

### **Operation of unit-1 of Kaiga Generating Station (KGS) for 962 days**

AERB has laid down regulations for safe operation of Nuclear Power Plants (NPPs) in India. NPPs are sited, designed, constructed, commissioned and operated in accordance with these regulations. These regulations are continuously evolving taking into consideration technological developments and operating experiences. With current established surveillance requirements, Indian NPPs can operate continuously for a period of about 850 days when these are required to be shutdown for carrying out certain surveillance tests which cannot be done during reactor power operation.

KGS-1 is a pressurised heavy water reactor with on-power refuelling facility and thus, does not require reactor shutdown for refuelling purposes. KGS-1 was synchronized to grid on May 13, 2016 after completion of Biennial Shutdown (BSD) activities. Since then, the reactor has operated continuously without any safety or operational issues. Considering the continuous safe operation of the unit as an opportunity for generating data on performance of various reactor systems and condition of SSCs during prolonged operation, station proposed for continuous operation of KGS-1 till December 31, 2018 (962 days).

The station's submissions were extensively reviewed in multiple tiers of AERB (viz. in-house, expert committees, unit safety committee and SARCOP) as per the established mechanism. AERB also performed independent assessment of various aspects related to KGS-1 continuous long term operation. During review, it was ascertained that the previous surveillance results had been satisfactory and the various parameters during calibration of the safety components were within limits. Based on the assessment of reactor safety systems through relevant parameters and surveillances it was concluded during the review that the fundamental safety functions are not getting compromised in any way due to prolonged operation of KGS-1. The safety systems are provided with high level of redundancy (triplicated channels), diversity and robustness in design with provision to perform functional tests during power operation. These systems are continuously monitored during reactor operation (along with provision of conservative alarm settings for operator actions) and channel wise comparison is performed to ensure healthiness of sensors. This provided reasonable confidence on fulfilment of the safety functions by these systems in case of demand. The on-power surveillances performed on a number of systems including the safety systems were satisfactory without any deviations.

Due to prolonged operation of the unit, station instituted additional measures such as close monitoring & trending of important parameters, monitoring of alternate/backup parameters, issuance of relevant operator instructions and increased panel walk down by control room staff to detect any abnormality. Trends of important parameters were submitted to AERB on

weekly basis and were found satisfactory. **AERB also carried out repeated regulatory inspections, both announced and unannounced, to gather first hand information on the safety status of the plant, verify/check compliance and effectiveness of instituted compensatory measures, performance of various SSCs, conduct of operating staff and safety management of KGS-1&2. The AERB team interacted with operating staff, examined the test procedures and records, made direct observations of various parameters from the recording systems, verified the healthiness of systems from the field etc. Observations made by AERB during these inspections did not indicate any safety significant deviation.**

Based on the extensive reviews and enhanced regulatory oversight as mentioned above, continued operation of KGS-1 was permitted in phases up to December 31, 2018. With additional/alternate surveillances & monitoring provisions, various other compensatory measures instituted in view of continued operation and enhanced regulatory oversight, KGS-1 completed 962 days of continuous SAFE operation and reactor was manually shutdown on December 31, 2018. The stable & safe operation of KGS-1 for long duration demonstrated the maturity of nuclear reactor technology and effectiveness of regulatory oversight mechanism in India. **The continuous long term operation of KGS-1 provided first-of-a-kind opportunity for generating the data on performance of plant systems, structures and components during continuous run. The valuable data would be useful to the utilities with respect to operation management as well as to AERB in future safety reviews.**