Minutes of the XX meeting of National Committee on Seismic Design Parameters (NCSDP) for River Valley Projects held on 23.09.2008 in CWC, New Delhi

General:

The XX meeting of the National Committee on Seismic Design Parameters (NCSDP) for River Valley Projects was held on 23rd September 2008 at 1030 hours in the Conference Hall, Central Water Commission, New Delhi. **Sh. A.K. Bajaj, Member (D&R), CWC and Chairman, NCSDP chaired the meeting**. The list of Members, project representatives and invitees who attended the meeting is given at **Annexure I**.

Meeting commenced with Sh. A.K. Bajaj, Chairman, NCSDP welcoming the participants and invitees of the meeting. This was followed by a brief introduction of the participants. Thereafter, Dr.BRK Pillai, Director (FE&SA), CWC and Member Secretary, NCSDP was requested to take up the agenda items for discussion.

Member Secretary informed the Committee that Dr. I.D.Gupta, Joint Director, CWPRS, has desired to make a presentation on "**Estimation of site specific seismic parameters for river valley projects**"; and this will be taken up first. He also said that the presentation is linked with the issue of **preparation of Guidelines for the Site Specific Seismic Studies**, and hence the last item of agenda note (i.e. Item no.20.4.0) too will be brought forward for discussion.

Item: **Presentation on "Estimation of site specific seismic parameters for river valley projects"; and discussion on "Guidelines for Site Specific Seismic Studies for River Valley Projects" (Item No. 20.4.0).**

Dr. I.D. Gupta, Joint Director, CWPRS, Pune made the presentation on "Estimation of site specific seismic parameters for river valley projects". He elaborated upon the issues of characterization of the strong earthquake ground motion, concepts of response spectrum, and the parameters governing ground motion at site. He touched upon issues involved in site specific design ground motion, and also made a comparison of **mean and mean + sigma spectral shapes** vis-à-vis **normalized spectral shapes**. Concluding the presentation, he stressed upon the need for obtaining site specific response spectrum (for given Magnitude (M), Source to Site distance (R) and Site-soil condition) directly at all natural periods using the Attenuation Relationship for the spectral amplitude at each natural period. He also

emphasized the need for obtaining response spectra of horizontal and vertical components of motion separately.

Complimenting Dr. I.D. Gupta, Chairman said that more time would be required for the Members to assimilate the presented information for further detailed discussion. He requested Member Secretary to circulate the copy of Dr.Gupta's presentation to all Members along with Minutes of the Meeting (*A copy of Presentation is accordingly given as* ***Annexure-II*** *for observations/ views of Members*). Dr. A.S.Arya said that the issue of appropriate methodology is a complex one because the outcome of studies shall be site-specific, while substantial variations in outcomes for projects of the same region is also not desirable. He also pointed out that no meeting ground on the issue could be achieved in the sub-Committee formed for preparation of Guidelines. Throwing further light on the issue, Member Secretary said that divergent views are existing in three key areas, namely (i) use of mean and mean + sigma spectral shapes against use of normalized spectral shapes, (ii) sole reliance on Deterministic approach against use of both Deterministic and Probabilistic approach, and (iii) the appropriate role and analysis of input parameters in deciding the MCE and Source-to-Site Distance values. He also pointed out that these vital issues have remained unresolved since 2001, despite their immense bearing on every discussion and decision of the NCSDP meetings.

The Chairman observed that such national level technical committee shall not continue to remain divided in thrust areas of its functioning. **Seeking cooperation from every Member, Chairman also requested Member Secretary to make efforts for narrowing down the differences on all issues related to preparation of the Guidelines.**

Item No. 20.1.0 Confirmation of the minutes of the XIX meeting

Member Secretary informed that the Minutes of the XIX meeting of NCSDP held on 11/04/08 were circulated to all Members; and no observation/ comment on the circulated Minutes have been received by the Secretariat. He also informed that relevant extracts from the Minutes of Meeting were also sent to the concerned project authorities. Shri S.K.Sengupta, Chief Engineer (DSO), CWC wanted to know if any response has been received from project authorities who were given conditional approval in the last meeting. Member Secretary informed that no such response was received, and accordingly these projects were also not included for discussion in the current agenda.

