

Central Electricity Authority
SP&PA Division, Sewa Bhawan,
R.K. Puram, New Delhi-110066

No.66/5/99-SP&PA/

Dated: 29-05-2007

1. Member (Transmission),
Bihar State Electricity Board
Vidyut Bhavan, Baily Road,
Patna-800021.
2. Director (System),
Damodar Valley Corporation
DVC Towers, VIP Road,
Kolkata-700054.
3. Member Secretary,
Eastern Regional Power Committee,
14, Golf Club Road, Tollygange,
Kolkata-700033.
4. Director (Transmission),
Orissa Power Transmission Corporation Ltd,
Jan path, Bhubaneshwar-751022.
5. Director (System Operation),
West Bengal State Electricity
Transmission Company Ltd,
Vidyut Bhavan, Block-DJ, Sector-II
Salt Lake city, Kolkata-700091.
6. Principal Chief Engineer cum Secretary,
Power Department
Government of Sikkim
Sikkim.
7. Director (Projects),
Power Grid Corporation of India
"Saudamini" Plot No. 2, Sector-29
Gurgaon-122001
8. Director (Technical),
NTPC Limited,
Engineering Office Complex,
A-8, Sector 24, Noida.
9. Member (Transmission),
Jharkhand State Electricity Board,
In front of Main Secretariat,
Doranda, Ranchi-834002.
10. Executive Director (T&RE),
NHPC Ltd, NHPC Office complex,
Sector 33, Faridabad-121003.
11. Director (Operation),
Power Trading Corporation
NBCC Towers, 2nd floor,
13, Bhikaji Cama Place, New Delhi.

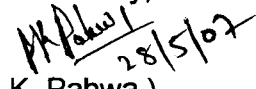
Sub: Minutes of the Standing Committee Meeting on Power System Planning in Eastern
Region held at Puri, Orissa on 05-05-2007.

Sir,

Minutes of the Standing Committee Meeting on Power System Planning in Eastern
Region held at Puri, Orissa on 05-05-2007 is enclosed.

Encl: As above

Yours faithfully,


(P. K. Pahwa)
Director(SP&PA)

Minutes of the meeting of the Standing Committee on Power System Planning of Eastern Region held on Saturday the 5th May 2007 at Puri, Orissa.

A meeting of the Standing Committee on Power System Planning of Eastern Region was held at Puri on Saturday the 5th May 2007. List of participants is at Appendix-I.

Shri A.C Mallick, Director (Comml), GRIDCO welcomed the guests to the meeting

Shri V. Ramakrishna, Member (Power System), CEA welcomed all the participants to the meeting and thanked GRIDCO for organizing the meeting and for the excellent arrangements. He stated that subsequent to the last meeting, the Northern Region had been synchronously interconnected with ER-NER-WR system. ER and NR through Muzuffarpur-Gorakhpur 400 kV line under the Tala transmission and also through the Patna-Balia 400 kV line and WR and NR through 765 kV Agra-Gwalior line operated at 400 kV . He stated that coal reserves were mostly located in Eastern Region and there was an ambitious generation programme in Eastern Region. After meeting the requirements of Eastern Region, major part of this power would need to be transmitted to deficit regions. He stated that transmission system from new generation capacity planned by DVC together with review of transmission system for North Karanpura and Maithon RB was listed as agenda item for the meeting. The review of transmission for North Karanpura and Maithon RB was necessitated because of common transmission corridor of these projects as well as DVC projects planned in ER. He hoped that fruitful discussions would take place during the course of the meeting and members would be able to arrive at decision.

The agenda items were thereafter taken up.

1. Confirmation of the minutes of the meeting held at Mirik on 22-6-2006

- 1.1 Chief Engineer (SP&PA) informed that minutes of the last meeting held at Mirik, Darjelling was circulated vide letter no 66/9/99/SP&PA/ dated 14-8-2007 . No comments had been received from any of the constituents. The minutes of the meeting were thereafter confirmed.

2. Augmentation of Talcher-II transmission system

- 2.1 Member (PS) stated that earlier proposal of sharing of transmission charges for Talcher-II augmentation on 50:50 bases for Menhdashal (Bhubneswar)-Behrampur-Gazuwaka 400 kV D/C with series compensation was not agreeable to Eastern Region constituents. Hence, augmentation of Talcher-II transmission was again taken up in Southern Region and the SR constituents had decided for a direct 400 kV link emanating from Talcher-II switchyard by having Talcher II- Behrampur-Gazuwaka 400 kV D/c line with switching station at Behrampur and the required series compensation. In addition SR constituents had also decided to have Talcher II- Rourkela 400 kV quad D/C line. For reliability of Eastern Region grid it was in the interest of Eastern Region that augmentation of Talcher-II transmission was implemented at the earliest. Member (PS), CEA further stated that OPTCL had recently informed that they had also been allocated 200 MW of power from Talcher-II and as per the present regulation would also become liable to share transmission charges. He informed that Talcher-II augmentation system had been agreed by SR constituents and OPTCL would need to ascertain the commercial impact of these transmission charges. Director (Commercial), GRIDCO stated that Talcher-Kolar HVDC was conceived as a dedicated transmission system for drawal by Southern Region and sharing of transmission charges by Orrissa for this HVDC link would be inappropriate, highly taxing and difficult for them to bear. It would be injustice to Orissa if it was asked to share

transmission charges for HVDC link and direct lines emanating from switchyard to SR. He stated that load growth requirements in and around Behrampur did not warrant a 400 kV substation at this stage and therefore OPTCL had not agreed to the 400 kV Behrampur substation. Member (PS), CEA stated that Orrissa would be drawing power from Talcher bus directly and it may have to take up with the CERC regarding sharing of the transmission charges for Talcher-II.

