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UNIVERSITY OF MARYLAND
SCHOOL OF LAW

Oscar S. Gray
Jacob A. France Professor Emeritus of Torts

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National Medal of Technology
And Innovation Nomination
Evaluation Committee
c/o The United States Patent and Trademark Office
Attn: Jennifer Lo, Program Manager
600 Dulany Street
Suite 10D44 West
Alexandria, Va. 22314

Re: Nomination of Dr. Zalman M. Shapiro

I am the Jacob A. France Professor Emeritus of Torts in the University of Maryland School of Law. I have also taught in the law schools of Georgetown University, Catholic University of America, and the University of Tennessee. I was a member of the Legal Adviser's Office of the U.S. Department of State in the Truman and Eisenhower administrations and served as Director of the Office of Environmental Impact in the Office of the Secretary of Transportation in the Johnson and Nixon administrations.

I have known Dr. Shapiro for over fifty years. My experience with his technological career dates from 1957, when I left the Department of State to join him as an officer of a start-up company that he was in the process of founding, Nuclear Materials and Equipment Corporation, headquartered in Apollo, Pa. (NUMEC). He was the President of the company. I became its Secretary and Treasurer, and later a Vice President.

I made this move because of the convergence of two circumstances. One was the apparent emergence of vast new opportunities for the participation of private commerce in the nuclear energy field, sparked by the brilliant success of the government's nuclear submarine program and the apparent progress that was being made in parallel for the development of commercial-scale nuclear power reactors for the generation of electricity. The other was the prominence with which Westinghouse Electric Corp. had featured Dr. Shapiro as among those principally

responsible for the success of this work technically at its Bettis Atomic Power Laboratory, which Westinghouse managed as one of the principal contractors for Admiral Hyman Rickover's naval reactor program. (Westinghouse, for instance, bestowed on Dr. Shapiro its "Silver W" award, its highest corporate honor for technical achievement).

Dr. Shapiro's contributions at this stage included the development of the process for the large-scale manufacture of corrosion-resistant zirconium that was one of the keys to the success of the Nautilus, our first nuclear-powered submarine. The ultra-pure zirconium became a crucial structural element for reactor cores because of its combination of three important qualities: strength, workability and transparency to neutrons. Later, at NUMEC, Dr. Shapiro led the development of processes for the large-scale manufacture of corrosion-resistant hafnium crystal bar for reactor power control, without which the naval nuclear reactors could not operate.

In this relationship I had occasion to work with Dr. Shapiro closely on a wide range of non-technical problems associated with the establishment and operation of a technology-based business. We worked together at all hours of the day and night for a decade or more. I had every opportunity to observe his reactions to a broad variety of the vicissitudes to which a start-up business dependent on government contracts and regulation can become subject. In all these circumstances, I can state, with no reservation whatever, that his reactions to all problems in hundreds or thousands of crises, whatever the emergency situations in which they presented themselves, displayed three unvarying characteristics: firm leadership; punctilious honor; and intense patriotism. I recall no exceptions in all my experience with him.

Dr. Shapiro's technological contributions have advanced the public interest in a number of important ways. First, as to our national security interests, the development of the nuclear-powered Navy, for which his development of production processes for ultra-pure zirconium and, later, for hafnium crystal bar, was a key element, was one of the great success stories of the twentieth century. The corresponding development of the capacity to generate electricity without the use of fossil fuels had been of world-wide importance for economic and environmental (as well as security) aspects of the public interest, and may well have an expanding impact in all these areas in the twenty-first century. In his work as NUMEC, in addition, Dr. Shapiro led in the development of processes for the production of reactor fuel through the combination of oxides of uranium and plutonium, which could be reprocessed from spent nuclear fuel in such a way as to permit the plutonium to be "burned", in effect, as useful reactor fuel, reducing the need for storage of long-half-life dangerous fission products. The ultimate significance of this partial solution to the problem of storage of radioactive fission products is probably

yet to be realized, but the successes of Dr. Shapiro's previous work with such materials provide striking evidence of its potential.

In many smaller ways Dr. Shapiro's technological contributions have had spin-off effects of public interest consequence. Forty or fifty years ago, for instance, as one example of contribution to national economic interests, the U.S. Department of Commerce itself honored NUMEC with an award for excellence in promoting, under Dr. Shapiro's leadership, exports of products in the fields of nuclear materials and equipment under the Atoms for Peace Program. As another example- -in the field of health--under Dr. Shapiro's direction, NUMEC developed a successful radiation-powered heart pacemaker. This became important not only for the development of radiation-based power supplies, but also for the impetus that this gave to the further development of pacemakers themselves for long-term implantation, regardless of the source of their power. Apart, furthermore, from the intrinsic importance of his technological contributions, Dr. Shapiro's career epitomizes our national interest in overcoming ageism. It extends from his technological contributions of over a half century ago to the very present. This year, at the age of eighty-nine, he is being awarded his fifteenth patent, for a process for the production of synthetic diamonds at far lower temperatures and expense than those at which this could be done through previously available technology.

For all these reasons I respectfully support the award of the National Medal of Technology and Innovation this year to Dr. Zalman M. Shapiro.

Sincerely yours,

Oscar S. Gray

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