

## **Minutes of the twenty seventh meeting of National Committee on Dam Safety (NCDS) held in CWC, New Delhi on 27.9.2005**

The 27<sup>th</sup> meeting of the National Committee on Dam Safety (NCDS) was held on 27 September 2005 in Sewa Bhavan, R.K.Puram, New Delhi under the Chairmanship of Shri R.Jeyaseelan, Chairman, CWC & NCDS.

List of officers / representatives of various States / Organizations who attended the meeting is given at Annex I.

### **27.0.0 Opening Remarks**

27.0.1 At the outset, Chairman welcomed the members & all other representatives present. He expressed his happiness on the good monsoon which resulted in the reservoirs filling upto their capacities. He emphasized the importance of ensuring safety of dams by dam owning States & Agencies and advised the participants to utilize the opportunity provided at this meeting to express their views on various issues. He referred to some of the recent failure of small dams in Andaman & Nicobar, Maharashtra and Gujarat and expressed concern on the health status of dams under distress.

27.0.2 Touching briefly on the issues to be discussed, Chairman requested Member (D&R) and Vice Chairman of the Committee to conduct the proceedings, as he was required to attend on urgent matters at the Ministry of Water Resources. Thereafter, as desired by the Vice Chairman, Chief Engineer (DSO), Member Secretary of NCDS, took up the agenda items.

### **27.1.0 Confirmation of the minutes**

Chief Engineer (DSO) and Member Secretary, NCDS informed that the minutes of the 26<sup>th</sup> meeting were circulated to all members vide letter No.3/19/NCDS/DSM/2003/11-15 dated 7.1.2005. Comments on the same from some of the States/Organizations were received. As no major changes have been suggested, the minutes were taken as approved and confirmed.

### **27.2.0 Issues relating to "Dam Safety Assurance, Rehabilitation and Disaster Management Project (DSARDMP)"**

27.2.1 For information of members of the Committee, Chief Engineer (DSO) informed that the Dam Safety Assurance, Rehabilitation and Disaster Management Project (DSARDMP) was proposed to be renamed as 'Dam Rehabilitation and Improvement Project'

(DRIP) in keeping with the activities envisaged under this project. He informed that the Ministry of Water Resources had constituted two committees, viz. National Level Steering Committee (NLSC) headed by Secretary (WR) and Technical Committee headed by Member (D&R). In the National Level Steering Committee, the Principal Secretaries / Secretaries of the participating States are members. This Committee has been constituted to provide policy directions in formulation and implementation of the project and to review the physical and financial progress of the project. The Technical Committee has the following terms of reference:

- (i) to provide technical input to the steering committee
- (ii) to finalize the technical details of the project
- (iii) to coordinate with the implementing agencies of respective State Governments
- (iv) to review the progress of the project and
- (v) report to the National Level Steering Committee.

27.2.2 Thereafter, the views of the participating States were invited. The views of some of the States are as under:

Andhra Pradesh: Most of the criteria laid down by CWC for World Bank assistance have been fulfilled and the revised proposal is under submission.

Gujarat: The matter is under consideration at government level. Central Design Organization (CDO) has already communicated its views / comments to DSO (GERI) for further necessary action on the issue.

Orissa: The State is interested to participate in the project and a project proposal has been posed before MoWR for consideration.

Rajasthan: It has availed the assistance in Phase I. The proposal for the distressed dams has already been considered under RWSRP. The work on distressed dams is under progress as per recommendations of Dam Safety Review Panel (DSRP).

## **27.3.0 Review of National Scenario**

27.3.1 Member Secretary informed the Committee regarding the recent failure of dams in Andaman & Nicobar, Maharashtra and Gujarat. Thereafter, Mr. Ram Saran, Director (DSR) & Mr. M.K. Sinha, Director (FE & SA), who visited the dams and held site inspections with respective project authorities, were asked to apprise the Committee about the issues relating to failures.

