CHAPTER – VI

Disaster Management

6.1 Importance of disaster management in hydro power CPSEs

Hydro power stations located in J&K, Uttarakhand, Himachal Pradesh and Sikkim fall in high seismic zone[22]. These power stations are located in the Himalayan region which is prone to heavy rainfall, especially during monsoon and the occurrence of flood and landslides at different locations is common. Further, since there is no other means of transport except roads in Himalayan States where power stations of CPSEs are located, poor accessibility to infrastructure increases the vulnerability of CPSEs during disasters. Thus, Disaster Management assumes great significance for Hydro power sector CPSEs.

6.2 Snapshot of disaster management regulations– Role of Government of India

CEA prepared (2002) a report on disaster management in power sector with intention to provide guidelines for safeguarding electrical installations against natural and man-made disasters.

Government of India (GoI) also enacted Disaster Management Act, 2005 (Act). Section 37 (1) of the Act, provided that every Ministry or Department of the GoI shall prepare a Disaster Management Plan (DMP) *inter alia* specifying the measures to be taken by it for prevention and mitigation of disasters in accordance with national plan. Section 37 further provided that every Ministry or Department shall review and update annually the DMP.

6.3 Observations on disaster management in hydro power CPSEs

In the light of CEA's guidelines and Disaster Management Act, 2005, the preparedness of selected power stations of CPSEs, to foresee and prevent disasters, was examined. Results of examination are discussed in succeeding paragraphs:

6.3.1 Existence and updation of DMPs

The following table indicates the position regarding preparation and updation of DMP by power stations selected for performance audit:

22 As per information available at Indian Meterological Department website, from the point of view of intensity of seismic activities the country has been divided into four zones. Zone –II to Zone-V. Zone-II (covering 43 per cent of total area) is the least seismic prone while Zone-V (Covering 12 per cent of the total area) is the most seismic prone.

Table 6.1

Details regarding preparation and updation of DMPs by selected power stations

Sl. No.	Name of Power Station	Year of start of commercial operation	Date of issue of DMP	Year of review and updation of DMP
	NHPC			
1	Bairasiul	1982	April 2005	Not reviewed and updated
2	Tanakpur	1993	April 2005	-do-
3	Chamera-I	1994	April 2005	October 2012
4	Uri-I	1997	April 2005	Not reviewed and updated
5	Dhauliganga	2005	November 2007	-do-
6	Teesta-V	2008	March 2012	-do-
7	Chamera-III	2012	October 2014	Not due for review and updation
8	Chutak	2013	January 2015	
	NHDC			
9	Indira Sagar	2005	October 2013	Not reviewed and updated
	SJVN			
10	Nathpa-Jhakri	2004	March 2007	Not reviewed and updated
	THDC			
11	Tehri Hydro	2007	May 2009	June 2015

As could be seen from above table, out of 11 power stations, which prepared DMPs, eight did not review the same annually as per requirement under clause 37(1) (b) of the Disaster Management Act, 2005. Of the remaining three power stations, only one power station reviewed its DMP and in other two, it was not due for review and updation.

NHPC stated (August 2015) that instructions for updation of DMP had been circulated to all HOPs and same shall be finalized shortly.

MoP agreed (August 2015) that NHPC needed to ensure updation of DMP annually in all its power stations. MoP also endorsed CEA's comments on suitable measures to be taken by utilities for disaster management in case of dam failure or sudden release of water. Disaster management in case of flash flood might also be factored in, especially in view of the Uttarakhand floods in 2013.

Regarding NJHPS, SJVN stated (August 2015) that the DMP prepared in 2007 was reviewed in June 2013.

However, the fact remains that the areas identified in the review like flooding of power house due to excessive inflow of water from Bayal nallah, requirement for coordination mechanism especially during monsoon season, coordination with District Administration, Army, Karcham Wangtu project, Rampur Hydro electric project and strengthening of early warning system stations in real time situation were yet to be addressed in DMP.

