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विद्युत मंत्रालय / Ministry of Power
केन्द्रीय विद्युत प्राधिकरण / Central Electricity Authority
विद्युत प्रणाली योजना एवं परियोजना मूल्यांकन प्रभाग - I
Power System Planning & Project Appraisal Division-I
सेवा भवन आरण केण पुरम नई दिल्ली-110066
वेबसाइट / Website: www.cea.nic.in



Sewa Bhawan, R. K. Puram, New Delhi-110066

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No. 26/10/2015-PSP&PA-I/ 424-437

Date: 24.11.2015

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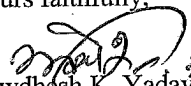
Sub: Additional agenda for the 39th meeting of the Standing Committee on Power System Planning of Western Region

Sir / Madam,

The additional agenda notes for 39th Standing Committee Meeting on Power System of Western Region (to be held at 10:30 Hrs on 30.11.2015 at NRPC, Katwaria Sarai, New Delhi) are available on CEA website (www.cea.nic.in) at the following link: <http://www.cea.nic.in/compsplanningwr.html> i.e. Home page-Wings-Power Systems-PSP&PA-I - Standing Committee on Power System Planning-Western Region).

Kindly make it convenient to attend the same.

Yours faithfully,


(Awdhesh K. Yadav), 24/11/2015
Director, PSP&PA - I

Additional Agenda notes for the 39th Meeting of Standing Committee on Power System Planning in Western Region

1.0 Provision of 4nos of 220kV feeder bays at 750MW Rewa Ultra Mega Solar Project (UMSP) Pooling Station – proposal by MSETCL.

1.1 Rewa Ultra Mega Solar Project (UMSP) of 750MW capacity to be constructed in Gurh tehsil of Rewa district has already been approved by MNRE. Rewa UMSP is a joint venture company of MP Urja Vikas Nigam Ltd (MPUVNL) and Solar Energy Corporation of India (SECI). The following transmission system for Rewa Ultra Mega Solar Project (RUMSP) has been agreed in the 38th SCM of WR :

- a. LILO of Vindhyachal – Jabalpur 400kV 2nd D/c line (circuit-3&4) at Rewa Pooling Station – 59KM (2x27=54KM D/c portion + 5KM M/s portion)
- b. Establishment of 400/220kV, 3x500 MVA Pooling station at Rewa
- c. 1x125 MVAr bus reactor at Rewa Pooling Station
- d. 6 Nos. 220kV Line bays at Rewa Pooling station (for its interconnection with solar park)

1.2 MPPTCL Vide letter 04 – 02/PSP – 421/2988 dated 20.11.2015 has informed that 400/220kV Satna (PGCIL) S/s is feeding power to Rewa, Satna, Sidhi and Chhatarpur areas. The above substation is critically loaded and outage of any element would result in loss of supply in the above areas. 400/220kV substation at Rewa which has been proposed as a part of the evacuation system for 750MW RUMSP (solar power which is available around 8hrs during the day time only) would be utilized for 8hrs only and for remaining period of about 16hours the proposed pooling station remains unutilized. For better utilization of proposed 400/220kV Rewa pooling station and to relive loading on 400/220kV transformers at Satna (PGCIL), MPPTCL has proposed the following transmission system:

- 220kV D/C line from 400/220kV Rewa Solar Pooling Station to Rewa 220kV S/s.
- 220kV D/C line from 400/220kV Rewa Solar Pooling Station to Sidhi 220kV S/s.

1.3 For termination of aforesaid 220kV lines, MPPTCL has requested for provision of 4nos of 220kV feeder bays at the proposed 400/220kV Rewa pooling station and MPPTCL would also bear the cost of these 4nos of 220kV feeders if agreed by PGCIL.

Members may deliberate.

