

No. S-26-92
Tel. 301/504-2240

VICIOUS CIRCLES
AND
VIRTUOUS SPIRALS

FORREST J. REMICK, COMMISSIONER
U.S. NUCLEAR REGULATORY COMMISSION

AFTER DINNER THOUGHTS
NRC REGULATORY INFORMATION CONFERENCE
MAYFLOWER HOTEL
WASHINGTON, D.C.
JULY 21, 1992

I am very pleased to have been invited to be with you this evening and to provide my support to the Regulatory Information Conference, which has become an important annual event.

I pondered what wonderful words of wisdom I could offer which would be interesting enough to keep you awake this evening following dinner and a full day of presentations and debates. If lucky, I'll be able to come up with such wisdom tomorrow. I hope everyone is taking their coffee black. I am.

As a former professor, I often said, "Have Lecture - Will Travel." However, my purpose this evening is not to lecture you on, or repeat, the information which has been and will be discussed throughout this conference. I would, however, like to take this opportunity to convey some of my views on the future of nuclear power and its regulation, views I've gained over the past two and a half years as a Commissioner. I've tried to keep my remarks brief.

However, it's hard to write a short speech. Mark Twain once wrote a friend, "If I'd had more time, I would have written you a shorter letter." But I didn't have a lot of time to compact waste words. So instead I started out with just two or three simple points which I could then elaborate usefully. The result will, I hope, afford us a panoramic, though necessarily somewhat fuzzy, view of the future of nuclear power and its regulation. Here are my three points:

First, present circumstances offer the American nuclear industry great opportunities to increase the contributions which nuclear power makes to the common good, and the industry's increasing excellence renders it poised to make use of those opportunities. But this increasingly excellent industry must avoid some vices which are very easy to acquire because they are closely allied to certain virtues.

Second, circumstances also present the NRC with good opportunities to increase the consistency and coherence of its regulations, and I am pleased to say that the agency is taking advantage of some of these opportunities, but here too lurk certain easy vices, close cousins of certain difficult virtues.

Third, shortcomings in either the regulated or the regulator can contribute to a "vicious" circle, but excellence in industry and excellence in regulation can form what I would call a "virtuous" circle. Together, the industry and the NRC can help each other be models of advanced technology and its regulation, and can exert a beneficial influence far beyond our borders.

Maybe you're thinking now, "he said he was going to talk about the future, but he's talking about present opportunities instead; he said he'd talk about what *will* be, but instead he's talking about what *can* be." You're right. Even worse, I'm doing this on purpose! But I've got good excuses. I've heard it said that "civilization" is that state of society in which the only people who speak about the future with any degree of confidence are the fortunetellers. And even many of them are quitting the business. They claim that the future isn't what it used to be.

But my biggest reason for talking about what can be, instead of what will be, is that, speaking wholly in practical terms, the only thing the future is right now is a bundle of opportunities. There is no guarantee we will succeed if we seize these opportunities, but we will fail if we don't seize them. So, on the working hypothesis that we make our future by the best use of the present, I will now elaborate on my three points.

Just a few minutes ago, I said that there now were great opportunities for the nuclear industry. I said this even though I see clearly some dark clouds: For example, we are not going to have a high-level waste repository as soon as we would like, and a recent decision from the United States Supreme Court has thrown the institutional structure for low-level waste disposal into some disarray; economic considerations have forced more than one plant to permanently cease operation this year; we are in a trough in the number of young men and women training to manage and develop nuclear technology; and the shadow of Chernobyl still darkens public opinion everywhere.

On the famous other hand, concern for energy security and concern that the burning of fossil fuels could bring long-term, even irreversible, damage to the environment have moved many to look upon nuclear power as an attractive alternative. Indeed, both here and abroad, some former opponents of nuclear power now express a guarded and qualified support for it. Public concern in the U.S. about the effects of routine operation of nuclear power plants has, I believe, abated somewhat because of the continuing improvement in the operation of those plants, and because of statistical studies such as the one published in 1990 by the National Cancer Institute, which concluded that there was no evidence that an excess occurrence of cancer has resulted from living near nuclear facilities.

Not only the U.S. public, but also the Executive and Legislative Branches of the U.S. government, have been giving nuclear power a second, more approving, look. The nuclear option figures prominently in the President's National Energy Strategy, and somewhat to my surprise, both houses of Congress have now passed legislation which in part codifies, in part enhances, the now three-year-old body of regulations which the NRC issued to encourage increased standardization of plant design and to remove unnecessary inefficiencies from the process for licensing power plants. Also, the Tennessee Valley Authority stands poised to complete its long-stalled nuclear construction projects.