After a brief deliberation, the Committee decided that all conditionally cleared Projects of XIX meeting shall be asked to submit desired compliance at the earliest; and failing which, the conditional clearances of such projects shall be reviewed in next meeting of NCSDP. The Committee also confirmed the Minutes of XIX Meeting as circulated.

Item No. 20.2.0 Discussion on Spillover Projects from previous NCSDP Meetings

Item No. 20.2.1 Dibang H.E. Project, Arunachal Pradesh

Member Secretary informed that the Project is owned by **NHPC Ltd**. and the site specific study has been carried out by **IIT Roorkee**. Making a brief presentation of the study, project authority stated that the PGA value has been estimated as 0.38g; and the vertical spectral acceleration value has been recommended as 2/3 of corresponding horizontal value. The normalized horizontal response spectra has been furnished with multiplication factors 0.38g for MCE condition and 0.19g for DBE condition. It was also stated that as desired by the Committee in the XIX meeting, project authority have submitted the tentative schedule for L.E.T studies and M.T. studies. Detailing the ongoing studies, the project authority then requested for conditional clearance of the project.

Member Secretary pointed out that as per the schedule furnished by NHPC, the LET studies report is expected by December 2008 while MT studies may become final only by March 2009. Shri Sujit Das Gupta, Director, GSI, Kolkata was of the view that no change has happened in the status of site specific seismic study since previous meeting of NCSDP. Shri S.K.Sibbal, Director (CMDD), CWC pointed out that in the project report submitted by NHPC, it has been indicated that some of the adopted parameters are as per an earlier study report given by CWPRS. Shri S.K.Sengupta (CWC) said that this matter was discussed in the previous meeting as well and project authorities were expected to submit the CWPRS report to the Secretariat, even though it was not explicitly recorded in the Minutes. Replying to a query from the Chairman, project officials informed that the CCA clearance and Environmental clearance of the project are still awaited.

Concluding the discussion, the Committee decided to await the result of LET and MT studies before taking a final decision on site-specific seismic study report of IIT Roorkee. The Committee also requested Project authority to submit the site specific seismic study report conducted by CWPRS, and the design calculations done for the dam and its appurtenant structures using seismic parameters indicated in both the study reports.

Item No. 20.2.2 Pakal Dul (Drangdhuran) H.E. Project, Jammu & Kashmir

Member Secretary informed that site specific seismic study was conducted by IIT Roorkee for the project owned by NHPC Ltd. It was also informed that as desired by Committee during XVIII and XIX meetings, the project authority has submitted the methodology for arriving at the earthquake magnitude along with relation of the fault plane distance from dam site, and the same has been circulated to the Members.

Highlighting the recommendations of the site specific seismic study report, the Project authority informed that the MCE magnitude for the project falling under seismic zone IV has been identified as 7.5, and the estimated PGA value is 0.31g. The vertical spectral acceleration value has been recommended as 2/3 of the corresponding horizontal value. The normalized horizontal response spectra has also been given in the study report with multiplication factors of 0.31g for MCE condition and 0.16g for DBE condition. **After a brief deliberation, the Committee accorded approval to above seismic parameters and the response spectra as furnished in IIT Roorkee's study report [Report no.EQD-2001/2005-06 (March)].**

Item No. 20.2.3 Mankulam HE Project, Kerala

Member Secretary informed that the site specific seismic study was conducted by CWPRS, Pune for the project owned by Kerala State Electricity Board. It was also informed that in the XIX meeting the Committee suggested that the project authorities should revise the study as recommended values were on higher side. Accordingly the project authority has submitted the revised study report with modified peak ground accelerations for horizontal as well as vertical components of the motion.