2.0 Standardization of OPGW in lieu of One Earth Wire in all Transmission lines – agenda by POWERGRID

2.1 The Power System requirement for Communication is increasing multifold due to

- a. special protection scheme

- b. Ever increasing data reporting to Load Dispatch Centre.
- c. Phasor measurements based data collection and reporting.
- d. Remote monitoring/operation of sub-station/elements.
- e. Differential protection on Lines

The present practice of putting fiber in select lines for a stations connectivity lead to situation where stations connectivity is held up whenever the identified OPGW implementation held up either due to line delay, rerouting or LILO of under construction line for example connectivity of Siratu 132 KV.

- 2.2 OPGW installation on existing lines is taking long time / delayed due to shut down, ROW issues as well as capacity constraints of executing agencies.
- 2.3 It is proposed to include one 24 Fiber (OPGW) in all transmission lines which will ensure availability of wideband Communication from all substations to cater bandwidth for various power system application for which communication equipment (SDH– STM-16) shall be provided at all upcoming substations.
- 2.4 POWERGRID may present the case and members may deliberate.
- 3.0 Provision of 2 nos of 220kV bays at Raipur (PG) substation for LILO of Khedamara (CSPTCL) – Borjhara S/c line at 220kV Raipur (PG) substation.**
- 3.1 In 38th Meeting of Standing Committee on Power System Planning in Western Region held on 17.07.2015, construction of 2 nos. 220kV line bays by POWERGRID at its Raipur 400/220kV substation was agreed for termination of LILO of Khedamara (CSPTCL) – Borjhara S/c line of CSPTCL.
- 3.2 2 nos. 220kV line bays were constructed along with installation of additional 315 MVA, 400/220 kV ICT at Raipur 400/220kV substation as part of WRSS-6 (approved in the 25th Meeting of Standing Committee on Power System Planning in Western Region held on 30-09-2006). It is understood that CSPTCL has earmarked these 2no of 220kV line bays at Raipur for termination of 220kV D/c line from DOMA. However, these 220kV line bays are still unutilized.
- 3.3 POWERGRID has requested CSPTCL to confirm whether these 2 nos. 220 kV line bays shall be utilized by them for termination of 220 kV D/c line from DOMA (CSPTCL) or the same can be utilized for LILO of Khedamara (CSPTCL) - Borjhara 220 kV S/c line.

CSPTCL may confirm regarding utilization of the 220 kV bays.

- 4.0 Augmentation of Transformation Capacity at ISTS substations in WR to meet n-1 contingency of transformer- agenda by POWERGRID**
- 4.1 It has been observed that at many ISTS substations, n-1 transmission planning criteria doesn't get fulfilled in case of transformer outage. Sometimes it leads to load restriction during peak demand to avoid overloading of transformers. List of such substations along with recorded peak loadings is given in the table below. Further, load flow studies have been carried out to assess the extent of loading on these

transformers for 2018-19 time frame when almost all the under implementation / planned transmission schemes shall be commissioned and the same is also indicated in the table below:

DETAILS OF ICTs IN WESTERN REGION

Sl. No.	Name of the S/S	ICT Rating (MVA)	No. of ICT	Aggregate capacity (MVA)	N-1 Capacity (Outage of Largest ICT)	Peak Loading (MW)	Loading in 2018-19 Time Frame (MVA)	Remark
1	Khandwa 400/220kV	315	2	630	315	530	2x241 = 482 (345:n-1)	Provision of 1x500MVA, 400/220kV (3 rd) ICT is required
2	Boisar 400/220kV	315	2	1130	630	800	2x366+581= 1313 (500:n-1 of 500MVA)	Provision of 1x500MVA, 400/220kV (4 th) ICT is required
		500	1					
3	Bhachau 400/220kV	315	2	630	315	510	2x163 = 326 (245:n-1)	Provision of 1x500MVA, 400/220kV (3 rd) ICT is required
4	Kala(DNH) 400/220kV	315	2	630	315	466	2x278 = 558 (389:n-1)	Provision of 1x500MVA, 400/220kV (3 rd) ICT is required
5	Vapi 400/220kV	315	3	945	630	836	3x335 = 1005 (2x415: n-1)	Due to space constraints in the substation, it is proposed to replace existing 3x315MVAR, 400/220kV ICTs with 3x500MVA, 400/220kV ICTs and utilize 315 MVA ICTs at other S/s.
6	Dehgam 400/220kV	315	2	630	315	450	2x257= 514 (331:n-1)	Provision of 1x315MVA, 400/220kV (3 rd) ICT is required (to be shifted from Vapi 400/220kV s/s)
7	Raigarh (Existing) 400/220kV	315	2	630	315	400	2x168 = 336 (262:n-1)	Provision of 1x500MVA, 400/220kV (3 rd) ICT is required(to be shifted from Vapi 400/220kV s/s)
8	Bhatapara 400/220kV	315	2	630	315	440	2x183 = 366 (263:n-1)	Provision of 1x500MVA, 400/220kV (3 rd) ICT is required(to be shifted from Vapi 400/220kV s/s)

9	Bina(PG) 400/220kV	315	1	315	0	235	304 (n-1 criteria violated as only 1 trf)	No space is available at Bina (PG) 400/220kV S/s for provision of additional ICT
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4.2 It has been observed that loading on transformers at Boisar, Bhachau, Raigarh (Existing) and Bhatapara are expected to be reduced after commissioning of on-going and planned transmission in future and n-1 criteria is fulfilled even without augmentation. However, Maharashtra, Gujarat and Chhattisgarh may confirm whether they envisage requirement of additional ICTs at these substations.

4.3 Members may discuss and concur

5.0 Measure to control Fault Level at pooling stations/ substations in Chhattisgarh area

5.1 A large number of generation projects are coming up in Chhattisgarh which are getting pooled at various substations (at 765kV level) for onward transfer of power to other parts of the grid. This is leading to very high short circuit levels at almost all pooling stations of Chhattisgarh viz. Raigarh (Kotra) Pool (400kV & 765kV), Raigarh (Tamnar) Pool (400kV & 765kV), Champa Pool (400kV & 765kV), Dharamjaygarh Pool (400kV & 765kV), Bilaspur Pool (400kV & 765kV) and Raipur Pool (400kV & 765kV). Studies have been carried out to suggest suitable measures so as to control the fault levels of the substations in Chhattisgarh area within design values. The issue was discussed in the last Standing Committee Meeting (SCM) wherein it was decided that joint studies shall be done by CEA and CTU and the issue shall be finalized in the next WR SCM.

5.2 Joint study results indicate that following measures need to be taken to control the fault levels of the substations in the Chhattisgarh area:

- a. To improve the reliability of power transfer from generating stations connected at Raigarh Pool (Tamnar), LILO of both ckts of Jharsuguda – Dharamjaygarh 765kV 1x D/c line at Raigarh (Tamnar) Pool was agreed in 36th SCM of Western Region held on 29.08.2013.

In 17th SCM of ER held on 25.05.2015, ERPC stated that Jharsuguda – Dharamjaygarh 765kV lines were planned for evacuation of power from Odisha IPPs and Surplus generation in ER to WR & NR. It was also envisaged that LILO of above line at Raigarh (Tamnar) Pool may restrict power evacuation from ER side and would create congestion, thereby overloading in Eastern regional networks. Also, the concerns were raised by ER constituents regarding rising values of fault level at Jharsuguda and nearby substations after LILO of above line at Raigarh (Tamnar) Pool. The case was studied and found that with the proposed LILO line, fault level of a number of substations incl. Dharamjaygarh Pool, Raigarh (Tamnar) Pool and Jharsuguda, is becoming very high. In view of the above, it is proposed to withdraw the LILO of Jharsuguda – Dharamjaygarh 765kV D/c line at Raigarh (Tamnar) Pool. Further, in order to ensure reliable

evacuation of power for generation projects getting pooled at Raigarh (Tamnar) Pool, following is proposed.

