From:	Edwin Lyman
To:	RulemakingComments Resource
Subject:	[External_Sender] Union of Concerned Scientists comments on the Regulatory Basis for Physical Security for Advanced Reactors, NRC-2017-0227
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We are pleased to submit these comments for your consideration.

Sincerely,

Edwin Lyman
Union of Concerned Scientists

Comments on the Draft Regulatory Basis for the
Rulemaking For Physical Security for Advanced Reactors

ID: NRC-2017-0227

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UCS strongly opposes this ill-advised and unjustified rulemaking. Ordinarily we would support a public rulemaking process over the use of exemptions from existing rules. However, in this case we believe that the dangerous signal this rulemaking will send to the rest of the world – namely, that so-called "advanced" reactors are somehow invulnerable to radiological sabotage and do not require robust security – outweighs any benefits of a public rulemaking process. Those benefits could be adequately realized through a public process for development of guidance for reviewing exemption requests. We also anticipate that the NRC will receive, at most, a very small number of advanced reactor license applications in the foreseeable future, so the number of applicants that might benefit from this rulemaking will be small. Thus UCS continues to support Alternative 2, described in Section 4.2 of the draft Regulatory Basis. We understand that the NRC is no longer considering this alternative, but we encourage the agency to reverse this position and cancel this rulemaking.

Specific comments follow. (We will continue to use the term "advanced" reactors here, as it is used throughout the document, although most of the reactor designs that would be considered are of the same vintage as the light-water reactor and are therefore more "ancient" than "advanced.")

1. The draft Regulatory Basis does not contain sufficient information for the Commission to make an informed decision on the technical justification for this rulemaking. It does not provide any specific examples of reactor systems that plausibly could meet any of the three performance measures specified in Section 4.5. In fact, the draft Regulatory Basis itself points out that no advanced reactor designs have yet been analyzed against security scenarios. Moreover, liquid metal-cooled fast reactors, high-temperature gas-cooled reactors and molten-salt reactors each have different accident precursors than LWRs that could render them more vulnerable, rather than less, to radiological sabotage attacks. This danger will be amplified if the NRC reduces defense-in-depth for advanced reactors by eliminating regulatory requirements such as safety-related backup systems, leak-tight, high-strength containments, and a minimum number of licensed operators. Other changes that are proposed or underway, such as eliminating off-site emergency planning zones and the prohibition on urban siting, would also put the public at greater risk from radiological sabotage.

2. The proposed change to the current regulatory definition of radiological sabotage from "significant core damage or spent fuel sabotage" to an offsite dose-based standard, as manifested in the three performance criteria in Section 4.5, is unnecessary, would introduce significant additional uncertainty and subjectivity into security analyses, and would greatly reduce the required level of security for advanced reactors below the current LWR standard.

The draft Regulatory Basis states that a change in definition is needed because "some advanced reactor designs may not be susceptible to core damage as that term is used for LWRs." The only non-LWR design where the term "significant core damage" may not be strictly applicable is a molten-salt fueled reactor, for which the fuel is already in a liquid form and a significant fraction of the fission product inventory is vented to the off-gas system and must be stored outside of the core. However, even for such reactors, a functional definition of "significant core damage" could be derived that would be comparable to the "non-incipient, non-localized fuel melting and/or core disruption" definition for LWRs. In fact, this would likely be easier to develop than a dose-based criterion requiring Level III PRA information at the licensing stage because it would not require detailed knowledge of the chemical and physical states of fission products in an MSR core.[1]

More broadly, moving to a dose-based standard from a core damage standard would make the objective of radiological sabotage harder to achieve on paper, and thus reduce the security requirements needed to protect against it, because the adversary would likely need to destroy more targets to ensure an off-site release of a sufficient magnitude. UCS has long opposed attempts to impose a dose-based definition of radiological sabotage for any reactor for this reason and sees no reason to change it now for advanced reactors. Core or spent fuel damage (or overheating of fuel beyond a certain safety limit) resulting from destruction of a target set is a clearer end state than a dose-based definition and would require fewer assumptions to demonstrate. And it is hard to argue that a terrorist attack that causes significant core damage or a dangerous overheating of reactor fuel would not be "radiological sabotage" even without significant dose consequences off-site.

3. The draft Regulatory Basis provides no technical justification for why a limited-scope rulemaking that would target "requirements that rely on human actions"—namely, the minimum required number of armed responders and the requirement for an onsite secondary alarm station (SAS) —is appropriate, or how those requirements actually relate to the ability of any nuclear plant to protect against radiological sabotage. Security plans for protection against the design basis threat of radiological sabotage are governed by the full suite of requirements in 10 CFR 73.55. The required number of armed responders is determined by first identifying all target sets and then developing contingency response plans for protecting against the disabling or destruction of entire target sets by the DBT adversary. It is easy to determine from public information that the average number of armed responders per shift at U.S. nuclear power plants exceeds the minimum number of 10. But the actual number is only meaningful in the context of

[1] B.M. Chisolm et al., "A New Look at Licensing Basis Events for the Molten Salt Reactor Experiment," ORNL/TM-2018/788, August 2018.

the entire security plan. The draft Regulatory Basis should discuss the historical basis for the requirements for the minimum number of armed responders and the onsite SAS and explain exactly how a generic "advanced reactor" would differ from a large LWR in ways that would specifically enable elimination of these two requirements. This is actually not clear. For instance, if 10 armed responders are determined to be the minimum needed to provide full coverage of a protected area perimeter, reactor design features may be irrelevant. Without such an analysis, singling out these two requirements appears arbitrary (other than they are things that the Nuclear Energy Institute requested in its white paper on this topic).

4. In order to determine the appropriate level of security at a nuclear power plant, target sets must be developed. For the current fleet, these are obtained from PRA analysis. Such PRAs have been partially validated through decades of operating experience. In contrast, the PRAs for advanced reactors are based on paper designs and will not be validated until prototypes or commercial demonstration units are built and operated. Sufficiently accurate PRAs to develop target sets for advanced reactor designs may not even be available until many years of operating experience have been acquired. Thus for the first generation of such reactors, denial-of-access rather than denial-of-task protective strategies might be necessary to defend against the DBT. Such strategies would be insensitive to reactor design details. Giving additional credit a priori to paper reactor designs to allow security reductions based on poorly validated PRAs will introduce many new uncertainties and make it harder for the NRC to make a clear finding of reasonable assurance. In any event, the rule will have to include stringent standards for the quality of any PRA used for target set development.

For the above reasons, our responses to the three questions in the July 16, 2019 Federal Register notice are:

(1) No. The standard for radiological sabotage should remain based on a core and spent fuel damage (or overheating) criterion. We do not believe it is feasible or desirable to define performance criteria for off-site consequences.
(2) See above.
(3) No. We oppose giving credit to off-site response for protection against the DBT for both operating reactors and new reactors. Licensees should remain wholly responsible for protection against the DBT.