1.) NRC has used various definitions of core damage (see below). If the initial conditions and calculation methodologies are the same (i.e., the inputs into a MAAP or simulator run), would the time to core damage be significantly different for the different definitions? Has industry chosen a definition of core damage?

Table 4-1 from NUREG-2201 Example Definitions of Core Damage and Core Melt

PRA	Terms	Notes
NUREG-1150 draft (NRC, 1987a)	Severe core damage, core melt	• A severe core damage accident occurs when reactor conditions have degraded sufficiently to threaten loss of core cooling. • Core melt (large portions of the fuel becoming molten and penetrating the reactor pressure vessel) would occur if the accident is not terminated.
NUREG-1150 final (NRC, 1990)	Core damage	Core damage accidents involve core uncovery with reflooding not imminently expected. Operationally, • Pressurized-Water Reactors (PWRs): reactor water level drops to a point at the top of the active fuel. • Boiling Water Reactors (BWRs): reactor water level drops to a point 2 feet (0.6 meters) above the bottom of the active fuel
Individual Plant Examinations, as summarized in NUREG-1560 (NRC, 1997c)	Core damage, core melt	• Core damage: "uncovery and heatup of the reactor core because of a loss of core cooling to the point where prolonged clad oxidation and fuel damage is anticipated." • Core melt: "severe damage to the reactor fuel and core internal structures following the onset of core damage, including the melting and relocation of core materials." • Notes that submittals have used several definitions of core damage (e.g., involving peak cladding temperature, oxidation levels, or water level in the vessel), but all would release a substantial amount of gap activity (equivalent or greater than the design basis).

From NUREG-2122

Core Damage Sufficient damage that could lead to a release of radioactive material from the core that could affect public health.	In a PRA, the potential for core damage is evaluated in the Level 1 part of the analysis. Specifically, a Level 1 PRA calculates the core damage frequency given the design and operation of the plant. In this context, core damage in a Level 1 PRA is actually the onset of core damage; that is, being the onset of sufficient damage to the core that (1) if not immediately arrested could potentially result in a release of radioactive material from the core, and (2) if released from the vessel and containment, could result in offsite public health effects. In deterministic analyses, quantitative criteria often are used to define the onset of core damage (e.g. a peak clad temperature of 2,200 degrees Fahrenheit). The ASME/ANS PRA Standard (Ref. 2) defines core damage as "uncovery and heatup of the reactor core to the point at which prolonged oxidation and severe fuel damage are anticipated and involving enough of the core, if released, to result in offsite public health effects." The terms core damage and core melt are sometimes incorrectly used as synonyms. However, core melt occurs after the onset of core damage. Core damage does not necessarily indicate that the reactor fuel has melted, only that radioactive material could be released from the core into the reactor vessel. An illustration differentiating the concepts of core damage, core melt, and their timing is provided below.

2.) If the same definition of core damage used, what impact will the chosen set of initial conditions (e.g., time shutdown is initiated) and calculation methodologies have on the time to core damage? Are there site-specific initial conditions that could significantly impact the time to core damage calculation? Has industry chosen a set of initial conditions and calculation methodologies?

3.) Based on review of licensee target sets, there are many different conditions that licensees use to (1) calculate time to core damage (MAAP, simulator run), and (2) determine when significant core damage exists (CET at 1200 versus CETs at 1800 for 2 hours, etc). Has there been any thought in determining when TTCD occurs based on a licensee's determination to enter SAMGs? Does the licensees think this is a reasonable approach to determine TTCD?

4.) Most licensees perform one TTCD calculation for each target set. Due to the 8 hour guidance being written down, are the licensees planning to calculate TTCD for all permutations of all target sets to determine what elements can be removed?