Regarding availability of bays at Talcher-II switchyard NTPC confirmed availability of 2 no 400 kV line bays at Talcher-II switchyard.

2.2 After discussions the following transmission system for augmentation of Talcher-II transmission was technically agreed by ER. It was also decided that since Orrissa would be the sole beneficiary in ER it would take up with the regulatory body regarding sharing of transmission charges for Talcher-II.

- Talcher II-Rourkela 400 kV Quad D/C
- Talcher II- Behrampur-Gazuwaka 400 kV D/C with switching station at Behrampur and required series compensation

3. Establishment of 400/220 kV substation at Bolangir by LILO of Meramundali-Jeypore 400 kV S/C line.

3.1 Member (PS) stated that establishment of 400 kV substations at Bolangir was discussed during the last Standing Committee meeting and the ER constituents were not agreeable to the same as a regional scheme. He informed that as per the latest discussion paper circulated by CERC transmission charges for interlinking transformers meant for drawal by the states were proposed to be borne by the respective states. As the 400 kV substation at Bolangir was urgently required by OPTCL to meet the growing load demands, they could build the substation at their own cost and if at a latter date the same was agreed to be a part of regional asset the same could be pooled. He suggested that OPTCL could get the substation implemented

through POWERGRID so that at a later date if it was agreed to include the same in the regional pool the same could be done based on PGCIL's certified cost, otherwise if the project was executed by OPTCL on their own, reasonability of cost etc would need to be audited/verified.

3.2 Director (Commercial), GRIDCO stated that they had furnished requisition for about 600 MW allocations from North Karanpura, Barh Stage-I, Barh Stage-II and Nabi Nagar. In view of this requisition and possible allocation the Bolangir substation may be considered for implementation as a regional project by POWERGRID. AGM (PGCIL) stated that they had no objection in implementing the substation as a regional project provided the constituents of ER agreed for the same. He informed that with the establishment of Bolangir substation the series compensation at Jeypore end would need to be reviewed and could be relocated at some other suitable place where it may be required. WBSEDCL stated that Bolangir substation would benefit only to GRIDCO. He further stated that as discussed in the last meeting, the provision of state wise regional transformation capacity should also be considered in this context.

3.3 Member (PS) informed that based on discussions during the last meeting CEA had carried out an exercise to determine the state wise regional transformation capacity vis-à-vis their allocation from existing and under construction central generating stations. Members from WBSEB, BSEB and other utilities pointed out certain discrepancies against share allocation column. After discussions it was agreed that the ERPC in consultation with the state utilities would furnish the necessary details to CEA and CEA would recheck and after necessary corrections circulate the same separately.

Considering the views expressed and after further discussions, it was decided that the 400/220 kV substation at Bolangir by LILO of Meramundali-Jeypore 400 kV S/C line would be taken up for execution by POWERGRID

for earliest implementation and OPTCL would bear the transmission charges till finalisation of shares from new ISGS Projects viz. North Karanpura, Barh-II etc.

3.4 2nd 160 MVA 220/132 kV transformer at Baripada

2nd 160 MVA 220/132 KV transformer at Baripada was agreed in the last meeting held at Mirk on 22-6-2006. AGM (PGCIL) informed that the transformer was expected to be commissioned by January 2010.

4. Transmission system for the new generation capacity planned by DVC viz Koderma (2x500 MW), Bokaro Extn (1x500 MW), Mejia- Extn (2x500 MW), Durgapur (2x500 MW) and Raghunathpur (2x500 MW) together with review of transmission system associated with North Karanpura (3x660 MW) and Maithon RB (1000 MW)

4.1 Chief Engineer (SP&PA) informed that from proposed projects of DVC viz Koderma (2x500 MW), Bokaro Extn(1x500 MW), Mejia Extn(2x500 MW), Durgapur (2x500 MW) and Raghunathpur (2x500 MW) 3600 MW was allocated to Northern Region and 500 MW to Western Region. From Maithon RB 400 MW was allocated to Delhi. CE, DVC clarified that another 200 MW from Maithon RB had been allocated to Rajasthan. The balance would be available with DVC/generators for their own use/trading. Chief Engineer (SP&PA) further stated that transmission system for Maithon RB and North Karanpura was evolved and agreed earlier. However, as the transmission corridors to Northern Region for these generation projects and the new generation capacity planned by DVC was the same, review of evacuation system had become necessary. Accordingly, studies had been done to re-evolve the evacuation/transmission system. Based on studies, common and generation specific transmission schemes had been evolved. The studies had established need of 765kV pooling stations at Sasaram and Gaya for the Northern Region and at Ranchi for the Western Region. For the

Northern Region, the overall transmission system from Gaya at 765 kV would be through three numbers of 765 kV lines, two on the Sasaram-Fatehpur-Agra corridor and one through the Balia-Lucknow-Bareilly-Meerut corridor. Gaya would be connected to Sasaram as well as Balia via 765 kV lines whereas Sasaram and Balia both would receive power from east at 400kV also. Towards Western Region, from Ranchi pooling station, 2xS/C 765kV lines had been proposed. Interconnecting from the generating station to the grid points in ER as well as pooling stations for NR and WR had been identified. Based on review the transmission system for North Karanpura within Eastern Region up to the pooling points would be at 400 kV. This would result in lower transmission charges within the Eastern Region.