➤ Raigarh Pool (Tamnar) Pool – Dharamjaygarh 765 kV D/c Line.

b. In order to contain the fault level within designed value Champa Pool, proposal for Series Reactors and BUS Split arrangement was discussed in the 37th WR SCM held on 05.09.2014. After comprehensive studies, it has been observed that fault levels at Champa Pool may be contained with Bus splitting arrangement at both 765kV & 400kV levels even without series reactors.

c. Further, in the 30th WR SCM held on 08.07.2010, it was decided to keep following circuits in normally open condition at a later date:

➤ Raigarh Pool (Kotra) – Raigarh (Existing) 400 kV D/c line.

➤ Raipur Pool– Raipur (Existing) 400kV D/c line.

These lines may be kept normally open and may be used depending on the system condition

d. Splitting of 765kV Dharamjaygarh S/s and both 765kV & 400kV buses of Raigarh Pool (Kotra) S/s.

e. During the studies, it was observed that the interconnection between 4x600MW TPP and 4x250MW TPP of M/S Jindal Power Ltd, when switched ON, contributes excessive fault current to Raigarh (Tamnar) Pool & Raipur Substations. Hence, the same has been switched OFF in the studies. The same shall have to be ensured by M/s Jindal Power Ltd.

The results with the above bus split are shown in the table below:

SI.No	Substation	Voltage Level (in kV)	Designed SC MVA (in kA)	1	2	
				Fault level in Base Case (kA)	Fault level after Proposed bus splitting (kA)	
					Part A	Part B
1	Dharamjaigarh	400	50	37	33	#
		765	50	71	41	38
2	Raigarh Pool (Kotra)	400	50	102	47	31
		765	50	59	38	19
3	Raipur Pool	400	50	49	30	#
		765	50	53	44	#
4	Champa Pool	400	50	90	48	42
		765	50	62	37	26
5	Bilaspur Pool S/s	400	40	40	39	#
		765	40	46	44	#
6	Raigarh Pool (Tamnar)	765	50	61	38	#
		400	50	55	46	#
7	Raipur(Existing)	400	40	47	26	#
	Raipur (Existing) Split	400	40	41	39	#
8	Raigarh	400	40	88	34	#

9	Rajnandgaon	765	50	36	34	#
10	Sipat	765	50	42	41	#
		400	50	40	39	#

BUS not split

The Power Map of Chhattisgarh showing power flows and short-circuit levels before and after splitting arrangement of Dharamjaygarh Pool, Champa Pool and Raigarh Pool (Kotra) is enclosed at **Annexure 1**.

5.3 The Single Line Diagram of the pooling stations/ substations after bus splitting are given below-

i. Dharamjaygarh Pooling Station after splitting:

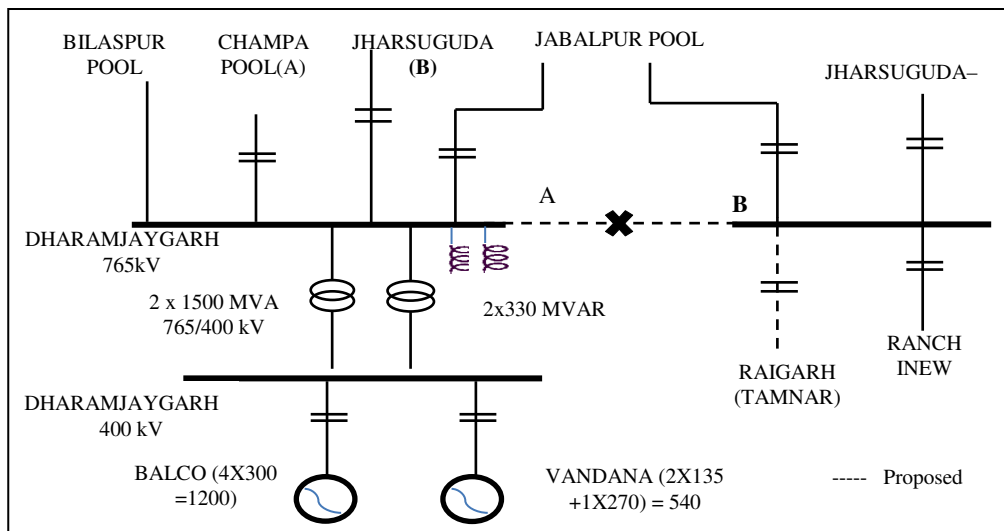


Fig. 1: Dharamjaygarh Pooling Station after splitting

Dharamjaygarh S/s Voltage Level (in kV)	Description		BUS Section A	BUS Section B
400	Generation (in MW)		1740	-
	BUS Reactor (in MVAR)	Available	-	-
		Proposed	1x125	-
	765/400kV ICT(in MVA)	Available	2x1500	-
765	BUS Reactor(in MVAR)	Available	2x330	-
		Proposed	-	1X330 to be shifted from BUS Section A

Balco TPP is a captive plant and LTA granted for 584MW (200MW for Balco Ltd & 384MW for CSPTCL)

ii. Raigarh Pool (Kotra) after splitting :

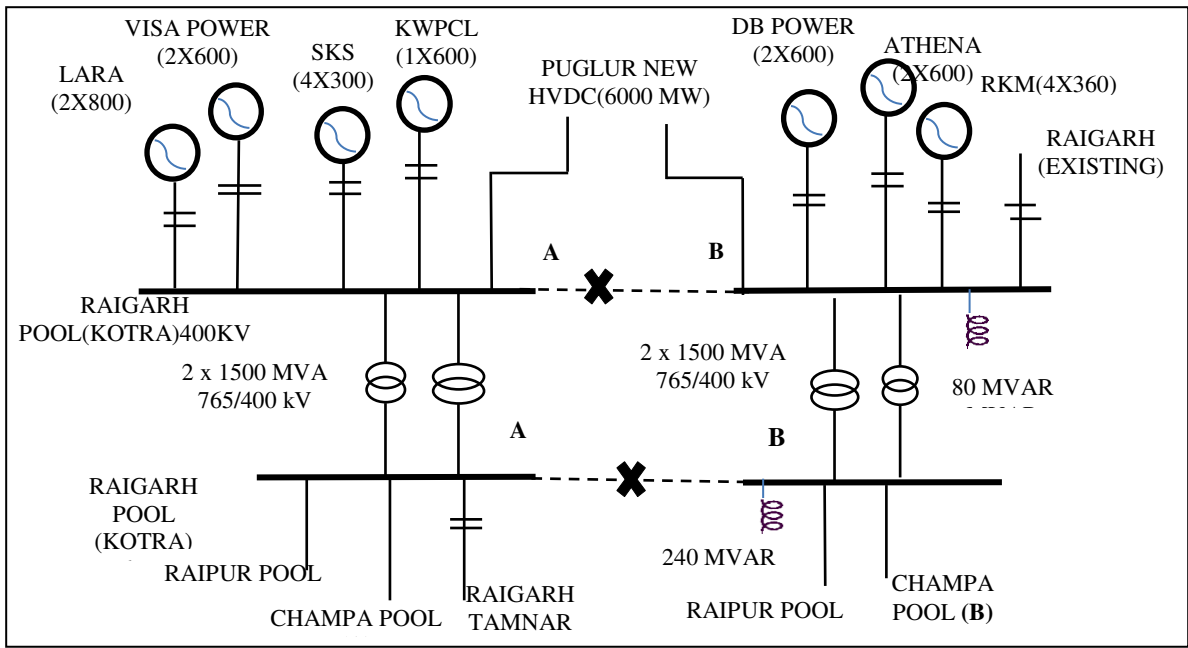


Fig. 2: Raigarh Pool (Kotra) after splitting.