As regards THPS, THDC stated (August 2015) that DMP of THPS had now been revised and circulated to all concerned on 04 June 2015 and shall be reviewed on annual basis.

MoP stated (September 2015) that CPSEs were addressing the inadequacies in their DMPs. As there is no human control over natural disaster, the objective should be to ensure how disasters can be prevented and/or contained.

6.3.2 Use of dam break analysis inputs in preparation of DMPs

Dam break is partial or catastrophic failure of a dam (which may happen in unlikely event/s of defective construction, poor management, inadequate spillway capacity or natural calamity) leading to the uncontrolled release of water causing severe damage to the lives and properties situated downstream. The effect of such a flood disaster can be mitigated to a great extent, if the resultant magnitude of flood peak and its time of arrival at different locations downstream of the dam can be estimated, facilitating planning and emergency action measures. Therefore, it is the responsibility of the organizations involved with the safety of the dams to plan preventive measures so that in the eventuality of dam failure, the loss can be minimized to the extent possible.

The Environmental Impact Assessment (EIA) Notification 1994 insisted upon the need for preparation of EIA and Environment Management Plan (EMP) which included dam break analysis to provide essential inputs for preparation of inundation maps and DMP. Compliance of EIA notification 1994 by CPSEs is discussed in following paras:

NHPC

6.3.2.1 Audit observed that out of eight selected power stations of NHPC, dam break analysis was conducted only in respect of three projects *viz.* Chamera I and III and Chutak. No dam break analysis was carried out in remaining five power stations *viz.* Bairasiul, Dhauliganga, Tanakpur, Uri I and Teesta V.

NHPC stated (November 2014) that, EIA and EMP, which essentially included dam break analysis, were prepared only for those projects which were taken up after EIA Notification.

The reply is to be viewed against the fact that (i) dam break analysis even in respect of project Teesta V where DPR was prepared after issue of EIA notification, was not carried out. (ii) EIA Notification had been issued by Ministry of Environment and Forests way back in 1994. As more than 20 years have passed after the issue of notification, it was desirable for NHPC to conduct dam break analysis for older power stations as well to ensure the relevance of their DMPs to the current situation. However, dam break analysis in respect of only one of the older power stations *viz*. Chamera- I had been carried out and in remaining four older power stations dam break analysis was not carried out. Though Chamera-I got dam break modelling study conducted in March 2005, the DMP updated in October 2012 did not include Emergency Action Plan (EAP) to deal with dam break situation.

NHPC stated (August 2015) that Dam Break Analysis in respect of all power stations would be completed within one year and would be included in DMPs/EAPs.

THDC

6.3.2.2 The DMP of THPS as originally prepared in 2009 did not include flood plain maps.

THDC stated (August 2015) that flood plain maps had since been made part of revised DMP in June 2015 which has been sent to MOP also for consideration of National Disaster Management Authority (NDMA).

6.4 Gaps between DMP of power stations vis a vis *CEA guidelines and States' DMP*

Audit observed that following provisions, though required as per CEA guidelines or States' DMP, were not included in DMP of NHPC power stations selected for performance audit:

(i) Setting up of advance warning system as measure of preparedness to deal with floods.

(ii) Finalization of commitment contracts for fixed periods with various agencies for resource deployment at short notice, such as large capacity truck mounted DG sets, fleet owners of trucks/trailers and cranes, *etc*.

(iii) Assessment of hospitals to respond to a given emergency situation to work out Emergency Medical Plan for Company's Hospital in Power Station complex.

(iv) The DMPs of power stations had not prescribed Standard Operating Procedures (SOPs) which will be useful for activities like search and rescue, medical assistance, provision of food, drinking water, sanitation, clothing, management relief camps and casualty management evacuation.

(v) Power stations had not carried out capacity building programme in house or externally in the areas of flood management including hydrological data collection and its management, hydrological studies, flood forecasting and use of latest Geographical Information System (GIS) based technologies in decision making.