- 4.2 Member (PS), CEA informed that Government of India had constituted an Empowered Committee to identify the transmission schemes for execution by the private sector through competitive tariff based bidding. Based on their recommendations the transmission system for North Karanpura, Maithon RB, Kodarma and Mejia-Extn were proposed to be implemented through this route. In the evolved schemes, the evacuation system for Bokaro-Extn was integrated with evacuation system for Kodarma. Hence, this was also included in the list. Regarding sharing of transmission charges he stated that transmission charges for the transmission system from generating stations up to the pooling points located in Eastern Region were proposed to be shared by all the beneficiaries of the generation project and transmission system beyond pooling point for Northern Region and Western Region was proposed to be shared by beneficiaries of the respective region. The total system had thus been covered under various transmission schemes of which some were proposed to be taken up for execution through POWERGRID, some through Generators or their transmission agency and some through Private sector participation in transmission as detailed at Annex-I of the agenda note.
- 4.3 Chief Engineer (SP&PA) informed that the proposal had been discussed and concurred by the Northern Region Standing Committee. The NR Standing

Committee had also observed that there could be need for shifting some elements between the schemes depending on initial progress in the process of implementation of schemes through private sector and the finally emerging schedule of generation projects and required time frame of execution of the transmission projects. If any such changes were required, CEA would decide the same in consultation with PGCIL and also take-up with the Empowered Committee and Ministry of Power for the needful. In regard to 765 kV system from Ranchi towards Sipat pooling point, the same would be further discussed and finalized in the Standing Committee of WR.

- 4.4 Chief Engineer (PSR), DVC stated that under transmission system for Kodarma and Bokaro Extn, Bokaro –Kodarma- Biharshariff 400 kV D/C line with twin moose conductor up to Kodarma and quad conductor from Kodarma to Biharshariff had been proposed. He opined that considering 1500 MW combined capacity for these two projects and also considering Koderma-Gaya 400 kV D/C quad line, twin moose conductor on Kodarma-Biharshariff section could be adequate. Member (PS), CEA clarified that considering right of way constraints and forest area the transmission scheme of Kodarma and Bokaro Extn had been planned considering possible extension by DVC at their Kodarma TPS at a future date. To a query from Member (PS), CEA Chief Engineer, DVC confirmed that they had no proposal for future expansion at Bokaro but expansion at Kodarma was not ruled out and could be contemplated at a future date. CE, DVC stated that issue of quad vis-à-vis twin conductor was also required to be considered on Durgapur-Ragunathpur-Ranchi 400 kV D/C line and suggested twin conductor for the same. Chief Engineer (SP&PA) stated that this issue was also discussed in a meeting between CEA and DVC and it was found that as DVC was not contemplating any expansion possibility at Durgapur, the Durgapur-Ragunathpur section of the 400 kV Durgapur-Ragunathpur-Ranchi line could be with twin conductor. DVC confirmed that there would be no expansion at Durgapur and it was therefore agreed to have Durgapur-

Raghunathpur 400 kV D/C line with twin conductor. Chief Engineer, DVC also enquired that with Raghunathpur-Ranchi 400 kV line with quad conductor, whether the system would be adequate to evacuate additional power from Stage-II without any further evacuation network. Chief Engineer (SP&PA) stated that with new generation capacity planned the flow pattern may undergo change and it would be appropriate to examine it again at the time when Raghunathpur Stage-II was firmed up.

- 4.5 Regarding bus reactors DVC stated that there were space constraints in switchyards at Bokaro Extn, Mejia Extn and Durgapur. In view of this the proposal of reactors was deleted with the stipulation that in order to limit the voltages, the generators would have to use their reactive absorption capability to full. It was also noted that line reactors on the 400 kV Kodarma-Gaya D/C line may not be required in view of provision of 2x50 MVAR bus reactor.
- 4.6 WBSEDCL stated that transmission system should also cater to power evacuation need taking into consideration other capacity addition programme in West Bengal.
- 4.7 Member (PS), CEA desired that latest status of various generating projects of DVC and WBSEDCL along with their commissioning schedule should be furnished so that the phasing of various transmission schemes could be worked out. As some of the lines were proposed through private sector commitment of transmission charges to private players had to be ensured from date of commissioning. DVC and WBSEDCL agreed to furnish the latest status of various projects along with time schedule of commissioning.

Based on the discussions the common and specific transmission schemes were agreed as given at Annex-1. It was also agreed that further transmission system would be evolved based on studies considering other generation projects.

5. Interconnectivity of 400 kV Ranchi substation

5.1 Chief Engineer (SP&PA) stated that Maithon-Ranchi-Sipat 400 kV D/C line along with 400/220 kV substation at Ranchi under Kahlgaon –II transmission was under implementation. Because of long length of line anchoring at Ranchi with Jharkhand grid was necessary. The matter was discussed with PGCIL and Jharkhand and it emerged that JSEBs program of providing interconnectivity at Ranchi would not materialize in the required time frame as at present load demand of Ranchi was being met satisfactorily from their 220 kV Hatia substation. LILO of Patratu-Hatia-Chandil 220 kV D/C line at Ranchi involving about 10 km 220 kV D/C line was therefore proposed and agreed. These LILO works would be covered under Kahlgaon-II transmission system. These have already been discussed and agreed in WR. Members took note and concurred with the proposal.

