Consequences. With no absolutes, to decide on the ethics of some proposal, one must compare it with available alternatives. In doing so, one should examine the consequences of each. For instance, banning pesticides in fruit-growing could result in people eating less fruit that is good for them, because organic fruit looks less attractive or is more expensive.

P.3 Principle that Facts Matter. In any such comparison sound judgements have to be based on properly established facts, as illustrated by the following fable. Once upon a time, a frog sitting in some long grass heard a roaring monster approaching. At first, the frog sat still hoping not to be noticed, but when the monster returned it jumped further into the long grass. It kept on doing this until there was no more long grass into which to jump. The monster was a lawn mower that I was pushing. Had it jumped out onto the cut grass I would have avoided it. As it was, its actions put it in grave danger of being mashed. Luckily, I saw it. This incident occurred soon after the reactor accident at Chernobyl in the former U.S.S.R., and the media were full of reports of the fallout from it spreading across Europe, and even being detected in Canada. Before going out to cut the grass I had heard on CBC Radio that, despite assurances from federal authorities that the radioactivity, though detectable, was not dangerous, some parents were keeping their children indoors. Apparently they were unaware of the fact that the radiation level inside the average dwelling due to naturally occurring radon was about a hundred times that from the Chernobyl fallout outside. These people, like the frog, from a lack of knowledge of the facts, were making decisions that resulted in consequences the exact opposite of what they intended.

P.4 Principle of Quantification where Possible. An informed comparison of the alternatives requires quantification of the factors involved, where possible. To illustrate this, the public (in the U.S.) overestimates the annual deaths from botulism by a factor of about one hundred. If the public is aware of the actual, actuarial, death rate and wants to expend a disproportionate share of its resources on preventing botulism, that is its right. To ignore or conceal available numerical facts, however, is unethical.

P.5 Principle of Perspective. Numbers can be meaningless, however, unless one has a scale for comparison. The media have reported the detection of 30 carcinogens in the Great Lakes: whether this is a concern depends on their concentrations compared with their harmful levels.

P.6 Principle of No Acceptable Risk. In the absence of absolute safety there is a demand to know what is an "*acceptable risk*" but there is no such single entity. Acceptability represents a judgement that the risk of a proposed activity is low enough in view of the expected net benefits. Risk and acceptability are therefore two distinct concepts. The distinction can be illustrated by a hypothetical example. In January of 1998 the 200 km of Highway 17 from where we live to Ottawa was dangerous because of the ice storm.

We had tickets for the Ottawa Little Theatre for the Monday night but we decided not to risk going. On the Tuesday my wife was diagnosed with something requiring treatment at the Ottawa Hospital, so we did go. The risk of the journey, and my perception of it, were the same on both days, but my perceptions of the benefits were vastly different and that is what affected the acceptability in my judgement.

P.7 Principle of No Free Lunch. Any of society's resources devoted to making one activity much safer than the others are unavailable for other worthwhile programs, including making the less safe activities safer. Thus the overall safety would be reduced so, ethically, one should avoid making any activity too safe.

P.8 Principle of Risk Optimization. From the previous principle it follows that risks should be optimized for the public benefit, not minimized. However, our societal values require that there be an absolute limit to the allowable risk for any individual however great the benefit to society at large. Since technologies are not judged solely on risk, technical, economic and social factors should also be considered in the optimization.

P.9 Principle that Good Intentions are not Good Enough. Many people seem to believe that if they feel strongly in favour of some end result, e.g., peace or a clean environment, then any action claiming to achieve this result must be ethical. There is an ethical obligation to examine the issue thoroughly before reaching a conclusion. The greater the fame or authority of the person the greater the obligation to examine the issue thoroughly. Recently, show-business personalities have sought media exposure to pronounce on Kyoto, Iraq, etc., without any evidence of having studied the issues.

P.10 Principle of Anti-Semanticism. To claim that something is "green" or "soft" does not make it an ethical choice. Choices should be made on their merits, not as a matter of semantic dogma.

Practice

As illustration, I apply these principles to electricity generation, the technology with which I am most familiar. For this application, nuclear energy is neither perfect, nor absolutely safe - none of the options for generating electricity is (P.1). One should therefore compare it with other options (P.2). In doing so, one should do one's best to assess the relevant costs, benefits and risks of each (P.3). Some of these are qualitative, subject to value judgements, but many can be quantified and this should be done to the best of one's ability (P.4). Economic assessments show that nuclear energy is competitive with other options with the preference depending on the size and nature of the demand, the proposed site, and other factors. When effects on the health of the public, workers and the environment are considered, nuclear and wind energies are clearly superior.

Since virtually the only risk from nuclear energy is from radiation it is important for people to be able to assess that risk. Hypothetical individuals living their whole lives at the boundary of a Canadian nuclear-power station would be exposed to an amount of radiation less than one-hundredth that from all other natural and man-made sources to which they are exposed (P.5). People should not be expected to accept this additional exposure, however little, unless they are convinced that the benefits from the resulting electricity justify the small additional risk (P.6). Since nuclear- and wind-energy are already considerably more benign than other sources of electricity, any measures to make them much safer would be counter-productive in that these would bleed limited resources from improving other activities that would yield greater net safety (P.7). In Canada, the federal regulatory agency, the Canadian Nuclear Safety

Commission, requires nuclear-generating stations to limit any radiation exposures in accordance with recommendations of the International Commission on Radiological Protection that exposures to radiation should be optimized for the public benefit, considering technical, economic and social factors, while imposing an absolute limit to the allowable exposure for any individual (P.8).

In this way, informed decisions can be made while still recognizing specific requirements and social factors: not to do so would be unethical (P.9). To select an option simply on the basis of a catch-phrase, e.g., "*the soft path*" or "*renewable*", would be particularly unethical (P.10). From the application of these ten principles I conclude that under some, but not all, conditions nuclear can be the energy source of ethical choice. For a greater in-depth discussion of the issue I invite readers to consult the book "Decide the nuclear issues for yourself: Nuclear need not be Unclear"[6] at my website, where there is also a critique, "Malice in Blunderland[7], of the BS Report by the Panel on Nuclear Fuel Wastes.

About the Author

J.A.L. Robertson is an applied scientist with over fifty years experience in nuclear energy. His contributions to the development of nuclear fuels, notably those for the Canadian CANDU reactors, were recognized by election as Fellow of the Royal Society of Canada (Academy of Science) in 1981 and by awards of the W.B. Lewis Medal (1987) and the Kroll Medal (1993). In subsequent management positions, he extended his interest to all nuclear R&D and, later, to nuclear safety. Since the 1970s he has actively promoted nuclear energy and has communicated with (not to) the public on the subject. He has participated in various roles in several public inquiries, including the Panel on the Disposal of Nuclear Fuel Wastes.

In these interactions with the public he was struck by how much public concerns about nuclear energy were based on beliefs that he considered false or misleading. Specifically, the widespread belief that nuclear energy is a necessary evil conflicted with his own belief that it can be the energy source of ethical choice for many applications. Finding little in academic ethics to help resolve the issue, he set out his own arguments in 1992, and has subsequently developed them further. When Google searches the internet for "Nuclear ethics" two of the first three of 586 returns are to Robertson's work. Factual biographical details, including family, education, war service, positions held, publications and items on nuclear ethics can be found at www.magma.ca/~jalrober/.

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[6] http://www.magma.ca/~jalrober/Decide.htm

[7] http://www.magma.ca/~jalrober/Blunder.htm