

## ENHANCEMENTS TO BE CONSIDERED IN FUTURE GUIDANCE UPDATES

Topic	Treatment of Uncertainty
Basis for Enhancement	Some Nuclear Regulatory Commission (NRC) regulatory analyses do not contain an analysis of uncertainties. NRC regulatory analyses may benefit from additional discussion of the uncertainty in benefit and cost estimates.
Additional Information	<p>Analysis of benefits for severe accident rules requires a complex chain of analyses and evaluations of cost drivers on estimates. This process includes establishing baselines for the demographics and health status of the exposed population, the release frequency and the source term for different regulatory alternatives. These are used to estimate the changes in population exposure with different protective action guidelines. Because of the potential compounding of high or low estimate assumptions in developing benefit estimates, the analyst, decisionmakers, and the public cannot know with any certainty whether the net benefit estimates (e.g., low, best, and high point estimates) provided by a regulatory analysis are overly conservative or optimistic.</p> <p>Quantifying uncertainty is an estimating best practice, which is addressed in many guides and references. The explicit identification and quantification of sources of uncertainty in regulatory analyses leads to better decisionmaking by providing a means to understand this uncertainty (e.g., the impact of data, assumptions, accident frequency and consequence), impact of variations within different regulatory analysis groupings (e.g., categories of licensees), and the potential range of incremental costs and benefits that result. Most importantly, decisionmakers need to understand that any uncertainty analysis is only as good as the comprehensiveness of risks and uncertainties identified and the breadth of the underlying model. Unknown risks are difficult if not impossible to quantify.</p> <p>Estimates of costs, benefits and other economic impacts should be accompanied by indications of the most important sources of uncertainty embodied in the estimates, and if possible, a quantitative assessment of their importance. Office of Management and Budget (OMB) requires formal quantitative analysis of uncertainties for rules with annual economic effects of \$1 billion or more (OMB Circular A-4).</p>

Topic	Addressing “Other Considerations,” Attribute 18 in NUREG/BR-0184, <i>Regulatory Analysis Technical Evaluation Handbook</i> —the impact of regulatory decisionmaking on offsite properties with iconic value
Basis for Enhancement	<p>As explained in the guidance, the set of attributes listed in NUREG/BR-0184 is believed to be reasonably comprehensive for most cost-benefit analyses for NRC regulatory decisionmaking. Attribute 18, “Other Considerations,” however, provides that any particular regulatory analysis “may also identify attributes unique to itself,” and that any such attributes “should be appropriately described and factored into the analysis.” These could include attributes that are unique to a specific nuclear power plant site or attributes of particular concern to a subset of the population. A specific example would be the impacts of the regulatory action on offsite properties with iconic value or a unique value to a particular community or group, e.g., a historic property or district, or Native American tribal lands. Part of the impetus for this potential enhancement is to address a concern raised by a Native American tribal representative during public outreach, namely, how the NRC would evaluate tribal lands as part of a severe accident offsite property damage analysis.</p> <p>Any update or revision of NRC’s regulatory analysis cost-benefit guidance should provide that these “other considerations,” should be identified, described and considered in the regulatory analysis (most likely, such consideration could be of a qualitative nature), provided that such revision is also in accordance with the Commission’s direction in SRM-SECY-12-0110. In SRM-SECY-12-0110, the Commission stated that it “finds that economic consequences should not be treated as equivalent in regulatory character to matters of adequate protection of public health and safety.” Thus, if the potential impacts of regulatory decisionmaking on offsite properties with iconic value are formalized as part of any update or revision to NRC cost-benefit guidance, then such update or revision will make clear that these considerations are secondary to the NRC’s obligations under the Atomic Energy Act, including matters of adequate protection of public health and safety and matters of common defense and security.</p>
Additional Information	Staff will consider whether limits need to be placed on Attribute 18 “Other Considerations.”