### **27.3.2 Breaching of Dams :**

- 27.3.2.1 **V.K.Pur & R.K.Pur dams, Andaman & Nicobar:** Shri Ram Saran, Director (DSR), CWC informed the Committee that it was reported by the Public Works Department, Andaman & Nicobar Administration, Port Blair that V.K.Pur and R.K.Pur dams of Little Andaman had breached and suffered damages at certain places due to the earthquake that occurred on 26.12.2004. A two member Expert Team comprising of (1) Shri Ram Saran, Director (DSR) and (2) Dr.Naresh Kumar, Deputy Director, Embankment (E&NE), CWC visited both the Schemes. It was noticed that in R.K.Pur dam two prominent longitudinal cracks at the downstream face were observed for a length of about 160 m (from RD 115 m to RD 275 m) of the dam. Undulations were observed in the longitudinal direction on the crest of the dam due to differential settlements. The crest had also tilted / rotated in the downstream direction. In V.K.Pur Minor Irrigation Scheme, longitudinal cracks on upstream slopes and crest and transverse cracks near right abutment and near junction with the spillway had been formed. Longitudinal and transverse cracks varying from 2mm to 5mm had also occurred on the top portion of the dam. The right dyke had been very severely damaged due to earthquake. From RD 804 m to RD 738 m there were 2-5 cm wide and 66 m long longitudinal crack on the crest and also along the axis of the left dyke. A number of wide transverse and longitudinal cracks were present and dyke body is damaged in this reach. After the visit, an interim report about measures to be taken for restoration of the dams has been furnished to the Ministry of Water Resources, and the dam owning agency.
- 27.3.2.2 **Nand Gavan Dam, Maharashtra :** Shri M.K.Sinha, Director (FE&SA), CWC who visited the State, informed the Committee that there was heavy rainfall in the catchment area of Nand Gavan dam on 9.7.2005. As a result, the water level in the reservoir rose above the maximum flood level. The height of water flowing over the waste weir was about 3.50 m against designed level of 2 m and it seems collapse of waste weir wall occurred due to tremendous pressure on the wall. This discharge combined with the flood in Dhavanda caused considerable damage in downstream areas. Four villages are reported as affected and nine persons dead and five persons missing.
- 27.3.2.3 **Pratappura dam, Gujarat :** Shri M.K.Sinha, Director (FE&SA), CWC who inspected the site informed the Committee that on 1<sup>st</sup> July 2005 due to heavy rainfall (about 450 mm in 24 hours) in

the catchment, the 75 year old 16 ft (4.9 m) high 2530 m long Pratappura earthen dam got breached due to piping on account of excessive water level rise on account of inadequate spilling capacity. Regarding remedial measures & hydrological review, representative from Gujarat informed that action is being processed by the District Municipality Corporation, Vadodara.

- 27.3.2.4 Director (FE&SA) who visited both the dams informed the Committee regarding the failures of Nand Gavan Dam in Maharashtra and Pratappur dam in Gujarat and gave a brief presentation on the parameters of the dam and possible mode of failure.
- 27.3.2.5 **Idukki Dam, Kerala:** It was reported by KSEB that a change in the pattern of the movement of Idukki arch dam is noticed since last few years. A progressive upstream deflection of the crest of the dam is noticed and an uplift pressure up to 90% is noticed in some of the foundation drain holes. As per design, maximum deflection is 48 mm. (in maximum loading condition). Member from KSEB wanted to know remedial measures, if any, should the dam suffer deflections beyond the design limit. In response, Member (D&R) raised a few queries, viz. (i) whether the suspended plumb bob and the inverted plumb bob are in correct position (ii) whether the readings are taken properly; and (iii) in the 3D analysis carried out as reported by KSEB, whether temperature differentials were considered. He desired that a detailed report on structural behaviour should be sent to CWC for analysis and suggestion. It was informed that possibility of entrusting the study to the Norwegian consultants under the institutional cooperation program with CSMRS & NGI, Norway is being explored.
- 27.3.2.6 **Idamalayar & Sholayar dams, Kerala:** In continuation of the last meeting, representative from KSEB informed that reddish/blackish slurry is oozing out from the foundation drain holes of Idamalayar and Sholayar dams. Director, Engineering Geology Division, GSI, Chennai has been requested by the KSEB for inspection of the dams. Further, he reported that wetness on the downstream face and sprouting from a few points inside foundation gallery is noticed in respect of Sholayar dam. The total seepage is of the order of 300 lpm. No solution to the above problem has yet been found out. Member from Kerala was requested to send a detailed report to DSO of CWC on both the dams for scrutiny and suggestion of remedial measures.

