# Overview of Applications for Review to Verify Compliance of Hamaoka Nuclear Power Station Unit 4 with New Regulatory Requirements

Subsequent to our implementation of measures to increase the safety of Hamaoka Nuclear Power Station, we have conducted the necessary checks and assessments of Unit 4 and completed the preparations for the relevant applications, and have therefore submitted application document for change in reactor establishment permission, an application document for approval of construction plans, and an application document for approval of an operational safety program to the Nuclear Regulation Authority as the conditions for a review that will verify that Unit 4 complies with new regulatory requirements.

## 1.Background to applications

【Chubu Electric initiatives】

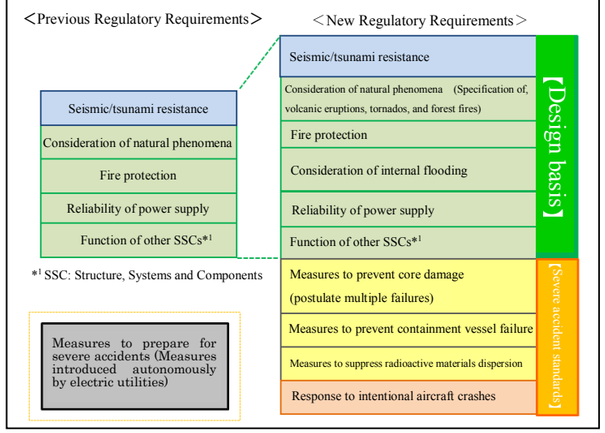
Chubu Electric has autonomously proceeded with measures to increase safety, including the introduction of accident management measures (the introduction of containment vessel venting lines with increased pressure resistance, etc.) and modification for seismic margin enhancement (modification of stacks, installation of supports for pipes and electric circuits, etc.).

We have continuously put in place autonomous measures to further increase the safety of Hamaoka Nuclear Power Station that reflect findings, etc. made following the accident that occurred at the Fukushima Daiichi Nuclear Power Station as a result of the tsunami caused by the Great East Japan Earthquake on March 11, 2011, including emergency safety measures (positioning of emergency generators, etc.) and tsunami countermeasures (construction of a tsunami protection wall, measures to prevent flooding of buildings, etc.).

【Government initiatives】

Following the accident at Fukushima Daiichi Nuclear Power Station, the government introduced new regulatory requirements in July 2013. In addition to the existing regulatory requirements, these new requirements newly introduced or enhanced items related to responses to natural phenomena including tornados and volcanic eruptions in addition to earthquakes and tsunami, fires, and other disasters, seeking to prevent simultaneous loss of safety functions due to common causes. Other newly added items include items related to severe accidents,*etc., which assume a loss of safety functions.

*Accidents that may lead to a severe accident or severe accidents




In addition to the measures we have autonomously put in place, Chubu Electric has also introduced a set of additional measures based on the new regulatory requirements (announced on September 25, 2013) and proceeded with necessary preparations for applications related to verification of our compliance with the new regulatory requirements.

We have now submitted application document for change in reactor establishment permission, an application document for approval of construction plans, and an application document for approval of an operation safety program to the Nuclear Regulation Authority as the conditions for a review that will verify that Unit 4 complies with new regulatory requirements.

## 2.About the applications

### Application document for change in reactor establishment permission

Responds to the design basis stipulated in the new regulatory requirements by defining standard seismic motion and design basis tsunami and presenting basic designs of responses, in addition to presenting basic designs of responses to tornados, volcanic eruptions, etc., which have been newly introduced or enhanced in the new regulatory requirements.

Also presents basic designs reflecting responses to severe accidents newly introduced to the new regulatory requirements.

＜Main details＞
■Definition of standard seismic motion and design-basis tsunami
■Basic design of design-basis facilities (Evaluation of impact of natural phenomena, etc.)
■Basic design of facility measures against severe accident and others (Preventive measures against core damage, preventive measures against containment vessel failure, etc.)
■Evaluation of effectiveness of countermeasures against severe accident and others.

### Application document for approval of construction plans

Presents the detailed design of the newly introduced and modified facilities, etc., as outlined in the application document for change in reactor establishment permission (Specifications, structure, seismic resistance calculations, strength calculations, diagrams, etc.).