5.2 220 kV bays for DVC at Maithon (PG) and Ranchi (PG)

DVC stated that for interconnection of the regional grid with their system they required 2 no 220 kV bays at Maithon (PG) and 2 no 220 kV bays at Ranchi substation of POWERGRID. AGM, POWERGRID stated that out of 4 no 220 kV bays at Maithon 2 nos had already been allocated and 2 no spare bays were available. However, at Ranchi substation no spare bays were available and the required bays at Ranchi could be constructed as deposit works at cost of DVC. Chief Engineer, DVC requested POWERGRID to send their offer to DVC.

6. Transmission proposal of WBSETCL for evolving Intra/Inter State Transmission System during XI Plan Period

6.1 WBSEDCL, vide their letter dated 20-4-2007 had proposed the following transmission works:

- (a) PPSP- Ranchi 400 kV D/C line or LILO of one ckt of Maithon-Ranchi 400 kV D/C line at PPSP
- (b) Parulia-Maithon 400 kV D/C line
- (c) Guptamani-Jamsedpur 400 kV D/C line and
- (d) Gokarna-Binaguri(PG)/ Purnea(PG) 400 kV D/C line
- (e) Subashgram(PG)- Jagatballavpur 400 kV D/C line
- (f) LILO of KTPS-Baripada 400 kV S/C line at Guptamoni.

- (a) PPSP-Ranchi 400 kV D/C line or LILO of one ckt of Maithon-Ranchi 400 kV D/C line at PPSP

Regarding the proposal at (a) of WBSEDCL, Chief Engineer, WBSEDCL stated that Maithon-Ranchi 400 kV D/C line under construction by PGCIL was in close proximity to the plant and suggested LILO of one ckt of this line at PPSP. Chief Engineer (SP&PA) stated that various proposal of WBSEDCL had been examined in CEA and studies had also been done. The result of the study had been circulated along with the supplementary agenda items. He stated that LILO of one circuit of Maithon-Ranchi at PPSP would be useful. AGM (POWERGRID) stated that the transmission requirement beyond Ranchi should also be examined where power from PPSP would be injected. Further, as the proposal involved injection of PPSP power in to the regional grid, WBSEDCL would need to apply for open access after which further examination and firming up of the proposal would be done. To a query from WBSEDCL regarding the latest status of implementation of Maithon-Ranchi 400 kV D/C line AGM POWERGRID informed that the line was in the process of investment approval. Member (PS) desired that implementation of this line should be expedited.

- (b) Parulia-Maithon 400 kV D/C

Chief Engineer, WBSEDCL stated that Parulia-Maithon 400 kV D/C line would be useful as Parulia substation would be connected to Farakka, Sagardighi,

PPSP and Bakreswar, this link would increase the reliability of power transfer. Chief Engineer (SP&PA) stated that Parulia-Maithon 400 kV D/C had already been approved in the Standing Committee meeting held on 22nd June 2006. AGM (POWERGRID) informed that the line was in the process of investment approval by the board and expected commissioning date was December 2009. WBSETCL requested POWERGRID to expedite the case for early commissioning.

(c) Guptamani-Jamsedpur 400 kV D/C

Chief Engineer, WBSEDCL stated that Guptamani would be directly connected with KTPS and with Sagardighi and Bakreswar via Jagatballavpur and as such this link would be useful under surplus conditions in sending power to the regional pooling station and dispersal of power. Chief Engineer (SP&PA) stated that studies indicated flow on Guptamani-Jamsedpur 400 kV would depend on increase in exportable surplus of WBSEDCL and could be linked with their generation projects from which export was being planned. WBSEDCL would need to apply for open access for further study and firming up the proposal.

(d) Gokarna-Binaguri(PG)/ Purnea(PG) 400 kV D/C line

Chief Engineer, CEA stated that WBSEDCL proposal for additional lines between north and south West Bengal could be examined along with hydro projects in North Bengal/ Sikkim. WBSEDCL stated that this link may be required during summer periods of hydro generation in NER, Sikkim, Bhutan projects when the existing links may get loaded. POWERGRID stated that after commissioning of Kahalgaon-Patna-Balia 400 kV line, this problem should not occur. ERLDC and CEA also endorsed this. WBSEDCL stated that the line proposed by them could also be required during winter periods when hydro generation was low. Chief Engineer, CEA stated that studies had not

shown requirement of firming up this link at this stage. It was decided that this link could be reviewed when allocation of shares from hydro projects in Sikkim and NER was firming up.

(e) Subashgram(PG)- Jagatballavpur 400 kV D/C line

Chief Engineer WBSEDCL stated that this link was meant for meeting the growing load demand in and around Jagatballavpur. Chief Engineer (SP&PA) stated that studies indicated the need for this link and hence the same could be agreed. Member (PS), CEA stated that the proposal needs to be linked with various generating projects of Sagardidghi, Bakreswar, Katwa etc. He stated that there was no objection to the development of transmission system of the state which was within the preview of the state. However, wherever interconnection and consequent injection by the state in to the regional grid was involved WBSEDCL would need to apply for open access for firming up the proposal.

(g) LILO of KTPS-Baripada 400 kV S/C line at Guptamani.

Chief Engineer (SP&PA) stated that studies indicated the usefulness of this LILO and hence the same was agreed

7. Revised tripping scheme under HVDC outage at Talcher-II

7.1 It was decided that Member (PS), CEA would hold a separate meeting to finalize the revised scheme.

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

List of participants for the Standing Committee Meeting on Power System Planning in ER held on 05.05.07 at Puri, Orissa.