Of course, as many of you know, there are similar stories from around the world. For example, I know from my trips this year to Indonesia and Taiwan that both countries have embarked on new nuclear projects. Indonesia is just beginning its nuclear power program, and Taiwan will be adding to its. Nuclear News reported this last February that there are, all told, some 97 nuclear power plants under construction or on order around the world.

The opportunities here are obvious and being seized upon already. For example, American designs are being built or are on order in Japan and Korea, and American designs are under very serious consideration in Indonesia and Taiwan. The NRC now has before it eight different standard designs in various stages of review, from five different vendors. Over the next two and a half years, the NRC staff expects to reach final judgment on four of these designs. The NRC expects that the next generation of nuclear power plants will incorporate the over 1600 reactor years of operational experience American plants have accumulated, and that these plants will therefore be significantly safer than the already existing, and already adequately safe, plants. We expect the new designs to be simpler, more tolerant of human error, more easily maintained, and less dependent upon active human or mechanical intervention to maintain normal operation.

Of course, it's not just in future plants that the industry can make the most of opportunities to contribute to the economic and environmental well-being of many nations. The operation of current plants can and should continue to improve. For example, in the United States, the average number of safety-significant events at plants has dropped to a tenth of what it was a mere six years ago. Another substantial drop would be welcome and would do much to increase the industry's stature in the public's eye. And I think we'll see this drop, if the utilities, the Institute for Nuclear Power Operations, and other groups and individuals continue their already great efforts toward increased safety and reliability in operations.

However, along with the decade-long increase in professionalism in the industry, and along with the new, and sometimes daring and exciting, design work going on, come new opportunities for failure. Certain vices are open only to those who are good: Only people who have achieved laurels can rest on them; only an engineer who knows how not to waste materials will often come close to the edge of not using enough; and only the designer who is good and *knows* he's good (and a professional knows he's good) will be tempted to think he doesn't need to listen to others.

Now let me turn to the opportunities the NRC has to improve its efforts, and let me begin by trying to get a broad perspective on the purpose of regulation. No professional worth his salt *likes* to be regulated. A professional likes to choose her own critics -- not to avoid harsh criticism, but to learn from someone whose judgment she trusts.

But a regulated industry doesn't get much choice. In these days of desk-top publishing, a writer might dispense with his editor and publish his work himself. But the well-being of the public is too intimately affected by large engineering projects for those projects to go forward without regulation. And so regulation will not ever go away. Even if the government stopped regulating the industry, the private sector would probably only expand the regulatory functions performed by professional societies, stock analysts, insurers, scholarship, and the like.

But regulation *can* be mostly to the good. Regulation has been an activity of the federal government since the founding. When he was Secretary of the Treasury, that great Founding Father Alexander Hamilton recommended more regulation as a way of increasing the demand for manufactured articles. He thought that, if buyers knew that a product met certain national standards, the buyers would be more willing to come into the market. NRC certification of a standard design may serve a similar purpose, among others. Hamilton thus thought that regulation could be a *productive* force. Of course, such regulation had to be "judicious," he said. And we've been trying to figure out now for 200 years what is judicious and what not.

I believe that there are many opportunities now for the NRC to become more of a model of judicious regulation, and not just of the market-making kind. The agency has, I believe, largely done well, and in recent years it has taken some major steps in judiciousness. Take, for example, the new Part 52, on standardization and combined licenses, and the new Part 54, on license renewals. Each adjusts the licensing process in a timely way to a new reality -- Part 52 to the new standard designs and the safety advantages of standardization, and Part 54 to the utilities' pressing need to make timely decisions on whether to build new base-load capacity. But there are new opportunities for the agency now. Let me mention a few, each of which we are making some significant use of already.

We have, for example, the opportunity to distinguish ourselves and serve the discipline of engineering by exercising our increasing analytic capabilities. The design of a new nuclear power plant is not a job for one person, one office, one discipline, or even one design firm. Many people know much -- especially about past failures and possible failures -- that would be useful to the designers of such a big project. And in any engineering project, there has to be somewhere along the line an independent, clear-seeing eye to judge the work and to point out things which, through no fault of his own, the designer has missed simply because he is not all-knowing.