Topic	Addressing “Other Considerations,” Attribute 18 in NUREG/BR-0184, <i>Regulatory Analysis Technical Evaluation Handbook</i> —the consideration of distributive impacts and equity in NRC cost-benefit analyses
Basis for Enhancement	<p>The set of attributes listed in NUREG/BR-0184 is believed to be reasonably comprehensive for most cost-benefit analyses for NRC regulatory decisionmaking. Attribute 18, “Other Considerations,” however, provides that any particular regulatory analysis “may also identify attributes unique to itself,” and that any such attributes “should be appropriately described and factored into the analysis.” These could include attributes that are unique to a specific nuclear power plant site or attributes of particular concern to a subset of the population.</p> <p>Executive Order 12866, paragraph 1(b)(5) states, “When an agency determines that a regulation is the best available method of achieving the regulatory objective, it shall design its regulations in the most cost-effective manner to achieve the regulatory objective. In doing so, each agency shall consider incentives for innovation, consistency, predictability, the costs of enforcement and compliance (to the government, regulated entities, and the public), flexibility, <b>distributive impacts, and equity</b> [emphasis added].” Thus, issues concerning the distributive impacts of a proposed regulatory action, or the equity of a proposed regulatory action could be considered “other considerations” under Attribute 18.</p> <p>The NRC, as an independent regulatory agency, is not required to comply with Executive Order 12866. Moreover, there is no statutory requirement to consider “distributive impacts” or “equity” in NRC regulatory analyses. In SRM-SECY-12-0110, the Commission stated that it “finds that economic consequences should not be treated as equivalent in regulatory character to matters of adequate protection of public health and safety.” Thus, if distributive impacts or equity considerations are to be formalized as part of any update or revision to NRC cost-benefit guidance, then such update or revision will make clear that these considerations are secondary to the NRC’s obligations under the Atomic Energy Act, including matters of adequate protection of public health and safety and matters of common defense and security.</p> <p><i>Background</i></p> <p>NUREG/BR-0058, <i>Regulatory Analysis Guidelines of the U.S. Nuclear Regulatory Commission</i>, Rev. 4, states “Except for certain planning functions in Section 4 of E.O. 12866, the NRC, as an independent agency, is not required to comply with E.O. 12866.</p>

	<p>Nevertheless, this fourth revision of the Guidelines reflects the intent of E.O. 12866, in part, because of the Commission’s previously expressed desire to meet the spirit of Executive Orders related to regulatory reform and decisionmaking.”</p> <p>Because most other Federal agencies are required to comply with Executive Order 12866 and NRC’s desire to meet the spirit of Executive Orders related to regulatory reform and decisionmaking, addressing other considerations, including distributive impacts and equity, needs to be better understood, explained, and/or defined in any revision of NRC’s regulatory analysis cost-benefit guidance. NRC did not determine that other agencies have widely applied the concepts of “distributive impacts and equity”.</p> <p>Issues involving distributive impacts and equity may overlap with environmental justice concerns. Office of Nuclear Reactor Regulation (NRR) Office Instruction, LIC-203, Revision 3, describes NRR staff responsibilities for addressing environmental justice in rulemakings (see Appendix D, page D-9, Procedures for Rulemaking Activities) as follows: “Staff responsible for rulemaking should address environmental justice in the preamble to any proposed and final rules that require an EIS, a supplement to an EIS, or generic EIS...If it is known in advance that a particular rulemaking might disproportionately affect a minority and/or low-income population or community, NRC staff should ensure that the population and/or community knows about the rulemaking and are given the opportunity to participate...Public comments on the environmental justice review should be addressed in the statements of consideration to the final rule when published in the <i>Federal Register</i>. Comments on the environmental justice review should be addressed at the same level of detail and in the same location as comments received on other parts of the rule.”</p>
Additional Information	<p>The terms “distributive impacts” and “equity” are not defined in either E.O. 12866 or the implementing OMB guidance document, Circular A-4. OMB Circular A-4, however, defines the term “distributional effects” as “how both benefits and costs are distributed among sub-populations of particular concern” and provides additional guidance on this issue.<sup>1</sup> In this regard, OMB Circular A-4 states that those “who bear the costs of a regulation and those who enjoy its benefits often are not the same people” and that “[b]enefits and costs of a</p>

<sup>1</sup> See OMB Circular A-4, 14 (2003).

	<p>regulation may be distributed unevenly over time, perhaps spanning several generations.”<sup>2</sup> OMB Circular A-4 recommends that the effects of a proposed regulatory action should be expressed quantitatively to the extent possible and that agencies “should be alert for situations in which regulatory [actions] result in significant changes in treatment or outcomes for different groups.”<sup>3</sup></p> <p>The Environmental Protection Agency (EPA) has also implemented guidance to address the distribution of benefits and costs associated with its regulatory actions.<sup>4</sup></p>
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<sup>2</sup> Id.

<sup>3</sup> Id.