27.3.2.7 **Salal (JK), Rangit (Sikkim) and Baira (HP) Dams:** It was informed by the representative from NHPC that erosion to silt excluder gallery/glacis observed during post monsoon inspection in case of Salal and Rangit dams have been repaired with epoxy mortar/HPC. Toe erosion observed in Baira dam has also been repaired with cement grouted boulder fill and toe protection with concrete blocks. No fresh cases of distress in dams, structural & operational deficiencies have been noticed since last meeting of NCDS.

27.3.2.8 **Kohira dam, Bihar:** Representative from Bihar informed regarding leakage in Kohira dam and stated that the matter has been referred to CWC. Director (DSR) in response said that some information was sought from the State Government and action will be taken after receipt of the information.

#### **27.4.0 Progress of implementation of the recommendations of the "Report on Dam Safety Procedures."**

27.4.1 Chief Engineer (DSO) informed the Committee that CWC Publications on the "Report on Dam Safety Procedures" (1987) and "Guidelines for Safety Inspection of Dams" (1986) are proposed to be revised / updated by incorporating the latest techniques & developments and the experience gained over the years. Comments / suggestions based on further experiences in the field of dam safety have been sought from the dam owning States / Organizations during the 26<sup>th</sup> meeting held in November 2004. As per records available, comments / suggestions only from Karnataka, Maharashtra and BBMB have been received. In this context, Member (D&R) informed that these publications were prepared with great effort after taking into account the various experience of dam owning agencies. He opined that it is high time that the publications should be revised and requested the members to send their comments / suggestions by 31 March 2006 positively so that further action could be taken.

#### **27.5.0 Dam Safety Legislation**

27.5.1 The importance of Dam Safety Legislation was once again impressed upon and members were requested to appraise the latest position of their respective States. Some of the States informed the NCDS as below:

Andhra Pradesh: Draft Dam Safety Act has been accepted by the Committee of Chief Engineers without any modification and recommended to Government of Andhra Pradesh.

Chhattisgarh : It has been submitted to the Government for consideration.

Gujarat: The Draft Act is under consideration of the Government.

Jharkhand: Draft Act is under active consideration of the Government.

Maharashtra: It has been intimated by the State that the draft will be finalized by the Law & Justice Department of Government of Maharashtra after the proposal of enactment is approved by the Cabinet.

Orissa: The State Government is considering actively to enact Dam Safety Legislation with some modification by providing penal clauses in the Draft Act.

Rajasthan: For obtaining the concurrence on Dam Safety Legislation, a Cabinet memo has been prepared and submitted to the Cabinet.

Uttar Pradesh : The proposal has been sent to Government and it is being processed at Government level with the assurance that it will be cleared by December 2005.

Kerala : Representative from Kerala informed that the Government of Kerala has enacted "The Kerala Irrigation and Water Conservation Act 2003." As per the Act "Kerala Dam Safety Authority" has been constituted for the surveillance, inspection and advice on maintenance of dams situated within the territory of the State.

All other members were requested to expedite action on this important issue.

## **27.6.0 Emergency Action Plans & inundation maps for downstream areas**

- 27.6.1 The importance of preparing Emergency Action Plans (EAP) and inundation maps was once again emphasized by the Chief Engineer (DSO). He also informed that in the last meeting Member (D&R) had stressed the importance and requested to speed up this work.