	<u>Name</u>	<u>Designation</u>
<u>CEA</u>		
1.	Sh. V. Ramakrishna	Member (PS)
2.	Sh. A.K. Asthana	Chief Engineer
3.	Sh. P.K. Pahwa	Director
<u>ERPC</u>		
4.	Sh. R.K. Grover	Member Secretary
5.	Sh. B. Sarkhel	EE
<u>PGCIL</u>		
6.	Sh. Y.K. Sehgal	Addl. Gen. Manager (Engg.)
7.	Sh. Ashok Pal	Dy. Gen Manager (Engg.)
<u>WBSETCL</u>		
8.	Sh. P. Gupta	Director (Sys. Operation)
9.	Sh. A. Karmakar	SE (CP&ED)
10.	Sh. A.K. Basu	CE (CP&ED)
<u>WBSEDCL</u>		
11.	Sh. M. Majumdar	CE (Comml.)
<u>DVC</u>		
12.	Sh. Swapan Kr. Saha	CE (Comml)
13.	Sh. C.P. Mukherjee	CE (PSR)
14.	Sh. C. Karmakar	SE (E)
15.	Sh. S.K. Ghosh	DCE (SPM)
<u>GRIDCO</u>		
16.	Sh.A.C. Mallick	Director (Comml.)
<u>OPTCL</u>		
17.	Sh. S.R. Das	CGM (O&M)

JSEB

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|-----|-------------------|------------------------|
| 18. | Sh. N.A. Siddiqui | CE, Transmission (O&M) |
| 19. | Sh. R.M. Tiwari | ESE/SLDC |

BSEB

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| 20. | Sh. R.K. Sharma | Member (Trans) |
| 21. | Sh. S.K. Ghosh | ESE/IS |

NTPC

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|-----|--------------------|------------------|
| 22. | Sh. A.K. Gupta | AGM & HOD(Elect) |
| 23. | Sh. R.K. Bhatnagar | AGM (COS) |
| 24. | Sh. Abhijit Sen | DGM (PE-Elect) |
| 25. | Sh. A. Basu Roy | DGM (Comm) |
| 26. | Sh. S. Nayak | DGM (EMD) |

NHPC

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|-----|-----------------|------------|
| 27. | Sh. V.K. Jain | ED (Trans) |
| 28. | Sh. D.K. Ray | GM (RE) |
| 29. | Sh. A.K. Pandey | CE (T&RE) |

ERLDC/ POWERGRID

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|-----|---------------------|---------------|
| 30. | Sh. P. Mukhopadhyay | DGM (OS&Comm) |
| 31. | Sh. Tapas Biswas | DGM (Oprn) |
| 32. | Sh. S.S. Barpanda | Chief Manager |

PTC

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| 33. | Sh. S.K. Dube | Director |
|-----|---------------|----------|

Transmission schemes for			ANNEX-1	
Evacuation and Transmission of Power from				
NTPC generation project at North Karanpura (1980MW)				
DVC/ TATA JV generation project at Maithon Right Bank (1000MW)				
DVC generation projects at Bokaro Extn (500MW), Kodarma (1000MW), and Mejla Extn (1000MW)				
DVC generation projects at Raghunathpur (1000MW) and Durgapur (1000MW)				
Pooling stations and transmission system for Import of Power by NR				
Pooling stations and transmission system for Import of Power by WR				
SCHEME	Scheme / Transmission works	Target Year/ Matching with	Beneficiaries	Proposed to be executed by
1	Evacuation System for North Karanpura (1980 MW)	2011-13		Private Sector through SPV of REC
1	North Karanpura – Gaya 400kV Quad D/C line	Nkpu1	Beneficiaries of NKP	
2	North Karanpura – Ranchi 400kV Quad D/C line	Nkpu1	Beneficiaries of NKP	
3	Sipat/Korba (pooling) – Seoni 765kV S/C line	Nkpu2	WR	
4	Lucknow – Bareilly 765kV S/C line	Nkpu3	NR	
5	Bareilly – Meerut 765kV S/C line	Nkpu3	NR	
6	Agra - Gurgaon (ITP) - Gurgaon (PG) 400kV quad D/C line	Earliest	NR	
7	Gurgaon 400/220kV GIS substation	Earliest	NR	
	400/220kV transformers: 2 x 315 MVA			
	400kV line bays : 4 nos of which 2 nos to be with 50 MVAR switchable reactors for Agra lines			
	220kV line bays : 4 nos			
	400kV : 1½ breaker scheme; 220kV double bus scheme			
2	Evacuation System for Maithon RB (1000 MW), Bokaro Extn. (500MW), Kodarma (1000MW), and Mejla Extn. (1000MW)			Private Sector through SPV of PFC
	Common Transmission System for Import of power by NR	2009-10		
✓1	Biharsharif – Sasaram (PG 765kV s/s) 400kV quad D/C line	At the earliest and ahead of the first unit of any of the MaithonRB, Kodarma, or Mejla Extn.	NR	
✓2	Sasaram-Fatehpur (PG 765kV s/s) 765kV S/C line		NR	
✓3	Fatehpur (PG 765kV s/s) - Agra 765kV S/C line		NR	
→ 4	Fatehpur (PG 765kV s/s) - Fatehpur (ITP 400kV s/s) 400kV quad D/C line (if 765kV PGCIL s/s & 400kV ITP s/s are contiguous, then this would be through extended bus)		NR	
5	LILo of Singrauli - Kanpur 400kV line at Fatehpur (400kV D/C LILo line)		NR	
6	LILo of both circuits of Fatehpur - Kanpur 220 kV lines at Fatehpur (220kV 2 x D/C LILo lines)		NR	
7	Fatehpur 400/220kV substation		NR	
	400/220kV transformers: 2 x 315 MVA			
	400kV line bays : 2 nos of which one to be with 50 MVAR switchable reactors for Singrauli line			
	220kV line bays : 4 nos			
	400kV : 1½ breaker scheme; 220kV double main & transfer bus			

