

POPA Study Proposal

November 15, 2012

Working Title:

Life Extension: A Technical Examination of the Nation's Nuclear Reactors

Proposed by:

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POPA Topical Area:

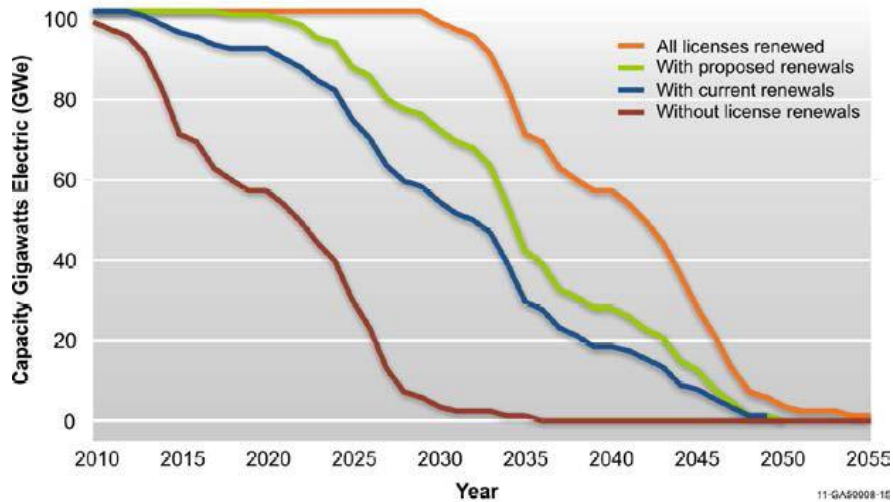
Energy & Environment

Objective:

Produce a POPA report that: 1) identifies technical challenges associated with extending nuclear reactor lifetimes from the current 60 years to 80 years; and, 2) determine whether the nascent Federal R&D program or, indeed, other possible technical approaches in this area would be sufficient and appropriate to address those challenges.

Background:

If all US nuclear reactors were retired at the end of a licensed 60-year lifetime, and no new reactors were built to compensate, then approximately 100 gigawatts of the nation's electricity supply would begin shutting down by the year 2030.



Source: <http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1350/v23/sr1350v23-sec-2.pdf>

11-GA60008-1E

There are no regulatory prohibitions against extending the licenses from 60 years to 80 years and there would be several advantages to doing so. First, such extensions, where appropriate, would provide stability of the nation's electricity supply while buying time to build new reactors or develop alternatives. In addition, while it may not be appropriate to extend the life of all reactors, extending the life of some portion of a major generating

asset may avoid the need for immediate investment in new generating capacity. Finally, the capital costs of extension are likely to be much smaller than the costs of any type of replacement capacity.¹

While there are clear advantages to extending licenses, there are also potentially substantial challenges. In February of 2008, the Department of Energy teamed with the Nuclear Regulatory Commission to hold a workshop on the subject. A report was issued that identified and prioritized numerous research needs as follows²:

- Primary suggested research areas: reactor vessel neutron embrittlement, crack growth models, late-failure modes, advanced inspection techniques
- Secondary suggested research areas: low and medium voltage cable aging, management of buried piping, degradation of concrete structures
- Crosscutting suggested research areas: infrastructure and policy, data and analysis, testing and evaluation, monitoring and inspection

In 2012, the administration began undertaking an R&D program to address the issue. The stated policy goal is:

Extending the operating lifetimes of current plants beyond 60 years and, where practical, making further improvements in their productivity is essential to realizing the administration's goals of reducing greenhouse gas emissions to 80% below 1990 levels by the year 2050.³

The DOE life extension program cost-shares with industry and identifies clear R&D objectives and timelines.

The R&D plan laid out by the Department of Energy has met with substantial resistance from Congress, where arguments include the appropriateness of a Federal Government role in R&D that can be viewed as benefiting a particular industry and associated public benefits in keeping a non-carbon electricity source in operation.

Opportunity:

The proposal to extend licenses has not yet been thoroughly examined by an independent, non-partisan group of technical experts. A POPA report would be well timed. This was confirmed in a February 2011 meeting with POPA members and the Assistant Secretary

¹ *Impacts of nuclear power plant life management and long-term operation*, P. Kovacs, NEA News 2006, No24.2: <http://www.oecd-nea.org/nea-news/2006/24-2-plant-management.html>

² *NRC/DOE Workshop on Nuclear Plant Life Extension R&D*, February, 2008: <http://www.mendeley.com/research/life-beyond-60-workshop-summary-report/>

³ *Light Water Reactor Sustainability Program*, Department of Energy, January 2012: <http://www.ne.doe.gov/pdfFiles/INL-EXT-11-23452%20LWRS%20Program%20Plan%2001-31-12.pdf>

for Nuclear Energy at the Department of Energy. Indeed, it seemed that such an assessment is urgently needed given congressional criticism of the DOE life extension R&D program and public concerns following the Fukushima disaster.