27.6.2 Chief Engineer (DSO) informed the Committee that as desired by the members and dam owning States, "Guidelines for developing and implementing emergency action plan (EAP) for dams" have been prepared by CWC and a draft copy has been circulated to all the member States/Organizations for views.

Suggestions / comments only from IMD, NHPC, Jharkhand, Karnataka & Uttar Pradesh have been received.

27.6.3 Member Secretary finally informed the Committee that most of the States in their view stated that the draft Guidelines were in order. It was, therefore, decided that the draft guidelines could now be treated as approved for circulation.

27.6.4 Representative from Kerala informed that a few engineers of KSEB have undergone training in remote sensing and GIS applications at National Remote Sensing Agency, Hyderabad. Further KSEB proposes to take up EAP of one project as a joint venture with NRSA, so as to develop required in-house expertise. KSEB has requested for financial assistance from the Centre for taking up these projects, and in response, Member (D&R) informed that it is not possible to provide financial assistance. He indicated that preparation of EAPs is an integral part of Dam safety aspect, and States / dam owning agencies are responsible for the safety of their dams and for developing & implementing EAP.

#### **27.7.0 Preparation of Data Book, Completion Reports, Operation & Maintenance Manual**

27.7.1 Member Secretary requested Director (DSM) to inform the Committee regarding the status of information received from different States. Director (DSM) informed that since the last meeting not much progress has been reported by States/dam owning Organizations. Present status related to dams of National Importance is given in Annex 2.

27.7.2 Members were requested to verify the status given and inform discrepancies, if any, for necessary modification. As reported by members from BBMB & NHPC, preparation of Data Books, Completion Reports and O&M Manuals are available for the dams under their respective jurisdictions. They were requested to make available the reports to DSM Dte., CWC. Bihar representative informed that O & M Manual for Phulwaria and Kohira dam have been prepared.

## **27.8.0 Dam safety activities and Inspection of Dams**

27.8.1 Director (DSM) informed that as per the "Report on Dam Safety Procedure", all the large dams must be inspected twice in a year during pre- and post-monsoon periods. State-wise / organization-wise annual consolidated report (Health Status Report) about the inspection of dams is required to be submitted to Dam Safety Monitoring Directorate, CWC. The consolidated report should be submitted on the format issued to all participating States. On the basis of deficiencies, dams may be classified as

Category –1 (Dams with major deficiency which may lead to dam failure)

Category–2 (Dams with rectifiable deficiency needing immediate attention) &

Category–3 (Dams with minor or no deficiency)

27.8.2 In the Health Status report, category number may be given in the remarks column. In the successive reports, an "Action Taken Report" for the dams of category 1 & 2 of the preceding report should also be given on the remedial measures taken for the deficiencies marked during the inspection.

27.8.3 Further it was informed by Director (DSM), that Health Status reports are still being received individual dam-wise from some States. The States/Organizations should submit consolidated reports for all the dams inspected during the year. It was pointed out that inspite of repeated requests, the Health Status reports are not being received from some of the States in time. The status is given in Annex 3. The above status of inspection maybe verified and discrepancies, if any, may be intimated.

27.8.4 Member (D&R) emphasized the importance of periodical inspection and requested all the members to be regular in pre- & post-monsoon inspections. He suggested that pre- & post-monsoon inspections for 2005-06 should be completed by December 2005 and the consolidated report sent by March 2006.

## **27.9.0 Safety review of large dams**

27.9.1 The States and dam owning organizations have to review safety aspects of all the large dams once in 10 years by an independent review panel. As per the information available, Andhra Pradesh, Madhya Pradesh, Orissa, Rajasthan, Tamil Nadu and BBMB have formed Dam Safety Review Panels (DSRP).

27.9.2 Position of States / dam owning agencies was reported as under:



NHPC : It was reported by the representative from NHPC that external expert panels are being constituted on need basis. He further informed that Chamera – I dam completed 10 years of service. Its safety review has been conducted by external panel of experts.

Gujarat: Representative from Gujarat informed that reconstitution of independent DSR Panel is in the process of finalization at CDO, Gandhinagar.