＜Main details＞
■Facility specifications (Capacity, number, materials, etc.)
■Results of seismic resistance calculations* and strength calculations
■Facility diagrams, etc.

*The results of seismic resistance calculations will be submitted as they become available.

### Application document for approval of operational safety program

Presents organizational systems, procedures, education and drills, etc. related to severe accidents, etc. in addition to handling in the case of malfunction or inspection of facilities employed in response to severe accidents, etc.

＜Main details＞
■Organizational systems, procedures, education and drills related to severe accidents, etc.
■Operational management of facility measures against severe accident and others (Operating limits, etc.)

## 3.Main details of application document for change in reactor establishment permission

### 【Design basis measures】

The new regulatory requirements have newly introduced or enhanced items related to responses to natural phenomena including tornados and volcanic eruptions in addition to earthquakes and tsunami, fires, and other disasters, seeking to prevent simultaneous loss of safety functions due to common causes.
At Hamaoka Nuclear Power Station we have previously ensured that design functioned to prevent the loss of safety functions due to common causes (natural phenomena, fires, etc.) based on the previous design basis. Based on the new regulatory requirements, we will increase the rigor of the assumptions we make in relation to design and the protective measures we put in place.

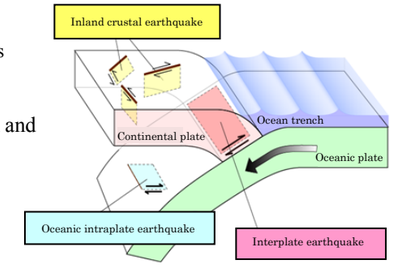
#### ＜Earthquake countermeasures(Prevention of damage caused by earthquake)＞

Taking into consideration elements of uncertainty, we have conducted an evaluation of seismic ground motion in relation to inland crustal earthquakes, interplate earthquakes and oceanic intraplate earthquakes, and have formulated standard seismic motion with consideration of the amplification factor on the Station site. We will put anti-earthquake and other measures in place continuously based on these figures for standard seismic motion.

Standard seismic motion Ss1[*1] (1,200gals)
Standard seismic motion Ss2[*1] (2,000gals)

*1: The application of Ss1 or Ss2 to each facility will be determined by whether or not conspicuous amplification is observed at nearby measurement points.

Standard seismic motion of Ss1 and Ss2 correspond to seismic ground motion for modification work and amplified seismic ground motion for earthquake countermeasures, announced on September 25, 2013.



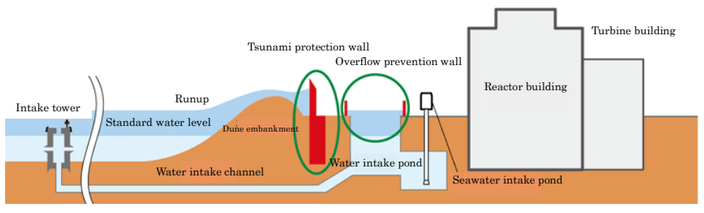

＜Main measures＞
○Work to improve supports for pipes and electric circuits
○Enhancement of emergency response centers[*2] etc.
○Work to reinforce ground around tsunami protection wall

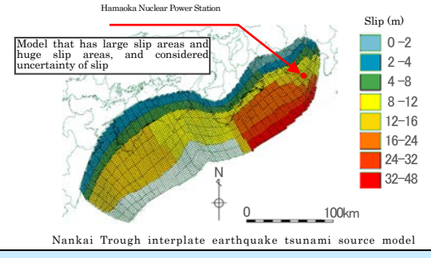
*2: We will construct new facilities in addition to our existing emergency response centers.

#### ＜Tsunami countermeasures (Prevention of damage caused by tsunami)＞

We have conducted surveys and studies on factors causing huge tsunami, regarding interplate earthquakes, oceanic intraplate earthquakes, crustal earthquakes produced by active faults, and submarine landslides, and then we have formulated a design basis tsunami in consideration of uncertainty of factors on a tsunami caused by a Nankai Trough interplate earthquake, which might have a significant effect on the Station site.

The maximum water reaching level by this design basis tsunami is level with T.P. +21.1m at the front of the tsunami protection wall. We have verified that our tsunami countermeasures (the tsunami protection wall with the height of T.P. +22m, overflow prevention measures on water intake ponds and others) could keep huge tsunami away from flooding in the Station site.



