



The Development of Base-Isolated APWR Plants



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Abstract

The seismic design of nuclear power stations plays a critical role in the assurance of plant safety in Japan, and standardization of design is difficult to achieve because every site is subject to different seismic conditions. However, the introduction of seismic-isolation devices is one way to rationally achieve safety assurance and promote design standardization. Base-isolated APWR (advanced pressurized water reactor) plants were developed by applying seismic-isolation devices to APWR plants.

The introduction of seismic-isolation devices, which are installed between the ground and buildings, largely decreases the effect of seismic force on buildings. Therefore, the limitation of building shape and eccentricity, which are undertaken in order to prevent the floating of buildings, could be eliminated. This permits the flexibility of building layouts, which result in a reduction of building volume. At the same time, the thickness of the buildings walls that are specific to nuclear power stations, can also be decreased except radiation shield.

As for the base-isolated APWR equipment design, the rational design of support structures for equipments and pipings is possible, because the floor response acceleration is greatly reduced.

For the cost reduction, it has been confirmed that the base-isolated APWR plants are more economical than traditional APWR plants even after the additionally required expenses for seismic-isolation devices are taken into account. This is primarily because of the rational design of the buildings and equipments which is possible as described above. Another advantage is that building standardization can be promoted because the seismic-isolation devices are able to control the seismic force transmitted to the buildings. This is accomplished by arranging the characteristics of the isolation devices according to the seismic conditions of each site.

The introduction of these devices to nuclear power stations is nearly ready to be realized. There are currently many examples of the adoption of such devices to general buildings and the application to actual plants is the next goal to be achieved.