Accepting the audit observation, NHPC stated (August 2015) that (i)TPS has initiated proposal to establish one Gauge and Discharge (G&D) observation site at foothills of Purnagiri temple, which will also give an advance warning for preparedness to deal with floods. Points raised at sl. Nos. (ii), (iv) and (v) shall be further deliberated upon. As regards point no. (iii), emergency medical plan was being included in DMP.

Regarding observation on steps taken by power stations other than TPS to set up advance warning system, NHPC stated (August 2015) that the importance of advance warning system which was a characteristic of storage projects, remains an additional knowledge on which no further corrective action was possible to be taken by the power station. Further, some of NHPC's power stations were in cascade and there was a proper co-ordination between upstream

and downstream power stations with respect to inflow. Therefore, a proper warning in advance was provided to the downstream projects. Wherever feasible, upstream G&D sites shall be established.

The reply is, however, to be seen against the fact that flood forecasting and warning was important to minimize damage potential from floods. Accurate flood forecasting and advance warning are aimed for providing valuable time to the people and to civil authorities in taking preventive measures like evacuation, relief and rehabilitation measures, preparedness for flood fighting by engineering authorities and thus mitigating losses from floods.

MoP agreed (August 2015) that advance warning system as recommended by Audit should be installed in all hydro projects.

6.5 Non-compliance of guidelines of Central Water Commission

Dam Safety Organisation of Central Water Commission (CWC) issued guidelines for development and implementation of EAP for dams in May, 2006. These guidelines should be followed during development and implementation of EAP for dams. However, the following CWC guidelines were not followed/ complied by the power stations, (except Indira Sagar) selected for performance audit, while preparing EAP for dam.

(i) The EAP should include a section that is signed by all parties involved in the plan, where they indicate their approval of the plan and agree to their responsibility in its execution. Including the approval signatures is essential in an EAP, as it assures that all parties involved are aware of and understand the EAP and agree to do their assigned roles, as soon as an emergency takes place.

(ii) The plan should designate a spokesperson to disseminate information. The news media, including radio, television and newspapers should be utilized to the extent available and appropriate.

(iii) Prescribed formats for emergency event report, earthquake damage report, *etc.*, to be used for recording various emergency situations and unusual occurrences.

NHPC accepted the Audit observation and stated (February 2015) that Draft EAP as per the CWC format had since been circulated to all power stations. The same shall be finalised by respective power stations shortly taking care of all the necessary compliances. NHPC further stated (August 2015) that EAPs for dams/ barrages of six NHPC power stations namely Chamera-I, Chutak, Nimmo-Bazgo, Dulhasti, Uri-II and Tanakpur had already been completed. Draft EAPs of other power stations have also been completed and shall be finalised within six months. Input from dam break analysis shall be incorporated wherever available and shall be updated.

SJVN stated (August 2015) that new Emergency Preparedness Plans (EPP) for NJHPS covering these aspects had been prepared and submitted for the approval of Management on 31 May 2015.

The SJVN Management need to approve the new EPPs on priority in line with CWC guidelines.

6.6 Lapses noticed in dealing with flood of June 2013 in DGPS and TPS of NHPC

In the intervening night of 16 and 17 June 2013 a devastating flood occurred in Uttarakhand which created disastrous situation in all complexes of DGPS. TPS also suffered damages due to this flood.

Audit examined the operational conditions prevailing before the flood of 16-17 June 2013 with reference to codal provisions and observed that both the power stations overlooked various codal requirements, compliance of which could have mitigated the adverse impact of the disaster. Power station-wise observations are as under:

6.6.1 DGPS of NHPC

DGPS was constructed with design flood of 3210 cumecs. Dhauliganga Dam was built on Dhauliganga River (5 Km upstream of confluence of Dhaulganga and Kali rivers), while water from the turbines was discharged through Draft Tubes (DTs) into a common tail race tunnel which in turn discharges water into Elagad nallah immediately upstream of its confluence with river Kali.

