Letters

EMP and a Limited Nuclear War

The electromagnetic pulse (EMP) that is generated by a nuclear blast high above the earth's surface is the subject of discussion in two issues of *Science* (News and Comment, 29 May, p. 1009; 5 June, p. 1116) and in two issues of the *IEEE Spectrum* (May, p. 41; June, p. 48). According to these sources the EMP could disable the power grid of the nation, thus giving rise to a national blackout, knock out communications, and make computers useless. Modest steps taken to minimize these effects within the past several years are discussed. Suddenly there is much interest in this topic.

I first became aware of the EMP, whose duration is measured in microseconds, and the associated nuclear blackout, whose duration is measured in minutes, when I spent a year with the Institute for Defense Analyses (IDA) in 1962 and 1963. IDA is a think tank which at that time was supported by a consortium of 12 universities and was a means used by the Department of Defense (DOD) to borrow university professors to study defense problems. One of the most pressing problems at that time was a study of the feasibility of an antiballistic missile (ABM) system, which was occasioned by the danger from intercontinental missiles. The system was known as Nike-X, a successor to Nike-Zeus; it was renamed Sentinel and then Safeguard. Not only was this a feasibility study but the purpose was to come up with a tentative design. However, there were instructions not to consider at that time two aspects of the problem. One was whether it was possible to build a phased antenna array hard enough to survive a nuclear blast, and the second was the possible effects of EMP and the associated nuclear blackout on radar systems. These latter were known to exist but were not understood at that time.

The concentration on the less difficult part of the problems rather than on the bottleneck was contrary to anything I had ever experienced in industrial or university research. If one cannot find solutions to the intractable parts of a problem, there is little point in finding solutions to the tractable portions. But this was the problem as outlined to IDA by DOD. Moreover, the project already had considerable momentum. IDA invited perhaps 20 defense contractors who had already worked on associated problems to present their proposals before panels of IDA members, in what we termed "picture-book engineering." The need for hardening the antenna and the effect of nuclear blackout were relegated to the back burner. . . .

At present the reasoning is used that since EMP would disable our power and communication networks, any nuclear attack that blacks out communication systems will be interpreted as an all-out attack. That leaves us with one option, namely, a limited nuclear attack. The Carter Administration embraced this concept, and the Reagan Administration has adopted it tentatively. . . . Does peace have a chance when those in power wish to believe that a limited nuclear war is an acceptable alternative?

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Residual Oil Conversion Process

Philip H. Abelson's editorial of 8 May (p. 615) is an excellent one, and we fully subscribe to the subject matter discussed therein. However, we take exception to the statement that "there are (only) two methods for upgrading residual oil," those being hydrogenation and coking.

We at Ashland Oil, Inc., have for some time promoted the idea that residual oil should be converted into high-quality transportation fuel, but we have taken a different tack from those described by Abelson. To this end, we have developed and have now under construction a 40,000-barrel-per-day reduced crude conversion process, in which, by means of process and highly specialized catalyst innovations, we are able to convert high coke, metals, and residuum containing sulfur to high-octane gasoline.

Attention has also been drawn to the hydrogen/carbon ratio as being a limiting factor. However, in our operation, hydrogen/carbon restrictions are only limited by limitations of our most recently developed, present-day catalysts. Theoretically, if the perfect catalyst were available to completely redistribute hydrogen and carbon to our liking, reduced crude has enough hydrogen to permit the production of an ideal mixture of two very high-octane hydrocarbons—namely toluene and isopentene—stoichiometrically and with volume yields in the range of 125 percent to 140 percent. Obviously, there are technical limitations to such a catalyst, but we are dedicated to making progress in that direction. Already, much progress has been made, as confirmed by Ashland Oil's plan to have a reduced crude conversion unit in place by 1983.

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University Research: DOD's Role

Colleen Clark and John Clark (Letters, 26 June, p. 1446) take aim at Department of Defense (DOD) support for university research in strong terms but with no better accuracy than a shotgun. Although it has become fashionable in years past to state so, there is nothing intrinsically wrong in DOD's need for research, even basic research. Classified research is not the issue; most universities govern that under special rules if they permit it at all. There is nothing immoral about university investigators who make a contribution to the security of the country, nor is it unpatriotic for universities to accept government support. It is all a matter of degree and, on the whole, the acceptance of federal funds has produced a healthy academic life. The Clarks suggest that we ought to take advantage of the reduction in government support to find other, more dependable sources with fewer strings attached. Even though they serve a university more successful than most in tapping private resources, they do not enlighten the rest of us regarding sources and means. In truth, that sort of statement is useless; the job cannot be done. We would diminish our dependence on government funds if we could, but the private and industrial money is not there. The image of university presidents scuttling in unseemly fashion for DOD money is amusing, but most DOD money is obtained by individual investigators below that level.