The designers of nuclear power plants didn't have the freedom to decide whether the NRC would be that independent eye, but the NRC does have the freedom to become the kind of helpful critic that the designers won't be entirely unhappy to have had. To be this sort of critic, the NRC must maintain top analytic capabilities. I am pleased to report that the NRC, in part at my urging, has taken several steps in the last few years to make sure that it has the necessary analytic capability.

Also, we have the opportunity to be less prescriptive in our regulations and thus to leave more room for industry innovation. Every engineer needs a good critic, but the critic isn't the innovator, any more than a writer's editor will think up wonderful new story lines and characters. Moreover, the kind of excellence everyone wants there to be in the nuclear industry cannot be choreographed from the outside. Non-prescriptive regulation is not easy. Either it requires solid bases on which to set quantitative standards and measure whether they have been met, or it requires that the NRC be willing to give full and fair consideration to new ways to meet old, qualitatively stated, standards.

Such willingness requires time, flexibility, knowledge, and a desire to leave the industry room to innovate.

We've made several good starts toward non-prescriptive regulation, the new maintenance rule being one good example. As you may know, I opposed going forward with such a rule at this time, because the NRC staff had judged the industry's programs to be doing well, and I was concerned that our intruding into those programs with a rule could be counter-productive. But if you're going to have a maintenance rule, the one we have is the right kind.

We also have an opportunity to work with others toward more regulatory coherence about risk, both nuclear and non-nuclear. In recent months I have spoken both here and abroad about my personal views on the usefulness of establishing a consensus standard of acceptable risk that could be applied to a wide range of regulated activities. The NRC has had for several years safety goals to use to bring more coherence to its regulation of nuclear power plants. We could do more, and are trying to do more, to implement these goals. I believe that similar goals would be useful to all the safety agencies of the federal government. Without such broadly applicable goals, we run an unacceptably high risk of misallocating scarce resources away from controlling the most significant risks.

I hold out some hope that consensus goals can be found. There is in fact some evidence that several institutions, both public and private, foreign and domestic, are already converging, sometimes unconsciously, on a goal. For instance, just taking the NRC alone, I have calculated that our safety goals, reactor site criteria, low-level waste disposal criteria, ill-fated BRC criteria and some of our radiation protection standards, all imply an annual individual risk of cancer fatality somewhere in the range of $10E-5$ to $10E-6$, even though these various criteria were established at different times, for different purposes, by different people, using different terminologies.

Again, certain vices are open only to the good, and the vices open to a first-rate regulatory agency tend to be the mirror-images of the vices open to a first-rate industry. Thus, the mirror-image of an industry that rests on its laurels is the agency that likes to appear macho about enforcement and doesn't stop to ask whether its super-tough enforcement contributes to safety or just makes good press. The mirror-image of an industry which is too concerned about cutting costs is an agency which acts either as if safety were cost-free or as if there were no better way to increase the well-being of the public than to make a marginal improvement in the safety of nuclear power plants. And the mirror-image of the designer who thinks that *he* knows everything is the agency which thinks that *it* knows everything and therefore doesn't need to listen to what the people with front-line responsibility for the plants are saying.

These mirror-image vices bring me to elaborating on the last of the three points I indicated I wanted to make this evening, which is that the vices of regulator and regulated feed on each other, but that so too do their virtues. If the industry starts to slide, the agency will have to enforce, and it will be tempted to be super-tough about it. If the industry gets carried away with economy in design, the agency will have to take a less cost-conscious view of the designs, and it will be tempted at times to disregard cost altogether. And if the designers become less self-critical, the agency will have to fill the vacuum, and the agency will be tempted to think that it always knows best. And of course, if we're super-tough, know-it-all, and oblivious to scarcity, we will tempt you to slide into a state in

which all you're fit to do is take directions and carp about them. We need something more independent and resourceful than that for designing, building and running nuclear power plants.

The good news is that we're both doing a pretty good job, I think, of not tempting each other and thus of staying out of this downward spiral. But we each can no doubt do better. The vicious circles I describe are always a threat to guard against, but there is also always the promise of what I'm going to call "virtuous" circles, or upward spirals: If the industry seeks constant improvement, we can afford to be a watchful, but non-prescriptive and not oppressive, presence; if the designers are as safety-conscious as they are cost-conscious, we too will be free to give cost its due and to compare one risk with another before requiring more safety; and if the industry acts as if it, like any other human enterprise, can benefit from independent criticism, we can exercise our analytic capabilities and urge appropriate changes without running the risk of trying to be the designers ourselves. In turn, our greater judiciousness will encourage and leave room for even more professionalism in the industry.

I hope that this upward spiral is the future of the industry and of NRC regulation.