Highlighting the modified recommendations of the site specific seismic study report, the Project authority informed that the MCE magnitude for the project falling under seismic zone III has been identified as 6.5. The MCE level PGA for the horizontal and vertical component of ground motion has been estimated as 0.199g and 0.155g respectively. The design basis earthquake (DBE) level of ground motion is recommended to be one half of the MCE level of ground motion. **After a brief deliberation, the Committee accorded approval to above seismic parameters and the response spectra as furnished in CWPRS Pune's Modified Study Report [Report no. 4485 (Sept. - 2007) modified vide Project Authorities letter no. PH/2/MKLM/2004/3092 dated 11.08.2008].**

Item No. 20.2.4 Alaknanda H.E. Project, Uttarakhand

Member Secretary informed that site specific seismic study was conducted by IIT Roorkee for the project owned by GMR Energy Ltd. It was also informed that the Committee during XIX meetings has requested the project authority to bring out the effect of overburden alluvium on which the barrage is founded. The compliance received from the project was circulated in the meeting (**Annexure-III**), and it was informed that the overburden is identified as soft rock with average shear velocity of 450 m/sec.

Highlighting the recommendations of the site specific seismic study report, the Project authority informed that the MCE magnitude for the project falling under seismic zone IV has been identified as 8.0, and the estimated PGA value is 0.36g. The vertical spectral acceleration value has been recommended as 2/3 of the corresponding horizontal value. The normalized horizontal response spectra has also been given in the study report with multiplication factors of 0.36g for MCE condition and 0.18g for DBE condition. **After a brief deliberation, the Committee accorded approval to above seismic parameters and the response spectra as furnished in IIT Roorkee's study report [Report no. EQD-3013/2007-08(Oct. 2007)].**

Item No. 20.2.5 Sapta Kosi high dam multipurpose project and Sun Kosi storage-cum-diversion scheme, Nepal.

Member Secretary informed that the site specific seismic study was conducted by CWPRS, Pune on request of JPO, SKSKI, Nepal. It was also informed that during XIX meeting project authorities did not attend the meeting and the study report could not be discussed.

Presentation on the site specific seismic study report was made by project authority. Highlighting the recommendations of the site specific seismic study report, the Project authority informed that the MCE magnitude for the project in Nepal has been identified as 8.1. The MCE level PGA for the horizontal and vertical component of ground motion has been estimated as 0.7202g and 0.4975g respectively for Sapta Kosi Dam, 0.6902g and 0.4457g for Sun Kosi Dam, 0.6144g and 0.4025g for Chhatra barrage, 0.6596g and 0.4036g for Sun Kosi Powerhouse, 0.5009g and 0.3370g for Chisapani Barrage as well as Kamala Dam.

Dr. Ashwani Kumar, Professor, DEQ, IIT Roorkee along with other members of IIT Roorkee were of the view that PGA values are on higher side. It was also informed that even for Tehri Project the PGA

has been taken as 0.5g only. Countering this view, Dr. I.D. Gupta (CWPRS) said that PGA values indicated in study report corresponded to Mean + Sigma level, and shall not be compared with the PGA corresponding to mean level. Shri Sujit Das Gupta (GSI, Kolkata) was of the view that different language was apparently being used, perhaps for stating the same statement; and this situation needed to be corrected at the earliest. Dr.Arya was of the view that the response spectra is more important from the point of view of designs, even then substantial variation in approved values of PGA for different projects of same region should be avoided. He also objected to presenting of PGA values up to fourth decimal places, when whole exercise is built up around uncertainties and assumptions.

Member Secretary wanted to know if PGA could be expressed at mean level without necessitating any change in response spectra furnished by CWPRS. He was further of the view that such an approach may narrow down variations in the recommended values of PGA by CWPRS and IIT Roorkee, and hence may be adopted till finalization of guidelines. Shri Manish Shrikhande (IIT Roorkee) said that the suggested approach would be possible if CWPRS presents its mean + sigma level response spectrum starting from 0.04 seconds instead of 0 second natural periods. This was agreed by Dr. I.D. Gupta (CWPRS) as well as other members of the Committee.

