



# BACKGROUND

Office of Public Affairs

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## Improved Plant Safety Performance

Accidents such as Three Mile Island Unit 2, Chernobyl and Fukushima are reminders for the NRC and those who operate plants to continue improving performance at operating U.S. commercial nuclear reactors, ensuring they remain safe.

Over the NRC's more than 40-year history, substantial regulatory changes and other improvements have contributed to nuclear plants operating safer and better. Some of the major changes include:

- at least two NRC resident inspectors working at each plant site;
- immediate NRC notification by plants of serious events;
- expanded emergency preparedness, including the NRC staffing its Operations Center 24/7;
- increased identification, analysis and publication of plant performance information;
- increased use of risk insights to focus resources in the areas of greatest need; and
- recognizing human performance's critical role in plant safety.

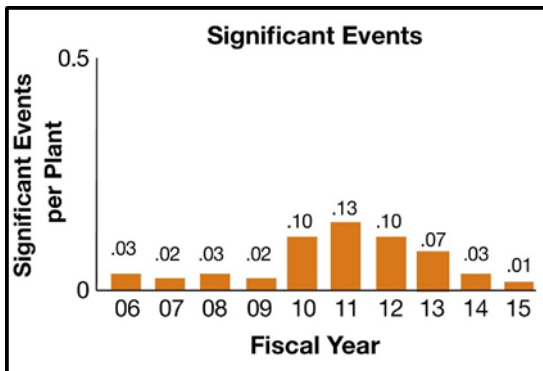
### Key Indicators

Key indicators of plant safety performance have improved dramatically, as indicated in the charts. They show:

- The average number of significant U.S. reactor events per year has remained at almost zero for more than 20 years.
- Reactor events today occur much less frequently, and when they do, the vast majority present only a very low risk of reactor core damage.
- On average, reactors activate their safety systems for non-testing reasons less than once per year.
- Plants have steadily decreased their workers' radiation exposure levels well below NRC limits, to a small fraction of the norm in 1985.
- The average number of unplanned reactor shutdowns has decreased by nearly 10-fold. In 2017, there were about 41 shutdowns compared to about 530 shutdowns in 1985.

## Trends in Nuclear Plant Performance

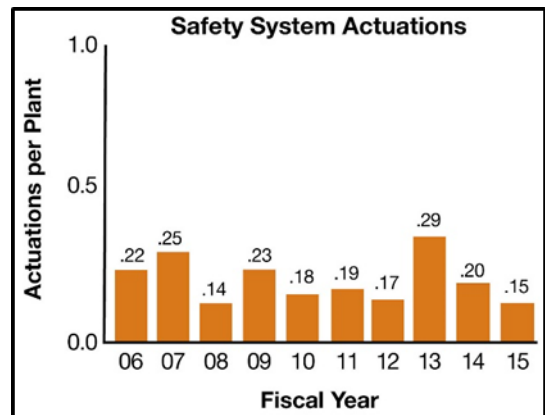
U.S. nuclear power plants have increasingly improved their safe operation over the past few decades. These charts depict reactor performance categories the NRC uses to help monitor operational safety. In general, safety has increased and problems have decreased. The charts below, from the final update of the Industry Trends Program<sup>1</sup>, show how the agency’s enhanced regulatory tools and requirements have helped ensure safe plant operation.



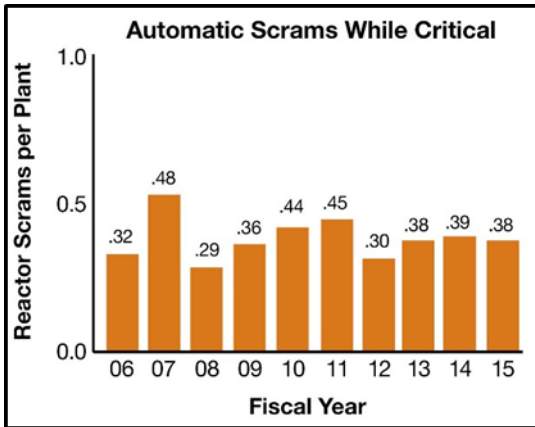
**Significant Events** – The NRC’s definition of “significant events” include: degradation of safety equipment; a sudden reactor shutdown with complications; or an unexpected response to a sudden degradation of fuel or pressure boundaries. The NRC staff identifies significant events through detailed screening and evaluation of operating experience. The number of significant events at each operating reactor has dramatically decreased from almost 2.5 events per plant in 1985 to fewer than 0.15 events per plant in recent years.

**Accident Precursors** – Even if an event at a plant had no impact, the NRC will analyze it if it could have led to an accident that damages the reactor core. The analysis assigns a risk number to these “precursor” events, relative to the chance of leading to an accident. For example, risk of 0.001 means that the event has a 1 in 1,000 chance of causing core damage. These events have become much less frequent and less risky, due to improvements to avoid these events or lessen their impact should they occur.

**Safety Systems Actuations** – Safety system actuations are when a manual or automatic signal starts emergency core cooling systems or emergency power systems. These systems either remove heat from the reactor if the normal system fails or provide emergency electrical power if the normal systems fail. Since 1985, fewer safety-related events have led to dramatically fewer safety system activations. The NRC calculates this by dividing the total number of actuations at operating reactors in any given year by the total number of operating plants in the fleet (99 in 2017). For example, in FY 2015, there were far fewer than one actuation per plant.



<sup>1</sup>In 2016, the NRC eliminated the ITP as part of the agency's Project Aim re-baselining initiative. The NRC’s decision came after examining the program’s costs and considering how negative performance trends would reveal themselves or be identified through other NRC methods.



**Automatic Scrams While Critical** - A reactor is “critical” when its core is undergoing a self-sustaining chain reaction. A “scram” rapidly shuts down a nuclear reactor by inserting control rods after an automatic or manual signal. This indicator measures the number of unplanned automatic scrams that occurred while the reactor was critical. Safer plant operations have dramatically reduced the average number of these scrams over the past several decades.

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