Maharashtra: Did not attend the meeting. However, information was received through mail that about 900 dams are identified for review. It is proposed to form 3 DSR Panels. Apart from this, forming 3 DSR Panels under MWSIP is under finalization.

Orissa: Representative from Orissa stated that three expert panels have been formed. The panel so far has inspected 38 dams out of 121.

BBMB : It was informed by the representative from BBMB that the 2<sup>nd</sup> dam safety review panel has inspected & reviewed all the projects under BBMB. The detailed reports have since been received in CWC. He informed the Committee that the structural review of Bhakra dam was got examined by CSMRS, New Delhi using a ROV (Remote Operated Vehicle). The dam is found to be in excellent condition.

27.9.3 Member (D&R) desired that the outcome of the review carried out by DSRP may be furnished to CWC. He also opined that other States/dam owning agencies may also consider review of safety aspects of dams by appointing DSRPs, if not already done. Some of the members informed that the Dam Safety Review Panel (DSRP) proposal has been sent to their respective governments for consideration and approval. Member (D&R) requested States to expedite formation of DSRP.

27.9.4 Representative from Tamil Nadu requested for financial help for safety review of large dams and to meet the expenditure for establishing dam safety cells. In this regard Member (D&R) reminded that the 'Dam Rehabilitation and Improvement Project' (DRIP) through World Bank assistance is getting activated and Tamil Nadu, which is a participating State, may also participate and avail of World Bank assistance for conducting its dam safety activities.

## **27.10.0 Monitoring safety aspects of inter-State dams by Sub Committees**

27.10.1 The following three Sub-committees had been constituted by NCDS to monitor and review the safety aspects of inter-state dams. The information in respect of their activities is as under:

**(a) Mahanadi River System:** It was informed that Government of Chhattisgarh has nominated its representative to the sub committee. As such it was advised that the sub committee may meet at an early date.

**(b) Parambikulam Aliyar Project:** Representative from Kerala was of the view that the three dams in Parambikulam group are situated inside Kerala territory. Hence, safety aspects of the upstream dams are required to be monitored jointly by Kerala & Tamil Nadu and as such the sub-committee for PAP should be continued. Member from Tamil Nadu, on the other hand opined that as the owner of the dams, they are conducting periodical inspections as per laid down procedures. As such it is felt this sub-committee be disbanded. In this context, Member (D&R) opined that the matter can be discussed separately.

**(c) Subarnarekha River System:** It was reported that Governments of Jharkhand & West Bengal have nominated their members to the sub-committee. It was, therefore, suggested that the sub-committee should meet at an early date.

## **27.11.0 Setting up of hydrological units in the States**

27.11.1 It was informed by Chief Engineer (DSO) that during every past meeting of NCDS, the States / dam owning agencies were advised to set up hydrology units to undertake hydrological review of existing dams. The present status of setting up of hydrology units in various States, as informed by the respective members, is placed at Annex 4.

27.11.2 In view of the importance, it was advised by the NCDS that separate Hydrology Units may be established immediately by the States / authorities owning dams and be strengthened where they are not functioning effectively. Members were again requested to verify the status and inform about the latest position in their States / Organizations so that the record can be updated.

- 27.11.3 Chief Engineer (DSO) informed the Committee that for carrying out dam break studies for preparation of Emergency Action Plans of all the dams, design flood of the dams are required to be reviewed. To start with, this exercise may be taken up for dams of National Importance. In the country there are 54 existing dams of National Importance and 16 are under construction. The PMFs of all these dams are required to be reviewed by respective owners so that action for EAPs could be initiated. The hydrological studies, therefore, assume greater importance and hence the setting up of / strengthening hydrological units in the States need to be expedited.

#### **27.12.0 Instrumentation of dams.**

- 27.12.1 Director (Instrumentation), CWC informed that in general, it had been observed that the instruments installed in the dams have either become obsolete or not working. As a result, monitoring the health status of dams is being carried out without structural behaviour information. He further informed that in the last meeting, a detailed report on the status of the instrumentation of dams has been called for from the dam owning authorities. The reports are still awaited.

