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"DOE Modernization: Legislation Addressing Development, Regulation, and Competitiveness of Advanced Nuclear Energy Technologies"

Before the

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SUMMARY OF UCS TESTIMONY

- The Union of Concerned Scientists (UCS) supports federal investment in nuclear energy research and development focused on increasing the safety and security of the once-through fuel cycle.
- UCS supports the Advanced Nuclear Fuel Availability initiative, provided that the program includes a study to address the proliferation and security implications of commercial-scale production and use of high-assay low enriched uranium (HA-LEU).
- UCS is neutral on the provisions in H.R. 1320 regarding Nuclear Regulatory Commission corporate support and user fee caps but opposes the provisions regarding regulatory streamlining in Sections 4-7.
- UCS believes the provisions in Section 3 of the Nuclear Energy Competitiveness discussion draft regarding improvements to the Part 810 process are premature and raise proliferation concerns. They should first be evaluated in the Section 2 review.
- UCS does not see a compelling need for the pilot program to develop micro-reactors at critical national security locations that would be defined by the study called for in the Report on a Pilot Program for Micro-Reactors discussion draft. In addition, the study outlined in the draft does not specifically address crucial considerations, such as the safety and security of micro-reactors.

On behalf of the Union of Concerned Scientists, I would like to thank Chairman Upton, Ranking Member Rush, and the other distinguished members of the Subcommittee for the opportunity to provide our views on the legislation being discussed today.

The Union of Concerned Scientists (UCS) has more than half a million supporters, united by a central concern: that we need sound scientific analysis to create a healthy, safe, and sustainable future. UCS, while neither pro- nor anti-nuclear power, has served as a nuclear safety and security watchdog for nearly fifty years. Combating the threat of global climate change is one of our priorities, and we have not ruled out an expansion of nuclear power as an option to help reduce greenhouse gas emissions—provided that it meets high standards of safety and security. It is from this perspective that I offer the comments below.

UCS supports DOE investment in nuclear energy research and development, with a focus on increasing the safety and security of the once-through fuel cycle. This applies to both evolutionary improvements in current-generation light-water reactor technology and advanced reactor development. In the near term we see promise in projects such as the Accident Tolerant Fuel program, designed to improve light-water reactor fuel behavior during both normal operation and accidents. However, our analysis to date has not identified any advanced reactor design that offers clear safety and security improvements over today's light-water reactors. In fact, some reactor concepts introduce new and significant safety and security issues. These must be effectively resolved in the design phase if advanced reactors are to be viable candidates for wide-scale deployment.

Unfortunately, there are troubling trends today that have the potential to undercut advances in nuclear safety and security. The commercialization of any non-light water reactor will take decades and require billions of dollars in investment. There are no feasible shortcuts in the technology development process that is required. Attempting to accelerate the commercialization of advanced reactors by allowing reactor applicants to bypass important technical work and mandating "streamlined" regulatory reviews could result in the premature deployment of designs whose safety characteristics have not been fully validated. Also, a drive to reduce capital and operating costs to make advanced reactors more competitive could be counterproductive if it involves weakening the standards that apply to current-generation reactors, including requirements for a high-strength, leak-tight containment building, a robust security force to protect against terrorist attacks, and off-site emergency evacuation plans. We hope that in addition to the issues addressed by the legislation being discussed today, the Subcommittee will take a hard look at all the necessary aspects of a program that would facilitate the deployment of a new generation of reactors that are genuinely safer and more secure than the current one.

We address the four pieces of legislation below.

1. Advanced Nuclear Fuel Availability (Discussion Draft)

UCS supports the initiative that would be authorized by this bill. A number of advanced reactor designs would require large quantities of high-assay low enriched uranium (HA-LEU) fuel (which has greater than 5 percent and less than 20 percent uranium-235). In addition, some accident-tolerant fuels for light-water reactors may require HA-LEU toward the lower end of the

enrichment range. But the existing supply chain for this material is very limited, and is currently needed to support operation of research and test reactors and medical isotope production facilities around the world. The draft's provision in Section 2(b)(4) for periodic surveys to assess demand for HA-LEU is sensible. The study will also provide useful data on the cost and time needed to establish a reliable supply of HA-LEU, as well as the infrastructure to support its processing, and will help to assess the viability of advanced reactor deployment in the near term. Acquisition of HA-LEU by the DOE should be closely tied to realistic projections of need for the material. The DOE should also be prepared for the possibility that it may need a substantial supply of HA-LEU to fuel the Versatile Test Reactor now under consideration. Although the DOE's preferred fuel for the reactor is plutonium, it is likely, in our view, that plutonium fuel use will prove infeasible.

We recommend a few additions to the discussion draft. First, the DOE program should prioritize acquisition of HA-LEU through downblending of excess highly enriched uranium (HEU) stocks. A recent independent assessment by a scholar at Princeton University estimates that the U.S. has more than 100 metric tons of HEU reserved for military purposes that could be declared excess to nuclear stockpile requirements. In addition, should relations with Russia improve, as we hope, a revived nuclear cooperation program to purchase Russian HEU for downblending to HA-LEU would be a win-win endeavor.