During the flood of 16-17 June 2013, despite maximum discharge 2051.72 cumecs as against design flood of 3210 cumecs, substantial damages occurred to the power station components *viz;* power house was submerged up to half the level of office floor (EL 1045 m) and there was heavy accumulation of silt on all the floors[23] the outlet of Tail Race Tunnel (TRT) was choked, four pole structure near the sub-station was washed away; hence grid power supply to power house was not available.

Dhauliganga Reservoir

Flooding in Dhauliganga Power House

23 i.e. Spherical valve floor (EL 1025 m), turbine floor (EL 1029 m), Intermediate floor (EL 1033 m) and Generator floor (EL 1039 m) and office floor (EL 1045 m)

Flooding in Dhauliganga Power House

Besides, eight blocks of B-type quarters (48 quarters) were completely washed away, C and D type quarters, field hostel, co-operative store, nursery school, workshop, colony roads, Central Industrial Security Force (CISF) colony and central store at Dobat suffered severe damages. In this regard NHPC informed MoP immediately after the disaster on 17 June 2013 that due to cloudburst and heavy unprecedented rainfall in upstream reaches of Dharchula area of Pithoragarh District during last two days and subsequent flood in river Kali, water entered the TRT and all systems of powerhouse had submerged in the early hours of 17 June 2013. Besides, a team from NHPC Corporate Office, consisting of Executive Director (Projects), Executive Director (Commercial) and GM (Design and Engineering) who visited the power house site and colony areas of DGPS on 19 and 20 June 2013, submitted its report on 21 June 2013; wherein it mentioned the extent of damages and restoration works required to be carried out. In addition, DGPS prepared (21 June 2013) a report on sequence of events. The reports did not critically examine the sequence of events and adequacy of efforts to mitigate the impact of flood. Restoration activities started from July 2013 with dewatering of power house and three out of four generating units of DGPS were re-commissioned in May-June 2014. Unit no. 1 was put on generation on 22 May 2015.

Audit examined the actual reservoir operations conditions with reference to provisions prescribed in Reservoir Operation Manual (ROM) and sequence of events that had taken place in power house just before the flooding and observed the following lapses:

(i) Against the requirement of ROM, DGPS did not have any Gauge & Discharge (G&D) site located upstream to provide 2 hour advance information. The Feasibility Report (FR) of DGPS had also proposed[24] the need for installation of one or two automatic warning stations in the upstream reaches of Dhauliganga. Further, a gauge site was also required to be maintained at outfall of the TRT as per ROM and readings taken at half hourly intervals during monsoon season were required to be communicated to control room on the dam top. DGPS, however, stopped keeping G&D data in respect of site at outfall of TRT (Kali River) after June 2012 without recording any reason.

(ii) ROM prescribed maintenance of reservoir level at Minimum draw down Level (EL 1330 m) during monsoon period (from 1 June to 15 October) in order to minimize the sediment accumulation in live capacity zone of reservoir as well as for management of flash flood. Against this, the reservoir was maintained around Full Reservoir Level (*i.e.* 1345 m) right from start of monsoon period on 1 June till the date of flooding on 16 June 2013, except on 11 and 12 June 2013 when it was 1338.80 m and 1337.49 m, respectively.

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*24 **Based on study of stream flow records at both Chhirkala and Tawaghat, it was concluded that during high floods, the increase in discharge in Dhauliganga was very fast, which could be even faster during extreme floods. As per FR, the automatically recording station consisting of a pressure sensor at the bottom of the river in an upstream reach could be connected to a tele metering system that could transmit data on the river level continuously or only when the water level exceeds a critical height. Transmission of the signals from the field station to the receiving station could be arranged via satellite or via radio link.***