At the end of discussion, the Committee decided that the project authority should submit a revised study indicating expected (mean) value of PGA for the horizontal and vertical component of ground motion along with mean + sigma level response spectra for natural periods ranging from 0.04 seconds through 4.0 seconds.

Committee also decided that in future all site specific seismic study reports shall round off the estimated seismic design parameters to two decimal digits.

20.2.6 Kundah Pumped Storage H.E. Project (4x125MW), Tamil Nadu.

Member Secretary informed that Power Project is owned by Tamil Nadu Electricity Board, and herein old and existing reservoirs will be utilized as storages. The project authorities have not carried out site specific seismic study as the reservoirs are in existence for over 40 years and all major structures are under ground. However, in the XIX meeting the Committee had decided that the site specific seismic study for the project needs to be done by the project authorities. Member Secretary further informed that no compliance has been received from the project authority so far and moreover no project

representative has come for the meeting despite intimation. **Discussion on the Project was deferred by the Committee till submission of the Study Report by project authorities.**

Item No. 20.3.0 Discussion on New Projects

Item No. 20.3.1 Bhairon Ghati H.E. Project (3x 127 MW), Uttarakhand

Member Secretary informed that site specific seismic study was conducted by IIT Roorkee for the project owned by Uttarakhand Jal Vidyut Nigam Ltd.

Highlighting the recommendations of the site specific seismic study report, the Project authority informed that the MCE magnitude for the project falling under seismic zone IV has been identified as 8.0, and the estimated PGA value is 0.36g. The vertical spectral acceleration value has been recommended as 2/3 of the corresponding horizontal value. The normalized horizontal response spectra has also been given in the study report with multiplication factors of 0.36g for MCE condition and 0.18g for DBE condition [as furnished in IIT Roorkee's study Report no. EQD-3005/2006-07(May, 2007)].

It was pointed out by Secretariat officials that the project authorities have not submitted all the mandatory information as per standard proforma. **After a brief deliberation, the Committee requested project authority to submit full information as per standard proforma of NCSDP to the Secretariat. Decision on the project was deferred by the committee till submission of above compliance by the project authority.**

Item No. 20.3.2 Lakya Dam at Kudremukh Project site, Kartnataka

Member Secretary informed that site specific seismic study was conducted by CWRS, Pune for the project owned by Kudremukh Iron Ore Company Ltd. It was also informed that submission of full information as per standard proforma has not been complied with by the project authority. Also, no representative of the project was present in the meeting to present the case.

Discussion on the project was deferred by the committee till submission of full information by the project authority as per standard proforma of the NCSDP.

Item No. 20.3.3 Teesta H.E. Project (Stage-VI), (4x125 MW), Sikkim

Member Secretary informed that site specific seismic study was conducted by CWPRS, Pune for the project owned by LANCO Energy Pvt. Ltd.

Highlighting the recommendations of the site specific seismic study report, the Project authority informed that the MCE magnitude for the project falling under seismic zone IV has been identified as 7.5, with the estimated horizontal peak ground acceleration (PGA) of 0.521g and vertical PGA of 0.363g. The DBE level of response spectra and accelerograms is recommended as one-half of those for the MCE level of motion. The vertical seismic coefficient has been recommended as 2/3rd of the horizontal coefficient [as furnished in CWPRS study Report no. Report No.4456 (June - 2007)].

The Committee members were the view that the values appeared to be on the higher side apparently on account of their presentation in terms of Mean + Sigma level. **After brief deliberation, the Committee decided that the project authority should submit a revised study indicating expected (mean) value of PGA for the horizontal and vertical component of ground motion along with mean + sigma level response spectra for natural periods ranging from 0.04 seconds through 4.0 seconds.**

Item No. 20.3.4 Siang Lower H.E. Project, (8x300 MW), Arunachal Pradesh

Member Secretary informed that site specific seismic study was conducted by IIT, Roorkee for the project owned by JAYPEE Ventures Pvt. Ltd.