- 27.12.2 Position of some of the States is given as under:

Gujarat: In this context, the representative from Gujarat stated that the present status of instruments is being called for from concerned SE/project officials. Consolidated reports will be submitted to CWC.

Maharashtra : Maharashtra informed through mail that instrumentation analysis reports are published by State DSO regularly. The abstract is being included in the annual health status report also. Suggestions on some of the issues had been sought for in their report. Director (Instrumentation) was asked to look into the matter.

Orissa: Representative from Orissa suggested for a training programme about (i) analysis of instrument data (ii) method of installing instruments in constructed dams where no instrument has been provided. It was suggested that the State engineers may participate in training programme scheduled to be conducted by CSMRS on this subject sometime by the end of this year.

Rajasthan: Representative from Rajasthan informed that different types of instruments for dams have already been installed. Some instruments are not working properly such as at Mahi, Rana Pratap Sagar dam for which studies are being conducted.

NHPC: Member from NHPC stated that report on status of instrumentation of dams has already been sent to CWC.

BBMB : It was informed by the Representative from BBMB that they have compiled instrumentation data, detailed analysis etc and they have been publishing a memo titled as "Annual Observation Reports" covering the period from 1<sup>st</sup> October to 30<sup>th</sup> September every year.

- 27.12.3 Member (D&R) desired that other States/dam owning organizations may also publish such reports on the instrumentation of dams and their behaviours.

### **27.13.0 National Register of Large Dams (NRLD).**

- 27.13.1 Director (DSM), CWC informed that National Register of Large Dams (NRLD) 2002 has already been circulated to all the members with a request to intimate discrepancies, if any. The number of large dams shown in some of the State Register of Large Dams differs from that recorded in the National Register of Large Dams. Also, since the publication of NRLD 2002, some dams under construction must have been completed, which need to be reported for revising the NRLD.

- 27.13.2 In this context Chief Engineer (DSO) referred to Nand Gavan dam, one of the large dams in Maharashtra, which breached during the recent flood, is not listed in the National Register of Large Dams (NRLD), 2002 as the information regarding this dam has not been received from the State Government. It was intimated by DSO, Nashik that this dam is maintained by Maharashtra Jeevan Pradhikaran and not by Irrigation Department and the information about the dam in the prescribed format was not received in time and hence the information could not be sent to include in NRLD 2002. Similarly, Indira Sagar dam which is a very large dam in terms of length & storage capacity has not been included in the NRLD. He opined that such information must be available with State DSO and made available to DSM Dte., of CWC irrespective of the fact whether they are owned by State Irrigation Department or any other organization.

Andhra Pradesh: Representative from Andhra Pradesh said that the list of projects had been communicated for inclusion in the list of NRLD.

NHPC: It was informed by the member from NHPC that details in respect of new additions for Chamera II, Dhauliganga and Dulhasti dam of NHPC have been intimated.

- 27.13.3 Members were requested to verify the salient features of large dams in their States carefully and send the updated list, including all the large dams maintained not only by the Irrigation Department but also by other organizations like municipality, public and private sector, completed as well as under construction, so that NRLD 2002 could be updated.

**27.14.0 Setting up of Management Information System (MIS) for dam safety.**

- 27.14.1 Director (Software Management), CWC informed that dams are valuable assets and the information in terms of various engineering data, health parameters and many other necessary aspects are required to be permanently stored for all the dams in the country. As such, need for a Management Information System (MIS) for dams is felt necessary.

- 27.14.2 Keeping this in mind, it was proposed to set up a MIS for covering all the large dams. In the 26<sup>th</sup> NCDS meeting, Director, Dam Safety Monitoring Directorate, CWC had requested the member States to send the engineering data of all the large dams located in their respective States in the format circulated. As per the records available, the response in this regard has not been encouraging.

- 27.14.3 In this connection representatives from some of the States informed the Committee as follows:

Andhra Pradesh: Setting up of MIS for dam safety is in progress.