Second, the draft should require that the DOE evaluate separately HA-LEU with enrichments of less than 10 percent uranium-235 and HA-LEU with more than 10 percent uranium-235. Both

the Nuclear Regulatory Commission (NRC) and the International Atomic Energy Agency (IAEA) classify these materials differently with respect to security. A 10-kilogram quantity of the latter material is classified as Category II, whereas 10 kilograms of the former would be Category III, the same as LEU with enrichments of 5 percent or less. This is an important distinction because, as the committee staff's hearing memo points out, the U.S. does not have any Category II commercial fuel cycle facilities. Understanding the differences in projected demand between these two categories of enrichment would help to guide the DOE's development of an appropriate acquisition strategy.

Finally, the report to Congress that Section 3 requires should include a non-proliferation and security impact assessment of any new DOE program for acquisition and supply of HA-LEU. Although HA-LEU is classified as low-enriched uranium and is therefore regarded as highly impractical for direct use in a nuclear weapon, the material does pose proliferation and security concerns, especially in the higher enrichment range, as reflected by the NRC and IAEA Category II classifications. HA-LEU with enrichment just below 20 percent was deemed too risky by the international community to be stockpiled by Iran. Therefore, the DOE should carefully evaluate the international impact of the precedent that the U.S. would establish by creating a new program for HA-LEU supply. Moreover, since U.S. advanced reactor developers may seek to sell HA-LEU-fueled designs overseas, and foreign advanced reactor vendors may seek to purchase U.S. HA-LEU, the proliferation and security implications of U.S. HA-LEU exports warrant close examination.

2. H.R. 1320, Nuclear Utilization of Keynote Energy Act

UCS has many concerns with this bill. We oppose the bill's arbitrary deadlines for completing environmental reviews and licensing actions, and the provisions that would curtail the hearing rights of intervenors in regulatory proceedings. In our view, such changes are unlikely to have a meaningful effect on the time required for the commercial deployment of advanced reactors, but will compromise safety and security. There will be new technical and policy issues associated with new reactor technologies, and addressing those issues may be time-consuming and resource-intensive. It may simply be infeasible to speed up the process. In any event, addressing these issues during the design and preliminary licensing stage will be easier and cheaper than doing so during construction or after startup.

We also do not support H.R 2340's attempt to micromanage the NRC by imposing arbitrary caps on corporate support costs and user fees. However, we acknowledge that the provisions limiting these costs and fees, Section 3(a)(3) and Section 3(b)(3), contain the caveat that they are imposed only "to the maximum extent practicable." Moreover, the bill provides for a 1-year waiver of the annual fee cap by the NRC. To the extent that these measures give the NRC the ability to routinely exceed the caps as necessary to ensure safety and security, we take a neutral position on the cap provisions.

We strongly oppose most other sections of the bill for the above-stated reasons. Section 7(c)(1) imposes one-size-fits-all timelines on the NRC's environmental and safety reviews for new reactors, without any technical justification. Section 7(c)(4) would allow the NRC to grant

licenses for nuclear reactors or spent fuel reprocessing plants before hearings on the license applications are concluded. And Section 6 would automatically impose informal hearing procedures for nuclear reactor licensing actions, with very limited exceptions, instead of allowing the presiding officer of the hearing to make that determination, as is currently the rule.

We also have concerns about Sections 4 and 5. These would require the Comptroller General to provide studies on the implications of repealing restrictions on foreign ownership, control, or domination of nuclear facilities in the United States, and on the implications of eliminating the requirement for mandatory hearings in NRC licensing proceedings. Although UCS does not oppose studies, provided they are well-formulated, in these cases we see little point in more study of dangerous proposals. With regard to elimination of mandatory hearings, I would refer you to our 2016 Senate testimony opposing a similar provision in the Nuclear Energy Innovation and Modernization Act, S.2795 (which was subsequently stricken).

3. Nuclear Energy Competitiveness (Discussion Draft)

This bill would amend the Atomic Energy Act to allow for the expedited consideration of requests for transfers of "low proliferation risk reactor technologies." The Secretary of Energy would be given the authority to determine which technologies could be classified as "low proliferation risk." Fuel fabrication and other fuel cycle technologies (e.g. "sensitive nuclear technologies") would be excluded.

The purpose of the draft bill appears to be creation of a fast track for authorizing exports of nuclear reactors that use low-enriched uranium fuel to countries that are predetermined to be trustworthy. But the proliferation risk of any technology is not an intrinsic and absolute characteristic, and the potential proliferation threat posed by any country depends on many factors and can change rapidly. Technology transfers cannot be undone. Any light-water reactor can become a plutonium factory if a country decides to do so and develops a reprocessing capability. As the example of Iran has shown, the latent proliferation potential of technology acquisition and the risk of "breakout" must be fully considered, with an eye to the future. Given today's geopolitical dangers, the scope of proliferation impacts of nuclear technology transfers—both direct and indirect—should be broadened, not limited.

