

CHAPTER - VII

Monitoring System

7.1 Monitoring of generation in power stations of CPSEs is done through Daily Generation Report (DGR) which indicates machine-wise hours of operation, electricity generated, machine outage hours with reasons. For monitoring health of structures and systems dam safety inspection/technical inspections are conducted twice a year, once before monsoon (in April-May) and once after monsoon (in October-November).

DGR of each power station is circulated to higher officers at power station with copies to respective corporate offices and NRLDC. Dam safety inspection is conducted by internal teams consisting of members from the Corporate office and power station or through Dam Safety Organisation (DSO), while technical inspection was carried out by the team of the Corporate office.

7.2 Non-operational instruments

Audit noticed that large number of instruments installed at dam and other structures for monitoring their health were not in working condition. CPSE-wise observations in this regard were as under:

Name of CPSE	Audit observation
NHPC	95.65 per cent and 44.26 per cent of the instruments installed at Tanakpur and Dhauliganga respectively were not in working condition in May 2014.
SJVN	Since 2009 out of three Strong Motion Accelerographs, only one was in working condition. Five Micro-Seismic Recorders and four Inclinometers which Dam Safety Team recommended during its inspection in 2009 have not been installed so far (May 2015).
THDC	During 2009-2014, the proportion of working instruments in Tehri dam, Chute and Shaft and Power Station decreased from 37.33 per cent, 61.51 per cent and 27.5 per cent, respectively to 17.56 per cent, 60.97 per cent and 19.93 per cent, respectively. In view of large number of unresponsive instruments, CWC recommended (December 2009) that analysis may be carried out to assess sufficiency and redundancy of reliable instruments and a project specific instrumentation manual may be developed describing type, location and scope of all reliable instruments. However, no such manual had been developed (September 2015).

NHPC stated (August 2015) that action has been taken for prompt repair of non functional instruments at all power stations. Monitoring system of power stations has now been made effective and same was being done at the highest level. The observations of Dam Safety and Technical Inspection team are being attended in a time bound manner. During Exit Conference, NHPC stated (August 2015) that it has already committed to prepare an Instrumentation Manual within three months time duly demarcating the instruments important for short, medium and long terms.

Regarding NJHPS, SJVN stated (August 2015) that Strong Motion Accelerographs (SMAs) and Micro Seismic Recorders (MSRs) had gone out of order and no service was available on those modules due to obsolescence of technology. Cases were being initiated to procure and install new SMAs and MSRs. Four Inclinometers were installed at Nathpa Dam slope, but their holes had been choked with rock fragments/soil. Efforts were being made to make these instruments functional.

The reply of SJVN is to be viewed against the fact that observations of Dam Safety Team which had bearing on important aspect of monitoring impact of earthquakes on the behaviour of dam, were not attended to since 2009.

As regards THPS, THDC stated (August 2015) that (i) most of the instruments were installed in foundation/rock or concealed in the structural concrete and therefore, were unapproachable to undertake any repair/replacement at this stage; (ii) Additional instruments like standpipe piezometers³¹, tri-axial joint meter³², tape extension meter³³ have been installed; and (iii) Tehri Dam has three inspection galleries which facilitate physical inspection of clay core zone and continuous monitoring regarding settlement and other parameters to ensure health of Dam.

The fact, however, remains that in spite of pointing out by CWC in December 2009, THDC has not so far assessed sufficiency and redundancy of reliable instruments and formulated project specific Instrumentation Manual describing type, location and scope of all reliable instruments.

7.3 Shortcomings noticed in compliance of pre and post monsoon inspections of dam

NHPC

7.3.1 Comprehensive compliance by TPS of the suggestions of Dam Safety Inspections carried out in May 2012 and April 2013 would have made the flood management in 2013 more effective. [Detailed observation of Dam safety team and their non-compliance by TPS has been discussed under para (6.6.2 (ii))]

NHPC noted the audit observation for future compliance and stated (August 2015) that now the observations of Dam Safety Team were being monitored till the issue is resolved or sorted out.

SJVN

7.3.2 Post monsoon inspection reports of Dam Safety Organisation (DSO), Nasik for the years 2009 and 2013 revealed that observations raised in 2009 related to non-installation of meteorological instruments at dam had not been complied till December 2014. Similarly,

³¹ To measure pore water pressure.

³² To monitor movement of structural joint.

³³ To monitor movement of rock mass/ structure.

observations of 2012 regarding preparation of EAP according to CWC guidelines, training of staff to monitor and operate the entire instrumentation of dam to ascertain the actual behaviour of dam under various operational conditions, etc. (Details in *Annexure 7.1*) were not attended by NJHPS so far (December 2014), thereby defeating the purpose of such inspection. It is also pertinent to mention that SJVN had not submitted compliance reports for any of the previous inspections conducted by the DSO till the last inspection (December 2013).

SJVN stated (August 2015) that (i) Purchase of Meteorological instrument was in final stage of tendering and these instruments will be installed in 2015-16, (ii) New Emergency Preparedness Plans for NJHPS has been prepared and submitted for the approval of management on 31 May 2015; and (iii) Training to monitor the entire instrumentation will be done before December 2015.

7.4 Non-compliance with recommendations of CWC for satellite based real time inflow forecasting for Tehri Dam - THDC

CWC, being the design consultant for THDC prepared (August 2005) a report for satellite based real time inflow forecasting for Tehri Dam reservoir. This would help in safety of dam by giving advance information regarding inflow into the reservoir and in turn help in reservoir operation thereby safeguarding the dam. For this CWC also proposed to set up five G&D stations at Dabrani, Uttarkashi, Dharasu on river Bhagirathi and at Gangi and Ghansali on river Bhilangana, 11 meteorological stations and one digital direct read out ground station at Tehri/Rishikesh.

Audit, however, observed that even after eight years of operation, THPS has not yet (November 2014) completed real time inflow forecasting system as suggested by CWC and was operating with three G&D stations only.

THDC stated (November 2014) that as the work of establishment of real time inflow forecasting system was getting delayed, three numbers of G&D stations were established, out of which two were manual stations at Dharasu on river Bhagirathi and at Ghansali on river Bhilangana and one was automatic G&D station near zero bridge at Tehri. After commissioning of Koteswar HEP, G&D observations were taken at three locations, Dharasu, Ghansali and downstream of Koteswar.

THDC added (August 2015) that installation of real time forecasting system was in progress and would be installed by January 2016.