Maharashtra: Most of the data are submitted to CWC by e-mail & in CD format.

Orissa: Engineering data for 19 dams have been sent to CWC.

NHPC: Data are being compiled and shall be supplied in a phased manner.

27.14.4 Members were requested to expedite action on this important issue.

**27.15.0 Discussions on other issues with the permission of the Chair.**

27.15.1 Maharashtra: (Received through e-mail) Maharashtra has 5 NI dams and over 1600 large dams, safety of which is the responsibility of the State Governments. However, it is suggested that safety of NI dams may be considered as National Safety. As such, the funds required for maintenance and safety of NI dams may be made available by the Central Government.

27.15.2 Orissa: Representative from Orissa informed that in the "Report on Dam Safety Procedures 1987" on page 116, point 10.8, it is mentioned that "The States shall arrange safety review of dams which are more than 15 m in height or which store 50000 acre ft. or more by an independent panel of experts once in 10 years. Matching financial grants shall be provided by the Centre towards expenditure incurred for establishment of the cell and safety review. The State shall, however, bear the cost of repairs, resulting from such reviews." The mode of amount of grant for this purpose may please be clarified as our State has already constituted 3 expert panels for safety review of large dams and the panels have started their inspection work in the meantime.

27.15.3 It was made clear to the dam owners that it is not possible to provide funds by CWC for safety aspects of dams to any of the States. The States / dam owning agencies are to provide budgetary support from the State budget to carry out dam safety activities in their respective States.

The meeting ended with a vote of thanks to the Chair.

SI No	State	Name of NI Dam	Status regarding preparation of		
			Data Book	Comp. Rep.	O & M Manual
1	Andhra Pradesh(4)	Nagarjunasagar	Available	Under Preparation	Under Preparation
		Sriramsagar	-do-	Under Preparation	Under Preparation
		Srisailem HE Project	-do-	Under Preparation	Under Preparation
		Somasila	In progress	Under Preparation	Under Preparation
2	Bihar	None			
3	Chhattisgarh (1)	Manimat (Hasdeo Bango)	Available	Not available	Not available
4	Gujarat (2)	Ukai	Available	Under Preparation	Under Preparation
		Karjan	Information yet to be received		
		Kadana	Available	-do-	-do-
5	Himachal Pradesh	Bhakra (H.P)	Available	Available	Available *
		Pong (H.P)	-do-	-do-	-do- *
		Chamera (H.P)	Available	Under Preparation	Available **
		Salal (J & K)	Available	Available	Available **
6	Jharkhand (3)	Maithon	Not available	Not available	Available ***
		Panchet Hill	-do-	-do-	Available ***
		Tenughat	-do-	-do-	Not available
7	Karnataka (12)	Krishnarajasagar	Available	Not available	-do-
		Tungabhadra	-do-	Completed	-do-
		Bhadra	-do-	Completed	-do-
		Linganamakki	-do-	Not available	-do-
		Malaprabha	-do-	Completed	-do-
		Hidkal	-do-	Completed	-do-
		Narayanpur	-do-	Not available	-do-
		Hemavathy Project	-do-	-do-	-do-
		Supa	-do-	Completed	-do-
		Mani	-do-	Completed	-do-
		Lakhya	Not available	Not available	-do-
		Almatti	-do-	-do-	-do-