SCHEME	Scheme / Transmission works	Target Year/ Matching with	Beneficiaries	Proposed to be executed by
	Specific System for Maithon RB	2009-10		
	1 Maithon RB-Maithon PG 400kV D/C line	MRB-U1	MaithonRB	
	2 Maithon RB - Ranchi 400kV D/C line	MRB-U2	MaithonRB	
	Specific System for Bokaro Extn.	2009-10		
	1 Bokaro-Biharsharif (routed via Kodarma) 400kV D/C line, twin moose from Bokaro upto Kodarma and quad moose from Kodarma to Biharsharif (with LILO at Kodarma, this would become two line - (1) Bokaro Extn. - Kodarma 400kV D/C and (2) Kodarma-Biharsharif 400kV quad D/C)	Bokaro Extn.	DVC	
	Specific System for Kodarma	2009-10		
	1 Kodarma - Gaya 400kV quad D/C line	Kod-U1	DVC	
	Specific System for Mejia Extn	2009-10		
	1 LILO of one ckt of Maithon-Jamshedpur 400kV line at Mejia (400kV D/C Lilo line)	M.Ex.-U1	DVC	
	2 Mejia-Maithon PG 400kV D/C line	M.Ex-U2	DVC	
3	Evacuation System for Rangunathpur(1000 MW) & Durgapur(1000MW)	2010-11	DVC	DVC
	1 LILO of one ckt of Durgapur(PG)-Jamshedpur 400kV line at Durgapur (400kV D/C Lilo line)	Durgp-U1		
	2 LILO of one ckt of Maithon(PG)-Ranchi 400kV line at Rangunathpur (400kV D/C Lilo line)	Raghu-U1		
	3 Durgapur(Gen)-Raghunathpur 400kV D/C line	U2 of Durgp or Raghu		
	4 Raghunathpur-Ranchi 400kV quad D/C line	U2 of Durgp or Raghu		
4	Common scheme for 765kV pooling stations and network for Northern Region (common for Sasan UMPP + NKP + Maion/Kodarma/Mejia/Bokaro + Rangunathpur/Durgapur + Import by NR from ER and from NER/SR/WR via ER)	Earliest	NR	PGCIL
	1 Seires capacitor at Balia end for 40% compensation on Barh-Balia 400kV quad D/C line			
	2 Seires capacitor at Biharsharif end for 40% compensation on Biharsharif-Balia 400kV quad D/C			
	3 LILO of both circuits of Allahabad - Mainpuri 400kV D/C line at Fatehpur (PG 765kV s/s) (400kV 2 x D/C LILO lines)			
	4 Gaya - Sasaram 765kV S/C line			
	5 Sasaram PG 765kV s/s - Sasaram (400kV s/s)			
	6 Maithon PG - Gaya 400kV quad D/C line			
	7 Gaya-Balia 765kV S/C			
	8 Balia-Lucknow 765kV S/C			
	9 2x400kV D/C LILO lines for connecting to Lucknow 765kV substation, the LILO would of both circuits of one of the Lucknow-Bareilly or Gorakhpur-Lucknow or Balia-Lucknow 400kV D/C lines which ever is close to location of Lucknow 765kV substation			
	10 2x400kV D/C LILO lines for connecting to Bareilly 765kV substation, the LILO would of both circuits of one of the Lucknow-Bareilly or Bareilly-Meerut/Mandola 400kV D/C lines which ever is close to location of Bareilly 765kV substation			
	11 Fatehpur 765kV substation :			
	1x1500 MVA, 765/400kV transformers with bays (2nd transformer in Sasan scheme)			
	1x330MVAR 765kV bus reactors with bay (2nd bus reactor in Sasan scheme)			
	4 nos 400kV line bays - for LILO lines connecting to Allahabad-Mainpuri 400kV D/C line			
	2x63MVAR 400kV bus reactors with bays			