A POPA examination of the technical issues associated with the life extension of nuclear power plants would be consistent with the intent of the 1993 APS policy statement on nuclear energy:

The American Physical Society has a long-standing interest in the establishment of a technically sound national energy policy. Such a policy must include steps to decrease the heavy dependence of the United States on fossil fuels. Their use entails significant environmental costs, including possibly substantial changes in global climate with uncertain consequences for human well being. Moreover, since resources of oil and, less immediately, natural gas are limited, U.S. reliance on foreign sources creates economic burdens and military dangers. We therefore endorse increases in federal funding and general support for programs in conservation and in the development of renewable energy sources.

A balanced energy policy, however, also requires that the Department of Energy have strong programs to keep the nuclear energy option open, through: (a) the continued development of nuclear reactors which can be built, operated, and eventually decommissioned in a manner which is simple, safe, environmentally sound and cost-effective; (b) the development and implementation of programs for the safe disposal of spent fuel and radioactive wastes; and (c) the development of an effective public education program to allow a more informed debate on the strengths and weaknesses of nuclear power. The American Physical Society is deeply concerned that the current progress in these areas is inadequate.

A POPA study on this issue would build on the studies that POPA has carried out on the topic of nuclear energy over the last several years:

1. **Readiness of the U.S. Nuclear Workforce for 21st Century Challenges**⁴
June 2008
2. **Consolidated Interim Storage of Commercial Spent Nuclear Fuel**⁵
February 2007
3. **Nuclear Power and Proliferation Resistance**⁶
May 2005

⁴ <http://www.aps.org/policy/reports/popa-reports/upload/Nuclear-Readiness-Report-FINAL-2.pdf>

⁵ <http://www.aps.org/policy/reports/popa-reports/upload/Energy-2007-Report-InterimStorage.pdf>

⁶ <http://www.aps.org/policy/reports/popa-reports/proliferation-resistance/upload/proliferation.pdf>

4. Nuclear Energy: Present Technology, Safety, and Future Directions: A Status Report⁷
November 2001

Approach:

The POPA Subcommittee on Energy and Environment will establish a committee of no more than 12 experts to conduct the study. The study committee will hold one workshop in Washington, DC that will include briefings from the Department of Energy as well as independent experts. At the conclusion of the workshop, study committee members will be given research and/or writing assignments. Further work on the report will be done via teleconference and e-mail. A draft report will be submitted first to the POPA Subcommittee on Energy and Environment for review. Following revisions, the second draft of the report will be submitted to POPA and to three independent experts for general assessment, as is the practice with POPA reports. The report would then be sent to the E Board for final approval.

Participants:

The study committee will be chaired by Roy Schwitters and include POPA members Jill Dahlburg and Bob Rosner and POPA Advisor Francis Slakey. Members include: Todd Allen (U of Wisconsin), Christina Back (General Atomics), Bill Barletta (MIT), Peter Hosemann (UC Berkeley), Jason Remer (NEI), Dave Teter, (LANL), Gary Was (U of Michigan), Rosa Yang (EPRI), and Steve Zinkle (ORNL).

Deliverables:

The goal is to produce a report of no more than 25 pages with actionable policy recommendations. The primary audiences would be: 1) the Members of Congress and staff on the relevant committees (Senate Energy & Natural Resources, Senate Environment and Public Works, and House Energy & Commerce); and 2) the relevant staff within the Administration including the Office of Science and Technology Policy and the office of Nuclear Energy within the Department of Energy. If the report considers any appropriations recommendations, they will be vetted by the APS Physics Policy Committee.

Duration and Funding:

If approved by POPA at the June meeting, workshop planning would proceed immediately and through the summer, with the workshop occurring in the early Fall. A draft of the report would be presented to POPA at the February meeting. The report would be completed in the Spring of 2013.

It is anticipated that only one workshop is required to complete the report for a cost not to exceed the standard POPA contribution of \$25K.

⁷ http://www.aps.org/policy/reports/popa-reports/upload/nuclear_energy.pdf