\* Under BBMB

\*\* Under NHPC

\*\*\* Under DVC

8	Kerala (5)	Kakki(KSEB)	Available	Available	Available
		Idukki (KSEB)	-do-	Not available	-do-
		Cheruthoni (KSEB )	Not Available	-do-	Not available
		Kulamavu ( KSEB )	-do-	-do-	-do-
		Idamalayar (KSEB )	Available	-do-	Available
9	Madhya Pradesh (5)	Gandhisagar	Available	Under Preparation	Under Preparation
		Tawa	Available	Under Preparation	Available
		Bargi(RABS Project)	Available	Under Preparation	Under Preparation
		Indira Sagar	Awaited	-do-	Under Scrutiny
		Bansagar	Awaited	-do-	Awaited
10	Maharashtra (5)	Koyna	Available	Not Available	Not Available
		Paithan(Jayakwadi )	-do-	-do-	Available
		Ujjain	-do-	-do-	Not Available
		Isapur	-do-	-do-	Available
		Totladoh (Pench Hydel)	-do-	Available	-do-
11	Orissa (4)	Hirakud	Available	Completed	Prepared but approval awaited
		Balimela	Available	Not available	Not available
		Rengali	-do-	Completed	Prepared
		Upper Kolab	-do-	Completed	Not Available
		Indravati	Information yet to be received		
		Muran			
		Podagoda			
		Kapur			
12	Punjab (1)	Thein (Ranjit Sagar)	Under preparation. Will be available in 3 months time.	Not available	Not available
14	Rajasthan (2)	Rana Pratap Sagar	Available	-do-	-do-
		Mahi Bajaj Sagar	Not available	-do-	Available
15	Tamil Nadu (2)	Mettur	-do-	-do-	-do-
		Sholayar	-do-	-do-	-do-
16	Uttaranchal (1)	Ramganga	Information not available		
17	Uttar Pradesh (4)	Rihand	Available	Available	Available
		Matatila	-do-	-do-	-do-
		Rajghat	-do-	-do-	-do-
		Jamrani	-do-	-do-	-do-
18	West Bengal (1)	Kangsabati	Information not available		



Sl.No.	State/ Organisation	Position of Hydrology Unit	Remarks
1	Andhra Pradesh	Under active consideration of Government	
2	Bihar	Separate unit under CDO is functioning	
3	Chhattisgarh	Yet to be established	Under Review
4	Guarat	Separate unit under CDO is functioning	
5	Jharkhand	Yet to be established	
6	Karnataka	Separate Hyd. Unit attached to E-in-Chief(WRDO) is functioning	Not started
7	Kerala (Irrg.Dept)	Separate unit under CE (IDRB) is functioning.	
8	Madhya Padesh	Established under CE (BODHI)	
9	Maharashtra	Separate unit established under CDO.	Additional unit under consideration
10	Orissa	Separate unit is functioning.	
11	Punjab	Separate unit established under CDO.	
12	Rajasthan	Separate unit established.	
13	Tamil Nadu	Separate unit not available. But for 2 projects, cells have been established.	
14	Uttaranchal	Yet to be established.	
15	Uttar Padesh	Establishment of Hydrology Unit in Dam Safety Cell under process.	CWC is doing the review works of Rihand & Matatila dams.
16	West Bengal	Information not available.	
17	BBMB	Yes, separate unit available.	
18	DVC	Yes, separate unit available.	
19	NHPC	Yes, separate unit available.	

Annex 3

<b>SI No</b>	<b>State/ Organization &amp; number of dams</b>	<b>Whether report for 2004 is received or not</b>	<b>Remarks</b>
1	Andhra Pradesh (161)	Report is under preparation	Received for 2002-03
2	Bihar (24)	Received for 2004-05	
3	Chhattisgarh (247)	Received for post monsoon 2004	
4	Gujarat (470)	Received	
5	Jharkhand (46)	No information is available	
6	Karnataka (203)	Yet to be received	Received for 2002
7	Kerala (KSEB) (33 )	Consolidated report is under preparation	
8	Kerala (Irrg. Dept) (21)	Received	
9	Madhya Pradesh (793)	Received for 2004	
10	Maharashtra ( 1453)	Received	
11	Orissa ( 143)	Received	
12	Punjab (11)	No information is available	
13	Rajasthan (180)	Received	
14	Tamil Nadu ( 92 )	Received for 2004	
15	Uttaranchal (11)	No information is available	
16	Uttar Pradesh (113)	Received for 2003-04	
17	West Bengal ( 22 )	No information is available	
18	BBMB (2)	Received	
19	NHPC (6)	Received	
20	DVC ( 2 )	No information is available	