(iii) ROM provided that during monsoon period, the gauges should be observed at an interval of every half hour. Against this, the gauges were being observed at an interval of two hours. Silt level showed increasing trend between 2200 hr on 15 June 2013 (975 ppm) and 0200 hr on 16 June 2013 (1182 ppm); and at 0400 hrs (2450 ppm), it was recorded more than twice the level recorded at 0200 hrs, still the next measurement was taken after two hours**.**

Flood water discharge form Radial Gate

(iv) Flushing operations due in May and June 2013 as per provisions[25] of ROM were not carried out despite the fact that till the date of flood (16-17 June 2013) the condition laid down in ROM, for carrying out flushing in June month, of discharge exceeding 150 cumecs was existing from 09 June 2013 to 11 June 2013. ROM further provided that if a flood of magnitude of 500 cumecs occurs, the sediment flushing operation should be conducted. However, despite the fact that river inflow was more than 500 cumecs continuously since 0100 hours of 16 June 2013, DGPS started flushing from 0900 hrs of 16 June 2013 only.

Picture showing the intensity of Flood

Damage to Dhauliganga dam site due to flood

25 First silt flushing should be done between 1st May and 31st May when discharge exceeds 110 cumecs; and if discharge does not exceed 110 cumecs then flushing should be carried out on 31 May irrespective of discharge. Second flushing should be done between 1st June and 30 June when discharge exceeds 150 cumecs; and if discharge does not exceed 150 cumecs then flushing should be carried out on 30th June irrespective of discharge.

(v) DMP of DGPS provided that in the situation of flooding of power house, maintenance staff should be informed by operation in-charge for lowering of DT gate[26] and as soon as the gate is lowered, the DT drain valve should be opened. However, from the sequence of events recorded in power house just before the flood, it was noticed that at any stage maintenance staff was not asked by operation in-charge to lower the DT gates. Consequently, water entered the power house from TRT and damaged it.

NHPC stated (August 2015) that (i) The G&D site had been re-established, 5 km upstream of dam w.e.f. 01 June 2015 and the discharge readings recorded regularly. Regarding G&D site at outfall of TRT (Kali River), the same was discontinued as it was not much of relevance for Power Station; (ii) The reservoir level at DGPS was maintained keeping in view generation constraints and inflow of river. However the Power Station has been cautioned to maintain level as per ROM; (iii) A parallel silt measurement method in addition to filtration and drying method which was capable of indicating silt at half-hourly interval has been set up; (iv) After restoration of the plant, all the flushings have been done as per the ROM guidelines and the same shall be ensured for future also; and (v) In Power Station, DT gates were provided for maintenance purpose and not for preventing flooding of power house. Even if DT gates were lowered, there were other galleries / openings from which water would have entered in power house. There was no protocol to lower the DT gates. Nevertheless, instructions have been issued to lower DT gates in high flood conditions as a measure of abundant caution. Since the water level rose very abruptly, there was no reaction time left to lower the DT gates as the kind of flash situation was unprecedented. The attention of the operation personnel at that moment got engaged in de-energizing the line circuit and other electrical installation and to escape to safety from real life hazard. In the Exit Conference (August 2015), it was added that provisions of ROM had nothing to do with disaster as they related to Dhauliganga river while the TRT from where water entered into the Power House opened in Elagad nallah.

Reply is to be viewed against the facts that (i) maintaining gauge site and taking half hourly readings at outfall of TRT was a requirement of ROM and therefore cannot be treated as irrelevant. (ii) CEA in March 2007 had recommended closing of DT gates to avoid flooding of Hydroelectric stations which had been included in the DMP (November 2007) of DGPS. Therefore, DT gates were required to be lowered as per the protocol prescribed in the DMP of DGPS (iii) From the daily Dam log it was seen that the water inflow increased abruptly from 579.14 cumecs at 06:00 hours (generation was stopped at 06:20 hours) to 1008.2 cumecs at 20:00 hours on 16 June 2013, *i.e.* water inflow almost doubled in 14 hours and flooding of