For instance, exporting nuclear reactors to a country that already has an established nuclear industry, such as the United Kingdom, could have quite different proliferation implications than exporting the same reactors to a country that is new to the nuclear business, such as Saudi Arabia. And if that new entrant uses the acquisition of nuclear reactors as justification for developing indigenous enrichment or reprocessing facilities, or its neighbors are prompted to acquire nuclear technology themselves, the proliferation risk of the reactor exports could be significant. These types of considerations are presumably part of the DOE's current assessment of applications for activities requiring specific authorizations, such as nuclear reactor technology exports. It is not clear that fast-tracking the review process can be done without increasing the risk that important factors may be overlooked that could ultimately jeopardize our own security.

In any event, as NNSA Assistant Deputy Administrator Art Atkins testified before this Subcommittee in February of this year, the long pole in the tent is not the DOE review, but the often lengthy period of time that foreign countries take to submit the assurances that the Department of State requires for concurrence. A fast track that eliminated the need for these assurances would not be advisable.

Finally, we do not give credence to the often-heard argument that the United States needs to engage in a race to the bottom with other, less responsible nuclear export nations by weakening critical nonproliferation criteria to make U.S. exports more competitive. U.S. nuclear vendors should focus on making products that are so safe and secure that foreign customers would be glad to accept a slightly longer wait to receive them.

We therefore propose that rather than modify current law, the discussion draft should incorporate its Section 3 proposal for a fast-track into the review of civil nuclear commerce required by Section 2. This will enable a full evaluation of its risks and benefits.

4. Report on Pilot Program for Micro-Reactors (Discussion Draft)

This discussion draft would require the Secretary of Energy to develop a report describing "a pilot program to provide resilience … at Department of Defense and Department of Energy facilities by contracting with a commercial entity to site, construct, and operate at least one licensed micro-reactor" by December 31, 2027. (In the draft, "micro-reactor" is defined as a

reactor with a power capacity of up to 50 megawatts. Other sources, such as ARPA-E, define it as a reactor of 10 megawatts-electric or less. A 50-megawatt reactor, such as a single NuScale module, is typically considered a "small" modular reactor.)

As stated above, UCS will not object to a good study that will advance knowledge and understanding. But the list of required elements of the study in the discussion draft is not sufficient to furnish all the information needed for a fair evaluation of the merits of the proposed pilot program, or of the risks and benefits of a plan to deploy micro-reactors at DOD and DOE sites to provide "energy resilience."

For instance, the draft vaguely calls for "assessments" of different nuclear technologies, but does not explicitly require analyses of nuclear safety and security: top-line information that a base commander would want to know. Even a so-called micro-reactor would contain enough potentially dispersible radioactivity to render large areas of a site instantly unusable or even uninhabitable in the event of a severe accident, sabotage, or an enemy military strike. It is not clear why the military would want to be saddled with the additional burden of protecting nuclear reactors and their irradiated fuel, and having to deal with the aftermath of a radiological release.

The 2016 Defense Science Board study on energy systems for forward/remote operating bases, while barely addressing safety issues, includes a recommendation that the "Defense Threat Reduction Agency (DTRA) with the Department of Energy (DOE) should conduct a study to

assess … consequence management scenarios" for very small reactors. Such a study, including a comprehensive safety and security review, should be incorporated into the discussion draft's proposed pilot plant report.

Some advocates for micro-reactors underplay safety and security risks, asserting that the reactors are "passively safe." But passive safety systems are not infallible—especially with respect to sabotage— and no nuclear reactor is completely immune to meltdown. For instance, a 2017 Idaho National Laboratory study of one of the candidate micro-reactors, the two megawatt-electric Special Purpose Reactor, identified many unknowns that are "major concerns," including seismic event impacts. Flooding was also found to be a potentially serious accident initiator. And the study found that the reactor lacked sufficient defense-in-depth to prevent fission product release.

In addition, the INL study sheds light on the key question of to what extent micro-reactors could improve "energy resilience" in practice. As demonstrated by the 2011 Fukushima nuclear disaster, which was initiated by a total loss of power, nuclear reactors generally require access to independent sources of power to remain safe in an emergency. This is also true for passively safe micro-reactors. The INL study considered events where the Special Purpose Reactor would lose electrical power and found the "potential for significant core damage," with the "potential need for [a] backup generator" and "battery backup." Thus the reactor that is supposed to provide energy resilience itself needs backup diesel or battery power to keep from melting down. Some small modular reactor designs, such as NuScale, have proposed an "island mode" of operation in

which a subset of modules is designated to supply electrical power to other modules in the event of a loss of external power. But this requires deployment of multiple modules and introduces complexity. Issues such as these should be included in the pilot plant study in order to make it as balanced and useful as possible.

We hope that these observations are useful for the Subcommittee's deliberations. Thank you for your attention.