

# The Study of Spent Nuclear Fuel Storage Facility to Consider Beyond Design Basis Accident

Dong-bin Shon

Korea Electric Power Corporation E&C, 269, Hyeoksin-ro, Gimcheon-si, Gyeongsangbuk-do, Republic of Korea

\*linusvan@kepc-co-enc.com

## 1. Introduction

The government has established a spent nuclear fuel storage plan to be applied to storage facilities before disposal through the Atomic Energy Promotion Council in 2016.

Spent nuclear fuel storage facilities provide for safe, stable and secure storage of spent nuclear fuel before it is disposed of as radioactive waste.

To achieve these objectives, the design of spent nuclear fuel storage facilities shall incorporate features to maintain subcritical spent nuclear fuel and to maintain containment over the anticipated lifetime of the storage facilities.

Therefore, after the 9.11 accidents, we will analyze the latest technologies from abroad in terms of designing to consider Beyond Design Basis Accident that have emerged as a major design issue in the design of spent nuclear fuel storage facilities.

## 2. Status of Beyond Design Basis Accident

### 2.1 Domestic Background and Status

The wet storage of NPPs that store spent nuclear fuel is expected to be saturated from 2024 in this order, so it is necessary to design the spent nuclear fuel storage facility as a top priority.

However, Design to consider Beyond Design Basis Accident was carried out within the framework

of probabilistic safety evaluation because it is an extremely low incidence.

Especially, aircraft impact assessment of Beyond Design Basis Accident was typical example.

For example, if the probability of occurrence of radioactive disaster due to aircraft impact is less than  $10^{-7}/\text{yr}$ , it does not take into consideration the risk of impact.

### 2.2 Situation change and overseas situation

In addition to the accident conditions that occurred during the flight of the aircraft after the 9.11, there was a need for safety assessment and design standards in preparation for the impact caused by the abduction of aircraft by terrorism.

In the United States, the NRC has created an "AIA" since September 11, 2009 to allow nuclear licensees and licensee applicants to carry out a design to consider Aircraft Impact Assessment. The evaluation criteria are to maintain the reactor core cooled or the containment remains intact and to maintain spent nuclear fuel pool integrity of the nuclear power plant.

Also, the general characteristics such as fuel injection amount, crash speed and angle, ability of both experienced and inexperienced pilots to control large, commercial aircraft were considered.

For the same reason as nuclear power plants, there is a need to evaluate aircraft impact in the spent

nuclear fuel transportation and storage system. Further, there is a need for further strengthened requirements such as impact evaluation for large commercial aircraft (Boeing 767 etc.) as well as small fighter crashes.

In Germany, there are two types of spent nuclear fuel storage facilities in the form of "WTI" and "STEAG" according to the designers.

After the 9.11, the evaluation of aircraft crashes of existing facilities was performed by a licensing organization. In the case of small aircraft impact evaluation, it was carried out before 9.11. But in this case, the impact evaluation of large commercial aircraft was taken into account and the safety of the structure was confirmed.

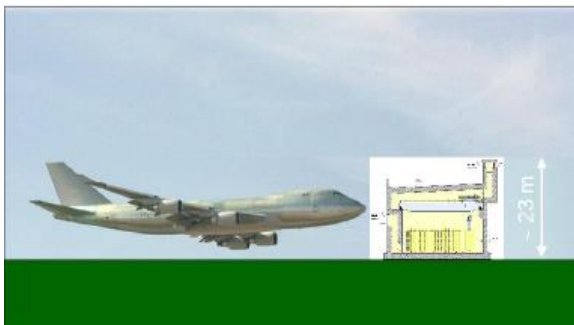


Fig. 1. STEAG-Building, Boeing 747, True Ratio of Size.

In the case of Japan, the Ministry of Economy, Trade and Industry (METI) issued a report (2008) containing the contents of the regulation on the safety evaluation of spent nuclear fuel intermediate storage facilities using metal dry cask.

### 3. Conclusion

Design to consider Beyond Design Basis Accident was carried out within the framework of probabilistic safety evaluation because it is an extremely low incidence.

But, after the 9.11, there was a need for safety

assessment and design standards in preparation for the impact caused by the abduction of aircraft by terrorism.

Whether to apply the design considering the aircraft impact assessment to the storage facility will be decided according to the regulatory requirements, but it is necessary to build a storage system suitable for the situation in Korea through overseas cases.

### REFERENCES

- [1] U.S.NRC, "50.150 Aircraft impact assessment" (2009).
- [2] Federal Office for Radiation Protection, "Interim storage of spent nuclear fuel in Germany" (2002).
- [3] CRIEPI, "Spent fuel storage in japan" (2015).