26 Draft tube is located between lower ring of turbine and tail race. It conveys water after discharge from runner to tail race tunnel. Draft tube (DT) gates are provided for isolating the Power house and tail pool before taking maintenance of the turbine. The DT gates are provided with hoisting mechanism. Draft Tube gate is kept closed, when respective turbine is in maintenance. Four Draft Tube gates for opening size of 3.8 m x 3.0 m, were provided in DGPS for preventing backflow of water from tail race side. For operation of four DT gate, four electrically operated 10 Tonne capacity Rope Drum hoists was also provided. Total lift of gate is 21.0 meters, while Lifting & Lowering speed of these gates was 0.5 meter per minute. Thus, lifting and lowering time for DT gate worked out to 42 minutes.

powerhouse happened six hours later *i.e.* at 02:00 hour of 17 June 2013. Thus, there were ample indications and time available for the Management to lower the DT gates.

CEA recommended (August 2015) that utilities may undertake suitable measures to avert the flooding of powerhouse.

6.6.2 TPS of NHPC

TPS was designed for passing flood of 7.02 lakh cusecs[27] (or 19879 cumecs). However, while negotiating the flood of 5.34 lakh cusec (or 15121 cumecs) on 17 June 2013, the power station suffered major damages and its power channel was filled with silt. To rectify the damages and clean the power channel, complete shutdown of TPS had to be taken from 11 January 2014 to 28 March 2014. Audit observed following lapses on the part of TPS in dealing with flood of June 2013:

(i) **Non-availability of system for advance information**

Regulation Rules of Tanakpur Barrage as modified in August 1999 required that a forecasting station at Pancheswar be installed before monsoon-2000. Corporate office of NHPC again instructed (March 2007) TPS to install discharge measuring system in the catchment areas of the project to provide advance warning on the occurrence of flood in the river so that timely action for shut down of the power house could be taken. However, TPS had not installed any such system upstream of barrage.

NHPC stated (August 2015) that available gates were able to pass full flood water without any problem. Power Station was shutdown timely and no damage to generating equipment had occurred. NHPC, however added (August 2015) that the G&D site earlier proposed at Pancheshwar has been reviewed and same was now proposed at foot hills of Purna Giri Temple, which was about 20 km from Tanakpur Barrage along with telemetry system to get real time discharge data.

Reply is to be viewed against the fact that even though available gates were able to pass full flood water, the gate operation was not ensured strictly as per Tanakpur Barrage Regulations as discussed in the subsequent para due to which silt passed into power channel. For clearance of silt TPS had to incur an expenditure of ₹2.79 crore.

(ii) **Non-compliance to the observation of Dam Safety Team**

Dam Safety Teams carrying out inspections between May 2012 and April 2013 pointed out certain locations (as per details given in ***Annexure 6.1***) at left afflux bund[28], right afflux bund, and river bank to be more vulnerable to severe erosion related damages; and, therefore, advised repairs on those locations to be completed before onset of monsoon. TPS, however, did

27 **1 cumec = 35.314 cusec**

28 Afflux bunds are provided on upstream and downstream to afford flood protection to low lying areas as a result of floods due to afflux (high rise in water) created by the construction ofbridge/structure.

not carry out repairs before onset of monsoon-2013. As a result TPS suffered major damages during flood of June 2013 on the following locations:

(i) The left afflux bund got extensively damaged between RD 200 m and RD 260 m. All the measures like cladding, toe wall, launching apron, *etc*. in this reach to soften the impact of the water current were washed out;

(ii) Change in course of river upstream of tail of the right afflux bund resulted in erosion of right bank as well as spilling of water through Sharda Ghat Bazar to the low lying areas.

(iii) Erosion on the right bank of river in the downstream of barrage along the alignment of power channel in the Military Engineering Service area. Five spurs[29] along with gabions / wire crates[30] between the spurs were completely washed away near RD 4650 m to 4880 m.