Highlighting the recommendations of the site specific seismic study report, the Project authority informed that the MCE magnitude for the project falling under seismic zone V has been identified as 7.5, and the estimated the PGA value as 0.36g for MCE condition and 0.18g for DBE condition. The vertical spectral acceleration value has been recommended as 2/3 of the corresponding horizontal value [as furnished in IIT Roorkee's study report Report no. EQD-2016/2005-06(April, 2006)].

On a specific query by Shri S.K.Sibal (CWC), it was informed by project authority that the maximum observed magnitude of earthquake from various sources around project has been 8.7, which was reduced to 8.0 in the studies. It was clarified by Member Secretary that no such direction has been recorded in the earlier minutes of the NCSDP.

Dr.Arya was of the view that observed magnitude should not have been reduced. Shri Sujit Das Gupta (GSI, Kolkata) also felt that the recommended values appeared to be on the lower side for the project region.

After a brief deliberation, the Committee decided that the project authority should submit a revised study without imposing any restriction on the magnitude of earthquake from various sources around the project.

Item No. 20.3.5 Dikrong/Pare H.E. Project,(2x55 MW), Arunachal Pradesh

Member Secretary informed that site specific seismic study was conducted by IIT, Roorkee for the project owned by North Eastern Electric Power Corporation Ltd.

Highlighting the recommendations of the site specific seismic study report, the Project authority informed that the MCE magnitude for the project falling under seismic zone V has been identified as 7.5, and the estimated the PGA value as 0.33g for MCE condition and 0.17g for DBE condition. The vertical spectral acceleration value has been recommended as 2/3 of the corresponding horizontal value [as furnished in IIT Roorkee's study Report No.P-2005-2006 (Nov - 2005)].

Shri S.K.Sibal (CWC) observed that the recommended values were even lower than those of Siang project in Arunachal Pradesh. Dr. I.D.Gupta (CWPRS) and Shri Sujit Das Gupta (GSI, Kolkata) were also of the view that indicated values were low, and therefore needed upward revision as agreed by the Committee in case of Siang Lower H.E. Project.

After a brief deliberation, the Committee decided that the project authority should submit a revised study with upward revision of recommended seismic parameters.

Item No. 20.3.6 Rammam H.E. Project (Stage-III), (3x40 MW), West Bengal

Member Secretary informed that site specific seismic study was conducted by IIT, Roorkee for the project owned by NTPC Hydro Ltd.

It was also informed that no representative of the project was present in the meeting to present the case. **The Committee therefore decided to consider the project in its next meeting subject to presentation of the study report by Project authority.**

Item No. 20.3.7 Halon Project, Madhya Pradesh

Member Secretary informed that site specific seismic study was conducted by CWPRS, Pune for the project owned Narmada Valley Development Authority, M.P. It was also informed that submission of full information as per standard proforma has not been complied with by the project authority. Also, the representative of the project was not prepared for making presentation of the case.

Discussion on the project was deferred by the committee till submission of full information by the project authority as per standard proforma of the NCSDP.

ADDITIONAL AGENDA ITEMS

Following Additional Item was taken up for discussion by the Committee with the permission of the chair:

Additional Item 1.0 Shrinagar H.E. Project, (4x82.5 MW), Uttarakhand

Member Secretary informed that site specific seismic study was conducted by IIT Roorkee for the project owned by Alaknanda Hydro Power Company Ltd.

Highlighting the recommendations of the site specific seismic study report, the Project authority informed that the MCE magnitude for the project falling under seismic zone IV has been identified as 7.5, and the estimated PGA value is 0.31g for MCE condition and 0.16g for DBE condition. The vertical spectral acceleration value has been recommended as 2/3 of the corresponding horizontal value. The normalized horizontal response spectra has also been given in the study report with multiplication factors of 0.31g for MCE condition and 0.16g for DBE condition. **After a brief deliberation, the Committee accorded approval to above seismic parameters and the response spectra as furnished in IIT Roorkee's study report [Report no. EQD-3021/2007/2008(April- 2008)].**

The meeting ended with vote of thanks to the Chair.