SCHEME	Scheme / Transmission works	Target Year/ Matching with	Beneficiaries	Proposed to be executed by
	12 Gaya 765kV substation :			
	1 nos 765kV line bay without reactor for Gaya-Sasaram 765kV S/C line			
	1 nos 765kV line bay with 240MVAR switchable line reactor for Gaya-Balia 765kV S/C lines			
	2x240MVAR 765kV bus reactors with bays			
	3x1500 MVA, 765/400kV transformers with bays			
	2 nos 400kV line bays each with 50MVAR switchable line reactors for Maithon PG - Gaya 400kV quad D/C line			
	2x125MVAR 400kV bus reactors with bays			
	2x315MVA 400/220kV transformers with bays			
	4 nos 220kV line bays for 220kV LILO lines			
	LILO of both circuits of Bodhgaya-Dehri 220kV D/C line at Gaya			
	13 Sasaram 765kV substation :			
	1 nos 765kV line bay without reactor for Gaya-Sasaram 765kV S/C line			
	1x1500 MVA, 765/400kV transformers with bays (2nd transformer in Sasan scheme)			
	1x330MVAR 765kV bus reactors with bay (2nd bus reactor in Sasan scheme)			
	2x125MVAR 400kV bus reactors with bays			
	2 nos 400kV line bays for Sasaram(765kV) - Sasaram(400kV) 400kV quad D/C line			
	14 Sasaram 400kV substation :			
	2 nos 400kV line bays for Sasaram(765kV) - Sasaram(400kV) 400kV quad D/C line			
	15 Agra 765kV substation :			
	1x1500 MVA, 765/400kV transformers with bays (2nd transformer in Sasan scheme)			
	1x240MVAR 765kV bus reactors with bay (2nd bus reactor in Sasan scheme)			
	2x63MVAR 400kV bus reactors with bays			
	16 Maithon (PG) 400kV substation extension:			
	2 nos 400kV line bays each with 50MVAR switchable for Maithon PG - Gaya 400kV quad D/C line			
	17 Balia 765kV substation (by extension of Balia 400kV substation) :			
	1 nos 765kV line bay with 240MVAR switchable line reactor for Gaya-Balia 765kV S/C line			
	1 nos 765kV line bay with 240MVAR switchable line reactor for Balia-Lucknow 765kV S/C line			
	2x240MVAR 765kV bus reactors with bays			
	2x1500 MVA, 765/400kV transformers with bays			
	2x125MVAR 400kV bus reactors with bays			
	18 Lucknow 765kV substation :			
	1 nos 765kV line bay with 240MVAR switchable line reactor for Balia-Lucknow 765kV S/C line			
	1x240MVAR 765kV bus reactors with bays			
	2x1500 MVA, 765/400kV transformers with bays			
	2x63MVAR 400kV bus reactors with bays			
	4 nos 400kV line bays for 2xD/C 400kV LILO lines on the 400kV D/C line close to Lucknow 765kV s/s			
	19 Bareilly 765kV substation :			
	1x240MVAR 765kV bus reactors with bays			
	2x1500 MVA, 765/400kV transformers with bays			
	2x63MVAR 400kV bus reactors with bays			
	4 nos 400kV line bays for 2xD/C 400kV LILO lines on the 400kV D/C line close to Bareilly 765kV s/s			

SCHEME	Scheme / Transmission works	Target Year/ Matching with	Beneficiaries	Proposed to be executed by
5	Common scheme for pooling stations and network for Western Region (common for + NKP + Maion/Kodarma/Mejia/Bokaro + Rangunathpur/Durgapur + Import by WR from ER and from NER/SR/NR via ER)	Earliest	WR	PGCIL
	1 Ranchi-Sipat/Korba(pooling) 765kV 2xS/C with 40% series compensation at Ranchi end (to be firmied up after further studies and WR meeting)			
	2 Sipat/Korba(pooling) - Sipat 765kV S/C			
	3 400kV connecting/feeding lines to Sipat/Korba(pooling) station (to be finalised in WR meeting)			
	4 Ranchi 765kV substation :			
	3x1500 MVA, 765/400kV transformers with bays			
	2x330MVAR 765kV bus reactors with bay			
	2 nos 765kV line bays each with 330MVAR switchable line reactor for Ranchi-Sipat/Korba(pooling) 765kV 2xS/C lines			
	2x125MVAR 400kV bus reactors with bays			
	5 Sipat/Korba(pooling) 765kV substation :			
	1x1500 MVA, 765/400kV transformers with bays (second transformer in Korba-III scheme)			
	2x330MVAR 765kV bus reactors with bays			
	2 nos 765kV line bays each with 330MVAR switchable line reactor for Ranchi-Sipat/Korba(pooling) 765kV 2xS/C lines			
	1 nos 765kV line bay without reactor for Sipat/Korba(pooling)-Sipat 765kV S/C line			
6	NR strengthening - 765kV system for NCR and around	Earliest	NR	PGCIL
	1 Agra-Mundka 765kV S/C			
	2 Agra-Meerut 765kV S/C			
	3 Mundka-Meerut 765kV S/C			
	4 Mundka-Moga 765kV S/C			
	5 Agra 765kV substation extension:			
	1 nos 765kV line bay without reactor for Agra-Mundka 765kV S/C line			
	1 nos 765kV line bay without reactor for Agra-Meerut 765kV S/C line			
	1x240MVAR 765kV bus reactors with bay			
	6 Meerut 765kV substation extension :			
	1 nos 765kV line bay with 240MVAR switchable line reactor for Agra-Meerut 765kV S/C line			
	1 nos 765kV line bay without reactor for Mundka-Meerut 765kV S/C line			
	1x240MVAR 765kV bus reactors with bay (this would be 2nd, 1st one in Tehri-II scheme)			
	7 Mundka 765kV substation :			
	1 nos 765kV line bay with 240MVAR switchable line reactor for Agra-Mundka 765kV S/C line			
	1 nos 765kV line bay without reactor for Mundka-Meerut 765kV S/C line			
	1 nos 765kV line bay with 240MVAR switchable line reactor for Mundka-Moga 765kV S/C line			
	1x240MVAR 765kV bus reactor with bay			
	2x1500 MVA, 765/400kV transformers with bays			
	2x63MVAR 400kV bus reactors with bays			
	8 Moga 765kV substation :			
	1 nos 765kV line bay with 240MVAR switchable line reactor for Mundka-Moga 765kV S/C line			
	1x240MVAR 765kV bus reactor with bay			
	2x1500 MVA, 765/400kV transformers with bays			
	2x63MVAR 400kV bus reactors with bays			