Thus, if the repairs suggested by Dam Safety Team had been carried out promptly, damages suffered by TPS while dealing with flood of June 2013 could have been mitigated.

NHPC stated (August 2015) that the right afflux bund and left afflux bund of the Tanakpur Barrage are made up of earthen material. Under such high flood condition, erosion of these bunds cannot be prevented. Repair of these bunds were undertaken during lean inflow period. To repair, the barrage had to be kept empty and thus shutdown of the power station was taken during that period. In lean inflow period, generation loss was minimum.

Reply is to be viewed against the facts that (i) TPS was designed for passing flood of 7.02 lakh cusecs, the flood of 2013 was only 5.34 lakh cusecs. (ii) Failure of Management to rectify defects pointed out by Dam Safety Team before onset of monsoon defeated the very purpose of the Dam Safety Inspection. Defects pointed out by Dam safety team in May 2012 remained unrectified for more than one year including the lean season of 2012-13. Repairs were undertaken subsequently in the lean season of 2013-14. Considering the criticality of work, it was desirable to expedite the works before the onset of monsoon 2013 to minimise the potential damages due to floods.

(iii) Non-operation of gates as per prescribed guidelines

Tanakpur Barrage Regulation Rules laid down following criteria for operation of barrage gates:

- Up to 1800 cumecs under sluice (1 to 5 and 19 to 22) bays to be operated
- Between 1800 cumecs and 5660 cumecs, inflow regulated through Barrage gates (6 to 18 gates)
- Beyond 5660 cumecs, all gates fully operated.

29 Spurs are constructed for protecting the river banks by keeping the flow away from it.

30 Walls constructed by filling large galvanized mesh wire with rocks. Flexibility of a Gabion structure allows it to with-stand pressure without deforming cracking or braking as in case of concrete or other material

Audit, however, observed that during flood of 17 June 2013, the gate operation was not done as per above guidelines. Though river inflow increased to 5788 cumecs at 0700 hrs on 17 June 2013 and reached up to 15140 cumecs at 0000 hrs on 18 June 2015 all gates were not operated as per rules. Gate nos. 3 and 22 were not opened and remained closed throughout 17 and 18 June 2013. Opening of gate nos. 1 and 2 was important for clearing silt deposited in front of Head Regulator (intake structure). However, gate nos. 1 and 2 were not operated fully. Consequently, silt deposited in front of Head Regulator passed into power channel when generation was restored on 19 June 2013 after passing of flood. TPS had to take complete shutdown of power station from 11 January 2014 to 28 March 2014 to clear 1.32 lakh cum of silt deposited in the power channel at a cost of ₹2.79 crore.

TPS stated (December 2014) that (i) gate no. 3 was closed as the same was under maintenance, gate no. 22 could not be operated due to technical snag, opening of gate no.1 was done in restricted way due to ongoing civil work to treat cavity at the downstream side of control room and gate no. 2 was opened beyond 1 meter up to 6 meter as per requirement. NHPC added (August 2015) that gate opening was sufficient to pass the actual flood as there was no over topping of the gates as such the damages were not due to non operation of gates.

The reply is to be viewed against the facts that (i) TPS did not ensure that before onset of monsoon all barrage gates were in working condition and all works in barrage area, which could have restricted gate operation, were completed before start of monsoon season. (ii) Though there was no overtopping of gates, the power station suffered damage due to non-operation of gates in accordance with the provisions of Tanakpur Barrage Regulation Rules resulting in deposition of silt at head regulator and subsequent passage into the power channel.