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Annexure -I

XX Meeting of National Committee on Seismic Design Parameters (NCSDP) on River Valley Projects

Date : 23.09.2008

Attendance

Sl.No.	Name & Address	Designation	Deptt./ Org.	Status/ Representative
I. Committee Members				
1.	Sh .A. K. Bajaj	Member (D&R)	CWC, New Delhi	Chairman, NCSDP
2.	Sh. S.K. Sen Gupta	Chief Engineer (DSO)	CWC, New Delhi	Member
3.	Sh. Sujit Das Gupta	Director	GSI, Kolkata	Member
4.	Dr. A.S. Arya	Prof. Emeritus	IIT Roorkee	Member
5.	Dr. Ashwani Kumar	Professor	DEQ, IIT Roorkee,	Member
6.	Sh. H.S. Mandal	Meteorologist, IMD	IMD Delhi	Member
7.	Maj. Genl. V. P. Srivastava	Director	Survey of India	Member
8.	Sh. K. C. Joshi	Geologist(Sr.)	GSI, Lucknow	Member
9.	Dr. I. D. Gupta	Jt. Director	CWPRS, Pune	Member
10.	Sh. Indra Raj	Commissioner, (Projects)	MoWR	Member
11.	Dr. B. R. K. Pillai	Director, FE&SA	CWC, New Delhi	Member-Secy. NCSDP
II. Special Invitees				
12.	Sh. S.K. Sibal	Director	CWC	
13.	Dr. M.L. Sharma	Assoc. Professor	DEQ, IITRoorkee	
14.	Sh. Manish Shrikhande	Assoc. Professor	DEQ, IITRoorkee	
15.	Dr. D. K. Paul	Professor	DEQ, IITRoorkee	
16.	Sh. O.P. Gupta	Dy. Director	CWC	
17..	Sh. V.C. Gupta	Dy. Director	CWC	
18.	Sh. Shibram Majhi	A.D.	CWC	
19.	Mrs. J.M. Peter	E.A.D.	CWC	
20	Sh. N. Saranga Pani	E.A.D.	CWC	
III. Project Representatives and Consultants				
21.	Sh. Imran Sayeed	Chief Geologist	NHPC	Dibang H.E. Project
22.	Sh. Y. K. Choubey	C.E. Designs	NHPC	Dibang H.E. Project
23.	Sh. Keshav Deshmukh	C.E. Designs	NHPC	Pakal H.E. Project
24.	Sh. P.K. Gupta	Chief Geologist	NHPC	Pakal H.E. Project
25.	Sh. V. Viswanathan Nayar	Dy. C.E.	Kerela Electricity Board	Mankulam H.E. Project
26.	Sh. U. V. Hegde	Associate Vice President	GMR Energy Ltd.	Alaknanda Project

27.	Sh. R. D. Deshpande	Senior Engineer	JPOSKSKI, Nepal	Sapta Kosi multipurpose project
28.	Sh. V. D. Ajmani	G. M. (CD&H)	UJVN Ltd.	Bhairon Ghati HEP
23	Sh. Anupam Mishra	Engineer	Lanco Pvt. Ltd.	Teesta (St. VI) HEP
24	Sh. O. N. Bajpai	Consultant	Jaypee Ventures Ltd.	Siang Lower HEP
25	Sh. S. S. Adhikari	Sr. Manager	Neepco Ltd.	Dikrong HEP
26	Sh. B. K. Kori	Ex. Engineer	N.V.D.A. (M. P.)	Halon Project
27	Sh. M. Shivaji	Director (Designs)	GVKAHP Comp. Ltd.	Shrinagar HEP