SCHEME	Scheme / Transmission works	Target Year/ Matching with	Beneficiaries	Proposed to be executed by
	PGCIL scheme for Substation Extension works at PGCIL substation corresponding to REC, PFC and DVC schemes			PGCIL
1	Evacuation System for North Karanpura (1980 MW)			
	Scope of works for North Karanpura Transmission ITP's scheme			
	1 Gaya 400kV : 2 line bays for North Karanpura – Gaya 400kV Quad D/C line	matching with line	Beneficiaries of NKP	
	2 Ranchi 400kV : 2 line bays for North Karanpura – Ranchi 400kV Quad D/C line		Beneficiaries of NKP	
	3 Sipat/Korba(pooling) 765kV : 1 line bay with 330MVAR fixed line reactor for Sipat/Korba (pooling) – Seoni 765kV S/C line		WR	
	4 Seoni 765kV : 1 line bay with 240MVAR fixed line reactor for Sipat/Korba (pooling) – Seoni 765kV S/C			
	5 Lucknow 765kV : 1 line bay without recator for Lucknow – Bareli 765kV S/C line		NR	
	6 Bareli 765kV : 1 line bay with 240MVAR fixed line reactor one for Lucknow – Bareli 765kV S/C line and 1 line bay without reactor for Bareli -Meerut 765kV line			
	7 Meerut 765kV : 1 line bay with 240MVAR fixed line reactor for Bareli – Meerut 765kV S/C line		NR	
	8 Agra 400kV : 2 line bays each with 50MVAR switchable line reactors for Agra - Gurgaon(ITP) 400kV quad D/C line		NR	
	9 Gurgaon(PG) 400kV : 2 line bays for Gurgaon(ITP) - Gurgaon (PG) 400kV quad D/C line		NR	
2	Evacuation System for Maithon RB (1000 MW), Bokaro Extn. (500MW), Kodarma (1000MW), and Mejla Extn. (1000MW) including common system			
	1 Biharsharif 400kV : 2 line bays without reactors for Biharsharif – Sasaram 400kV quad D/C line	matching with line	NR	
	2 Biharsharif 400kV : 2 line bays each with 63 MVAR switchable line reactors for Bokaro/Kodarma-Biharsharif 400kV quad D/C line		NR	
	3 Sasaram 765kV s/s : 2 nos 400kV line bays each with 63 MVAR switchable line reactors for Biharsharif – Sasaram(PG 765kV s/s) 400kV quad D/C line			
	4 Sasaram 765kV : 1 line bay with 330MVAR switchable line reactor for Sasaram-Fatehpur(PG 765kV s/s) 765kV S/C line		NR	
	5 Fatehpur 765kV : 1 line bay with 330MVAR fixed line reactor for Sasaram-Fatehpur(PG 765kV s/s) 765kV S/C line			
	6 Fatehpur 765kV : 1 line bay with 330MVAR switchable line reactor for Fatehpur - Agra 765kV S/C line			
	7 Agra 765kV : 1 line bay with 240MVAR fixed line reactor for Fatehpur(PG 765kV s/s) - Agra 765kV S/C line		NR	
	8 Fatehpur(PG) 400kV : 2 line bays for Fatehpur(PG 765kV s/s) - Fatehpur (ITP 400kV s/s) 400kV quad D/C line or extention of 400kV bus to Fatehpur (ITP) s/s in case the two s/s are contiguous		NR	
	9 Maith PG 400kV : 4 line bays - two for Maithon RB-Maithon PG 400kV D/C line and two for Mejla-Maithon 400kV D/C line		MaithonRB	
	10 Ranchi 400kV : 2 line bays for Maithon RB – Ranchi 400kV D/C line		MaithonRB	
	11 Gaya 400kV : 2 line bays for Kodarma - Gaya 400kV quad D/C line		DVC	
3	Evacuation System for Rangunathpur(1000 MW) & Durgapur(1000MW)	2010-11	DVC	
	1 Ranchi 400kV : 2 line bays each with 50MVAR switchable line reactors for Rangunathpur-Ranchi 400kV quad D/C line	matching with line		

SCHEME	Scheme / Transmission works	Target Year/ Matching with	Beneficiaries	Proposed to be executed by
Generation switchyard provisions to be provided by the Generators				
1	North Karanpura Generation Switchyard			
	1 400kV line bays : 4 nos, of which 2 nos (Gaya lines) with 50MVAR switchable line recators			
	2 400kV bus reactor of 2x50 MVAR			
2	Talcher-II Generation Switchyard Extension for Talcher Augmentation scheme			
	1 400kV line bays : 4 nos, of which 2 nos (Rourkela lines) with 50MVAR and 2 nos (Berhampur lines) with 63MVAR switchable line recators			
3	Sipat Generation Switchyard Extension for Sipat/Korba(poolig) - Sipat 765kV line			
	1 765kV line bay : 1 nos			
4	Maithon Right Bank Generation Switchyard			
	1 400kV line bays : 4 nos, of which 2 nos (Ranchi lines) with 50MVAR switchable line recators			
	2 400kV bus reactor of 2x50 MVAR			
5	Bokaro Extn. Generation Switchyard			
	1 400kV line bays : 2 nos			
6	Kodarma Generation Switchyard			
	1 LILO of both circuits of Bokaro-Biharsharif 400kV D/C line at Kodarma (400kV 2xD/C LILO from Gantry) so as to provide Kodarma-Bokaro Extn 400kV D/C and Kodarma-Biharsharif 400kV Quad D/C lines			
	2 400kV line bays : 6 nos			
	3 400kV bus reactor of 2x50 MVAR			
7	Mejla Extn. Generation Switchyard			
	1 400kV line bays : 4 nos			
8	Durgapur Generation Switchyard			
	1 400kV line bays : 4 nos			
9	Ragunathpur Generation Switchyard Extn.			
	1 400kV line bays : 4 nos of which 2 nos for Ranchi line with 50MVAR switchable line reactors			
	2 400kV bus reactor of 50 MVAR			