Comments on the NRC's Report to Congress on Environmental Reviews

Ernie Kee · October 2024 · NRC ADAMS Accession No. ML24276A196

About this document (background added November 2026)

Responding to: an NRC public meeting held on 25 September 2024 on the agency's report to Congress, required by the ADVANCE Act, on efforts to facilitate efficient, timely, and predictable environmental reviews for nuclear reactor applications.

Ernie Kee attended the meeting and submitted these written comments to clarify the points he raised there. The comments are part of the NRC's public record.

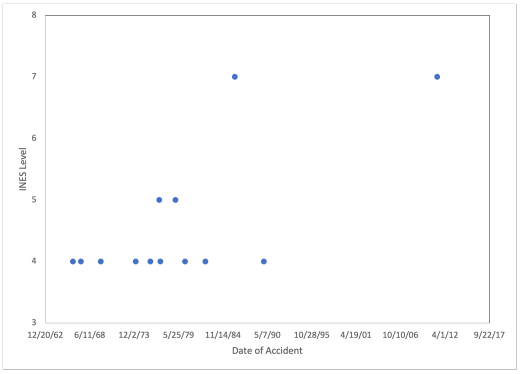
The comments that follow are reproduced exactly as submitted.

Comments on: Public input on the report to Congress on efforts to facilitate efficient, timely, and predictable environmental reviews for nuclear reactor applications

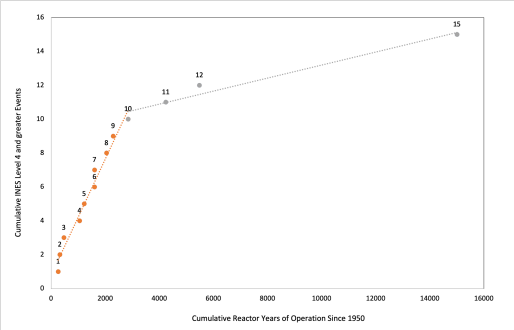
Ernie Kee, member of the public

This document provides input on the NRC's efforts to facilitate efficient, timely, and predictable environmental reviews for nuclear reactor applications. I attended the public meeting held on 25 September 2024, ADAMS Accession Number: ML24268A040. The following is clarification on my comments.

1. I strongly support the use of nuclear power for many reasons but specifically for its positive effect on the environment compared to other currently available energy production technologies. In my opinion:
   (a) Congress has correctly recognized that Commercial Nuclear Fission (CNF) can be used to benefit the environment.
   (b) Congress has recognized that environmental reviews for deploying new Commercial Nuclear Fission Reactor (CNFR) applications requires significant time and effort on the part of both CNFR investors and the NRC staff.
   (c) Long and costly review cycles have led investors to prefer other, less environmentally sustainable energy technologies such as fossil fuels (predominately, natural gas), wind turbine technologies, hydroelectric, and solar. All of the currently available alternative technologies have great impact on otherwise potentially environmentally beneficial land use (see studies for example by Yue et al., 2020).
   (d) Nuclear power is sustainable technology because it produces more fuel than it consumes. Approximately 94% of the energy coming from a CNF reactor is from fuel created by the fission process itself. As a consequence, if properly managed, the nuclear fuel cycle could sustain itself for hundreds, even thousands of years with very little external input (for example, see Waltar, 1981)
2. Products from fission can be both radioactive and toxic, they must be carefully managed to prevent environmental harm, particularly in the near term. While radiation danger to the environment may be insignificant say, hundreds of years after an accident, the ecosystem may follow a new course over the longer term (see von Wehrden et al., 2012, for a study at Chernobyl).



(a) Historical trends in CNFRs, assuming the global reactor population has remained relatively stable at around 400.



(b) The worldwide CNFR International Nuclear Event Scale (INES) accidents at level 4 and above has trended upward over time.

Figure 1: CNFR historical trends assuming the worldwide population has been relatively stable at about 400 CNFRs(data reduced from Ha-Duong and Journé, 2014).

3. Congress may not be aware that reliability engineering analysis shows that increasing the number of (unreliable) devices will directly result in an increase in the number of failures (ceteris paribus). This means that increasing the number of CNFRs that can have an accident will increase the number of accidents leading to environmental consequences. However, the NRC staff has successfully managed protections on US CNFRs to the point that their operation (approximately 100 CNFRs) has not had significant impact on the environment especially when compared with competing technologies (the accident reported in United States and Kemeny, 1979, notwithstanding).

4. Congress may not be aware that the worldwide trend in CNFRs has indicated that while the rate of accumulation of accidents has decreased over time, the severity, in terms of the International Nuclear Event Scale (INES) has trended upward as shown in Figures 1a and 1b even as newer and safer technologies evolved. When directing the NRC staff to change their highly successful regulatory framework to effect of rapid deployment of CNFRs in the US, Congress should have taken into account both results from reliability engineering and the urge to believe that new CNFR technologies are "inherently safe" (see conclusions of Schröder-Hinrichs et al., 2012, for example) and the empirical observations made by Peltzman (1975).

5. Congress, and many individuals in the NRC, the public, academia, and national laboratories may not be aware that the practice of quantitative risk assessment or Probabilistic Risk Assessment (PRA) not only produces optimistic values for the risk of accidents but absent sufficient accident data support is also untethered to the risk it intends to estimate (for background see Hansson, 2009; Kee and Wortman,

2023b,a).

> *However, even for well-established technologies, there may be insufficient data to determine the frequencies of unusual types of accidents or failures. As one example of this, there have (fortunately) been too few severe accidents in nuclear reactors to make it possible to estimate their probabilities. In particular, most of the reactor types in use have never been involved in any serious accident. It is therefore not possible to determine the risk (probability) of a severe accident in a specified type of reactor.*
>
> Hansson (2009)

6. In summary,

   (a) CNF is currently the premier energy technology considering environmental protection of the US. However Congress should realize that the premier status of CNFRs has been and in the future will only be realized through rigorous and costly oversight of protection design.

   (b) Congress could help the NRC even further minimize any small CNFR environmental impact and promote sustainability by supporting fuel recycling. To do this would require Congress to provide the NRC with the (publicly funded) resources necessary to implement regulatory development and oversight.

   (c) The most significant challenge to protecting the environment with CNF is the cost of protections on the technology. In my opinion, it is unwise for Congress to intervene in the NRC staff's well-established and highly effective regulatory framework on environmental protections in a rush to deploy many new reactors.

   (d) Congress should develop an effective program, possibly through DOE, and appropriate ongoing public funding necessary to entice CNFR investors to the technology by covering the excess cost of operation and maintenance of protections on the environment required to ensure accidents are avoided. The amount of public funding on protections could be reasonably estimated by offsets in harms compared to competing technologies – the cost for an equivalent reduction in atmospheric CO_2, differential land use, differential impact on environment (such as hydroelectric dams on fish and flooded land, wind turbine effects on migratory birds) and other offsets are examples.

   (e) If many new CNFRs are deployed, it is my opinion that the Congress, aware of the possibility for a greater number of accidents, should be mindful that proper evaluation of moral hazard based on "risk-informed and performance based" regulatory protection is a fiction, especially if Congress believes quantitative risk technologies such as PRA can be used in a scheme to assess risk of harm (see Fisher et al., 2023; Nelson and Kee, 2023, for background on this assertion).

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