Raigarh Pool (Kotra) Voltage Level (in kV)	Description		BUS Section A	BUS Section B
400	Generation (in MW)		3000	3840
	BUS Reactor(in MVAR)	Available	-	80
		Proposed	1 X 125	-
765	765/400kV ICT (in MVA)	Available	2x1500	2x1500
	BUS Reactor (in MVAR)	Available	-	240
		Proposed	240	

iii. Champa Pooling Station after BUS Splitting :

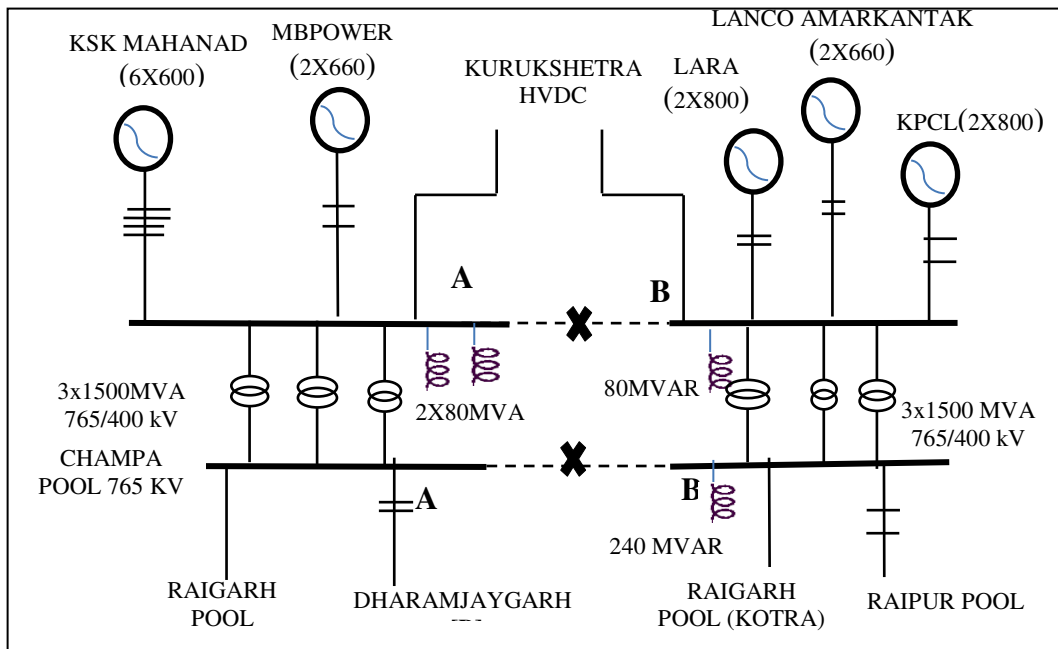


Fig. 3: Champa Pooling Station after splitting.

Champa Pool Voltage	Description		BUS Section A	BUS Section B

Level(in kV)				
400	Generation (in MW)	Available	4920	4520
	BUS Reactor (in MVAR)	Available	2x80	1x80
	765/400 kV ICT(in MVA)	Available	3x1500	3x1500
765	BUS Reactor (in MVAR)	Available	-	240
		Proposed	240	-