<sup>4</sup> EPA, Guidelines for Preparing Economic Analysis, December 17, 2010 (updated May 2014), accessible at [http://yosemite.epa.gov/ee/epa/eerm.nsf/vwAN/EE-0568-50.pdf/\\$file/EE-0568-50.pdf](http://yosemite.epa.gov/ee/epa/eerm.nsf/vwAN/EE-0568-50.pdf/$file/EE-0568-50.pdf)

Topic	Use of PRA Studies in Regulatory Analyses
Basis for Enhancement	<p>PRA and other related severe accident studies can improve the fidelity of regulatory analyses and provide useful insights. However, resource and scheduling limitations may necessitate the use of limited scope or historical PRA studies as bases for evaluating the impact of regulatory alternatives. In repurposing PRA and other studies in this fashion, the analyst must be cognizant of underlying assumptions and modeling performed. For example, the historical PRA studies referenced in NRC regulatory analysis guidance documents for operating nuclear power plants are typically partial-scope PRAs for a single reference plant or a limited number of reference plants; embody modeling choices that could affect the results; and do not always reflect the current state-of-practice in PRA analysis. Severe accident and PRA research activities conducted over the last several decades have resulted in improvements to the NRC's PRA tools and could alleviate some of these limitations if incorporated into regulatory analyses. Furthermore, more recent studies such as the State of the Art Reactor Consequence Analysis (SOARCA) study, the spent fuel pool (SFP) consequence study, and the Level 3 PRA project can provide insights for updating Regulatory Analysis guidance documents.</p> <p>Two examples of analysis choices – time truncation and distance truncation – are discussed further below. Time and distance truncation are only two modeling assumptions that may potentially change the outcome of estimates that could be applied in a subsequent cost-benefit analysis. The assumptions and inputs used in PRA studies and severe accident consequence analyses should be understood in order to determine whether they support the needs of the specific regulatory, backfitting, or environmental analysis being conducted.</p>

### ***Time Truncation***

NRC cost-benefit analysis guidance documents do not currently specify or recommend a specific truncation time for severe reactor accident analyses because the intent is to evaluate the accident until uncontrolled radiological releases are mitigated and an extension of the analyzed accident period would not change the results. Various accident duration periods have been used in studies performed over the years. For example, 24 hours was used for the analysis in NUREG-1150, "Severe Accident Risks: An Assessment for Five U.S. Nuclear Power Plants," circa 1990. More recently in the State of the Art Reactor Consequence Analyses (NUREG-1935, "State-of-the-Art Reactor Consequence Analyses (SOARCA) Report," 2012), 48 hours was used for the majority of sequences analyzed. In the Containment Protection and Release Reduction rulemaking technical bases currently under development, 72 hours is being applied. The NRC's ongoing Site Level 3 Probabilistic Risk Assessment project is likely to set different truncation times dependent on the accident under consideration. The source term, and hence consequences, may be affected by the selected truncation time. Some severe accidents are projected to continue releasing radionuclides beyond 48-72 hours, unless the accident can be successfully terminated by effective mitigative actions. In practice, the description and analysis of required mitigative actions are likely to vary across cost-benefit analyses. With regard to specifying a truncation time, there is also the question of the correct reference time "zero" (i.e., the onset of core damage), or the start of the accident (e.g., station blackout).

### ***Distance Truncation***

Regulatory analyses performed by the NRC have historically considered the health and economic consequences that apply to the population and land within 50 miles of the facility. Current regulatory analysis guidance found in NUREG/BR-0058 Rev. 4 states:

*In the case of nuclear power plants, changes in public health and safety from radiation exposure and offsite property impacts should be examined over a 50-mile distance from the plant site. The appropriate distance for other types of licensed facilities should be determined on a case-by-case basis.*

The staff notes, however, that the Federal guidance on cost benefit analysis found in OMB Circular A 4, which the NRC voluntarily complies with, states that the regulatory analysis "should focus on benefits and costs that accrue to citizens and residents of the United States." Thus, there is a question about the choice of an appropriate distance to use in regulatory analyses. Given the potential effect of distance truncation on regulatory analysis results, the staff is considering whether the 50 mile radius should be reaffirmed or modified.

Additional Information	<p>The American Society of Mechanical Engineers/American Nuclear Society (ASME/ANS) Level 2 PRA Standard that is likely to be issued for trial use and pilot application in November contains the following requirement:</p> <p style="padding-left: 40px;">SPECIFY and JUSTIFY the end-point or termination time of severe accident calculations. For the purpose of source term evaluation, USE a minimum end-point or termination time of 36 hours after the onset of core damage (and containment has reached a stable configuration) for all severe accident calculations. [See Note (4).]</p> <p>Note (4): Justification of end-point/termination time would typically address trends in results at the termination time and provide a technical basis for claims that results and conclusions drawn from the calculation would not change if the termination time was extended.</p>
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