Nankai Trough interplate earthquake tsunami source model

#### ＜Measures to respond to natural phenomena (Tornados and volcanic eruptions)＞

■ Tornados … Based on judgment of the existence or absence of an amplification factor due to the effect of geological forms surrounding the Station site in relation to the maximum wind speed of tornados previously occurring in Japan, we will define a design basis tornado (maximum wind speed: 100m/s), and we will put in place the necessary measures in response.
(Measures to protect against flying objects in the vicinity of the seawater intake pumps and light oil tanks, etc.)

■ Volcanic eruptions … We have verified that no phenomena associated with volcanic eruptions that could not be responded to on a design basis can reach the Station site from volcanoes located within a 160 km radius of the Station site. We have also verified in relation to falling tephra (volcanic ash) that could reach the Station site that safety functions would not be lost as a result of the load of tephra (thickness of 10cm),etc.

#### ＜Measures to prevent fires/respond to internal overflow＞

We will enhance fire prevention, early detection and extinguishing functions and functions related to mitigating the effects of fires. In addition, we will put in place measures to ensure that safety functions are not lost even if the reactor facilities are overflown.

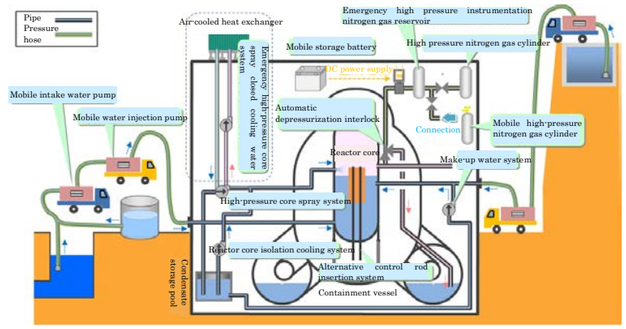
### 【Countermeasures against severe accidents and others】

The design-basis measures shown at the left will enhance our responses to natural phenomena, fires, etc. However, we put in place countermeasures against core damages, containment vessel failure, etc. in the event that a severe accident causes the loss of function in design-basis facilities, and also to ensure that the severe accident does not progress any further. We also verify that these measures are functioning effectively.

#### ＜Measures to prevent core damage＞

In order to enhance functions designed to prevent damage to reactor cores, we will implement measures including ensuring the availability of multiple methods for water injection in addition to the existing emergency core cooling system.

＜Main measures＞
○Supply of power by means of gas turbine generators, etc. positionedon high ground, etc.
○Installation of air-cooled heat exchangers to ensure operation of high-pressure coolant injection system
○Alternative methods of water injection by means of makeup water system, etc.

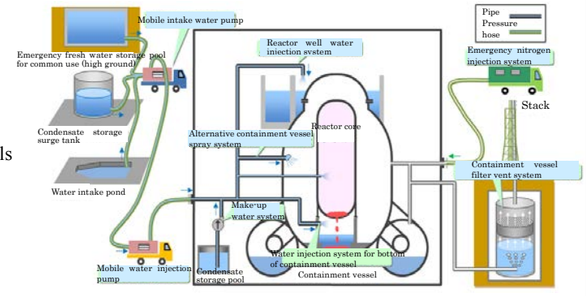



**We will also put in place measures to ensure that the containment vessel is not damaged even in the event of damage to the reactor core.**

#### ＜Measures to prevent failure of containment vessels＞

We will introduce measures including ensuring the availability of multiple methods of cooling the containment vessels and preventing overpressurization in order to enhance functions for the prevention of the containment vessels failure.

＜Main measures＞
○Supply of power by means of gas turbine generators, etc. positioned on high ground, etc.
○Enhancement of alternative spray system of containment vessel to ensure cooling of containment vessels
○Prevention of overpressurization by means of containment vessel filter vent system




#### ＜Evaluation of effectiveness of countermeasures against severe accidents and others＞

We evaluate our countermeasures against severe accidents (alternative water injection methods, alternative power supply, procedures and organizational systems to be employed when a severe accident, etc. occurs, etc.) on the basis of a variety of cases (the progression of events until core damage, containment vessel failure, etc. occurs, accident scenarios that we have identified independently, etc.), and verify that they function effectively in preventing severe accidents, etc. from progressing.