THE LANTAU GROUP

Watching Brief

A Perspective on the Taishan Nuclear Plant

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Background

On 14 June, CNN in the United States reported that it had received information that Taishan Nuclear Power Plant in Guangdong Province, China, was experiencing a radiation release. This information came by way of a memo prepared by Framatome, a subsidy of the French utility EDF, in an application to the United States Department of Energy to do work on Taishan NPP. EDF is a 30% equity stakeholder in the plant and Framatome is a technical services provider and reactor designer.

Why did Framatome submit documents to the US DOE?

The Taishan Nuclear Power Plant is majority-owned by China General Nuclear Power Company (CGNPC) via a 70% ownership stake of the plant's holding company. CGNPC is currently sanctioned by the United States government by placement on the Entity List, which forbids US firms and personnel to do work for CGNPC and disallows technical data or other operating information from the US to be distributed to CGNPC.

Framatome applied for an exemption to this regulation, on the basis that their work for CGNPC was necessary to ensure "operational safety" of the plant. Operational Safety is a well-established exemption condition for the United States' nuclear export ban to CGNPC. Framatome applied for this exemption because it hoped to consult with Framatome personnel from its US-based office to perform work for CGNPC. This application for exemption was denied, indicating US DOE and regulatory authority authorities did not consider the situation to constitute a sufficient risk to operational safety to justify granting an exemption.

What we know about what is going on at Taishan NPP

On Wednesday, June 16, China's National Nuclear Safety Administration (NNSA) put out a press release.[1] The press release states that Taishan has experienced five failure (broken) fuel rods, comprising .01% of the 60,000 fuel rods in the core. This matches a statement from EDF stating that the work they hoped to perform in Taishan was an "operational issue" related to noble gas build up due to damaged fuel rods. Cracked fuel rods are an undesirable but not uncommon phenomena in the nuclear industry. Most plants have them; some have many. A multi-year pan-industry effort in the USA has reduced fuel leaks nearly to zero, but this is an exceptional case. Most nuclear power industries, including China, exhibit some number of cases of cracked fuel rods.

1 Chinese: http://www.mee.gov.cn/ywdt/zbft/202106/t20210616_839172.shtml

Related Media Coverage:

Wall Street Journal:
https://www.wsj.com/articles/china-nuclear-plant-under-scrutiny-was-built-to-showcase-nations-prowess-11623766187

Barrons:
https://www.barrons.com/news/china-nuclear-plant-operators-release-gas-in-bid-to-fix-issue-01623687314?tesla=y

About the Author:

David Fishman has 7 years of experience in the Chinese power sector, with 5 of those years focused on nuclear power. At TLG, he is a project manager handling China energy sector work in the solar, wind, nuclear, and storage industries. David joined TLG by way of TLG's acquisition of Nicobar Group, a nuclear power specialty consultancy based in Shanghai. This acquisition has formed the basis of TLG's Shanghai team and marks our increased commitment to serving the needs of our customers in Mainland China.

How does a failed fuel rod lead to higher radiation levels?

When a rod is broken, it releases fission gases that were previously contained within the fuel cladding, allowing them to circulate in the cooling water. Radioactive Xenon-133 (a noble gas) is the most likely element to escape and find its way into the primary coolant loop, where its presence alerts plant operators as to the existence of a broken fuel rod.

Can the plant still operate, or will it have to be shut down to mitigate the issue?

NPPs usually can continue operating with damaged fuel rods in the core and do not require shutting the reactor down or changing the power output. A novel failure mechanism could prompt a shutdown, but there's insufficient evidence at this time to suggest that Taishan has experienced such a case.

Are damaged fuel rods dangerous?

Typically, damaged or cracked fuel rods (called failed fuel rods) are not considered to be especially dangerous, but they do require the plant owner to take extra steps to manage the damaged fuel while continuing to operate the plant. It is a technical challenge for the plant operator or a technical service firm working on the issue because it requires the plant to be operated differently until the broken rod can be removed (which would be during the next reactor refueling outage, usually once every 18 months). Broken fuel rods are generally not considered problems serious enough to stop the plant. The US, French, and Chinese authorities have all issued statements expressing that there is no indication of imminent danger from Taishan. And as we noted above, the fact that US DOE has turned down a request for an exemption from the US government restrictions applying to business dealing with CGN, would support the notion that the current situation is not serious, unless there are more details that haven't yet been revealed.

CNN reported that Framatome's memo to the US government showed China's regulatory authority had doubled the allowable level of radiation to allow the plant to continue operating in excess of allowable levels. What is known about this?

The Wednesday press release from the NNSA denied this statement and asserts that this is a misreading of the plant's operating procedures. NNSA stated that their organization had approving a doubling of the level of inert gas to be used in the plant's primary coolant loop chemistry, related to operations management, not radioactivity release. At the time of publishing, no statement had been made by Framatome/EDF about those allegations. However, there is no indication from gamma radiation detection around the plant, or from testing sites in Hong Kong, that environmental radiation in the greater Taishan plant area is higher than usual.[2]

2 Source: Hong Kong Observatory; CGN, NNSA and AFP