6.7 Not conducting mock drills for various emergency situations

As per DMPs of power stations, mock drills to deal with various emergency situations were to be conducted at regular intervals. Details of possible disastrous situations on which various power houses did not conduct any mock drill during last five years ended 31 March 2014 are given below:

Table 6.2

Emergency situations on which power stations did not conduct mock drills

Sl. No.	Name of Power station and CPSE	Emergency situation on which no mock drill was conducted during five years ended 31 March 2014
1	Bairasiul (NHPC)	Bomb threat, attack of terrorists, flooding of power house and earthquake
2	Tanakpur(NHPC)	Bomb threat, attack of terrorists, flooding of power house and earthquake
3	Chamera-I(NHPC)	Flooding of power house and earthquake

Sl. No.	Name of Power station and CPSE	Emergency situation on which no mock drill was conducted during five years ended 31 March 2014
4	Uri-I(NHPC)	Fire threat, flooding of power house and earthquake
5	Dhauliganga(NHPC)	Flooding of power house and earthquake
6	Teesta V(NHPC)	Bomb threat, attack of terrorists, flooding of power house and earthquake
7	Chamera-III(NHPC)	Bomb attack, fire threat, attack of terrorists, flooding of power house and earthquake
8	Chutak(NHPC)	Bomb attack, fire threat, attack of terrorists, flooding of power house and earthquake
9	NJHPS(SJVN)	Flooding of power house and earthquake
10	THPS(THDC)	Flooding of power house and earthquake
11	ISP(NHDC)	Earthquake

NHPC stated (February 2015) that in the ensuing financial year *i.e.* 2015-16 all relevant mock drills would be organized as per set out norms and guidelines.

SJVN stated (August 2015) that mock drill on flood was conducted on 15 January 2015 and on 07 July 2015 in association with Army and District Administration.

The corrective action taken by SJVN in the year 2015 is appreciated and its continuance would be verified in future audits.

THDC stated (March/August 2015) that specific mock drills to deal with situations like flooding in powerhouse, landslides and earthquakes were in planning process. However, regular mock drill to deal with security breach and fire hazards were being organised from time to time.

NHDC noted the Audit observation for future compliance.

MoP also agreed (August 2015) that mock drills for all possible disasters should be conducted at regular intervals by all the CPSEs. Besides, every project may have a team in place trained in disaster management.

6.8 Lack of training programmes on disaster management

For effective implementation of any DMP, it is important that various stake holders are consistently sensitized through periodic training programmes, workshops, seminars, *etc.* Audit, reviewed the provisions of DMPs of power stations selected for performance audit as regards training on Disaster Management and observed that Nil to five number training programmes on disaster management and Nil to 45 number training programmes on fires safety, first aid, *etc.* were organised by various power stations during 2009-14 as per details given below:

Table 6.3

Training programmes conducted by power stations

Name of Power Station	Provision in DMP regarding training programmes on Disaster Management	Number of training programmes conducted during 2009-2014		Remarks
		On Disaster Management	On Fire safety, first aid etc.	
Bairasiul	Training and awareness of Fire and Safety equipments will be given to the maximum number of employees of power house and dam through any specialised agency twice in a year	Nil	Nil	
Tanakpur		4	10	There was no provision in DMPs regarding training on management of disaster caused by natural calamities
Chamera-I		2	1	
Dhauliganga		3	3	
Teesta-V		3	Nil	
Chamera-III		Nil	Nil	
Chutak		Nil	Nil	
Nathpa Jhakri	DMP did not contain provision regarding regular training of employees on disaster management	Nil	16	No training programme was conducted to deal with disaster caused by natural calamities.
Tehri Hydro	Every year once before onset of monsoon	5	45	
Indira Sagar	There was no provision in DMP regarding frequency and number of training programmes to be conducted on disaster management.	4	Nil	Only 7 employees were given training in four training programmes got conducted through outside agencies.

NHPC stated (February 2015) that in the ensuing financial year 2015-16, all the relevant training programmes would be organised as per set norms and guidelines in TPS and in other power stations.

SJVN stated (August 2015) that training program on Safety in plant and disaster management was organized on 06 and 07 August 2015 through National Safety Council.

NHDC stated (August 2015) that the overall updation of the DMP has already been initiated. The provision for frequency and number of training programme would be suitably included in the updated plan.