5.4 The proposal to control fault level at pooling stations/ substations in Chhattisgarh area is summarized below:

1.	<p>Splitting Arrangement of following substations along with necessary switching arrangement</p> <p>(i) Dharamjaygarh Pool 765kV BUS as per Fig. 1. (ii) Raigarh Pool (Kotra) 400kV & 765kV BUS as per Fig. 2. (iii) Champa Pool 400 kV & 765kV BUS as per Fig 3.</p>
2.	<p>Followings ckts shall be operated as normally open and may be switched on as per operational requirement of grid:</p> <p>(iv) Raigarh Pool (Kotra) – Raigarh (Existing) 400 kV D/c line. (v) Raipur Pool – Raipur (Existing) 400kV D/c line</p>
3.	<p>Reactors:</p> <p>(vi) 1x125 MVAR BUS Reactor at 400 kV BUS Section A of Dharamjaygarh Pool. (vii) 1x125 MVAR BUS Reactor at 400 kV BUS Section A of Raigarh Pool (Kotra). (viii) 1x240MVAR BUS Reactor at 765 kV BUS Section A of Raigarh Pool (Kotra). (ix) 1x240MVAR BUS Reactor at 765 kV BUS Section A of Champa Pool. (x) 1X330MVAR BUS Reactor to be shifted from 765kV BUS Section A to 765kV BUS Section B of Dharamjaygarh Pool</p>
4.	<p>Additional System for Power Evacuation from Generation Projects pooled at Raigarh (Tamnar):</p> <p>(xi) Dharamjaygarh Pool section B - Raigarh (Tamnar) Pool 765kV D/c line</p>

Note # 1: Wherever there is space constraint, GIS bay would be used.

2: The interconnection between 4x600MW TPP and 4x250MW TPP of M/S Jindal Power Ltd shall normally remain in open condition and may be switched on as per operational requirement of grid.

Members may deliberate.

6.0 Measure to control fault level at Wardha Substation

6.1 Fault levels at several substations in Chhattisgarh area were brought under control through suitable splitting arrangements as discussed at item no. 5 without the need

of installation of series reactors. Even after splitting the above buses in Chhattisgarh, fault level at Wardha Substation remains very high. It was observed that short circuit level of 765kV Wardha bus reaches about 46 kA and that at 400kV bus reaches about 78 kA in 2018-19 condition.

The single line diagram of Wardha substation is given below:

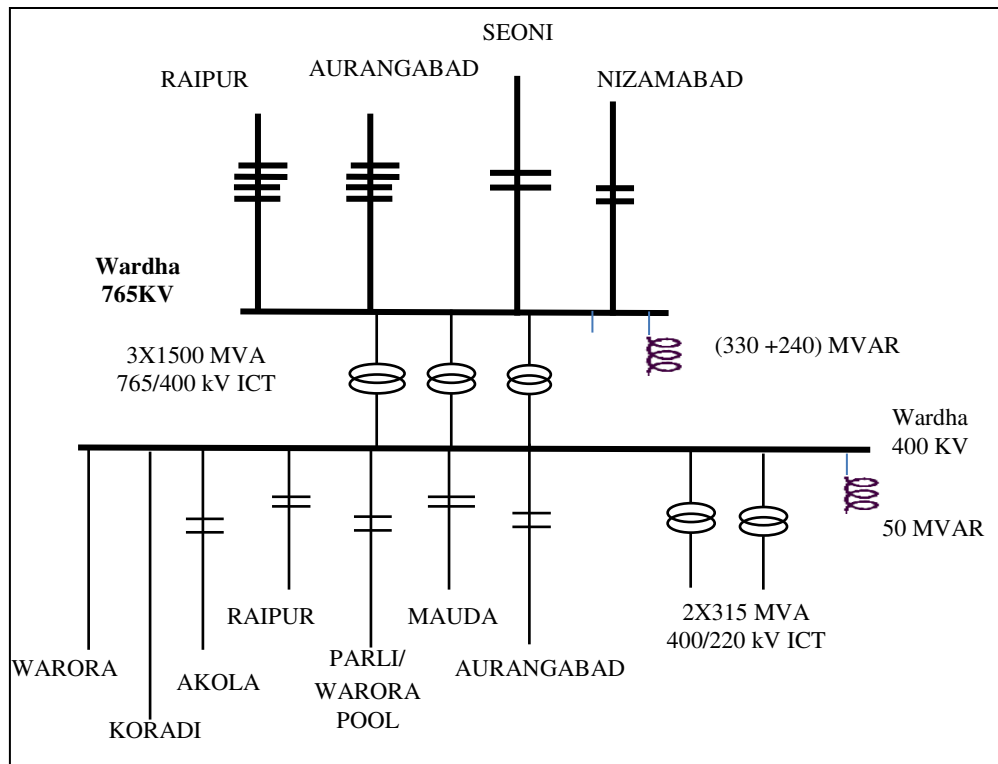


Fig. 4: Wardha Sub-Station

At 400kV Wardha bus, major fault current contributors are –

- Warora Pool D/c line – 16kA
- Warora (MSETCL) S/c line – 7.7kA
- Koradi II (MSETCL) S/c line – 9.6kA
- Mauda TPP D/c line – 5.6kA
- 765/400kV ICTs – 26kA

6.2 It is clear that Warora Pool contributes the most at Wardha 400kV bus. In view of the above, the option of bypassing Mauda TPP – Wardha 400kV D/c line at Wardha bus and connecting it with Wardha – Warora Pool 400kV D/c (Quad) line so as to form Mauda TPP – Warora Pool 400kV D/c (Quad) line was explored. Further, it is observed that the interconnection with MSETCL system contributes about 17.6kA at 400kV Wardha bus. Further, addition of 3x660MW generation at Koradi TPP II would exaggerate the problem. From power flow point of view, these interconnections are not very significant after development of state transmission system from Koradi TPP II. In view of above, the following re-arrangement is proposed at Wardha Substation:

- (i) Bypassing Mauda TPP – Wardha 400kV D/c line at Wardha bus and connecting it with Wardha – Warora Pool 400kV D/c (Quad) line so as to form Mauda TPP – Warora Pool 400kV D/c (Quad) line

- (ii) Bypassing Koradi TPP II – Wardha 400kV (Quad) line at Wardha bus and connecting it with Wardha – Warora (MSETCL) 400kV (Quad) line so as to form Koradi TPP II – Warora (MSETCL) 400kV (Quad) D/c line (one ckt via IEPL TPP)

The Power Map of Wardha complex showing power flows and short-circuit levels before and after re-arrangement of at Wardha 400kV bus is enclosed at **Annexure 2**. The corresponding short circuit levels are tabulated below:

Name of the S/s (BUS)	Voltage Level (kV)	3-Ph SC fault level of the Substations (in kA)	
		Base Case	Base Case + Proposed re-arrangement at Wardha (PG)
Wardha (PG)	400	78	44
Wardha (PG)	765	46	40
Warora MSETCL)	400	41	34
Koradi III MSETCL)	400	38	36
Koradi TPP II	400	56	53
Koradi TPP I	400	52	50
Aurangabad (PG)	400	45	44
Warora Pool	400	51	32
Chandrapur I (MSETCL)	400	51	48
Chandrapur II (MSETCL)	400	51	48

- 6.3 It may be noted here that design rating of Wardha substation is 40kA (3 phase) for both 400kV and 765kV levels. With the proposed re-arrangement, fault levels reduced from 78kA to 44kA at 400kV level and from 46 to 40kA at 765kV level. Additional measures to contain the fault levels below 40kA needs to be further worked out.

Members may deliberate.

7.0 Measures to control High fault levels observed in Vindhyachal complex

- 7.1 Fault levels in Vindhyachal complex have reached beyond the design limits. As reported by WRTS II, in a fault on Vindhyachal - Korba 400kV line#2 on 11.10.15 at a distance of 0.3km from Vindhyachal STPS, fault current fed from Vindhyachal was around 47.4kA. There was a similar fault on the same line on 06.10.14 and the fault current that was fed from Vindhyachal STPS was around 40kA. Such high fault currents are detrimental to switchyard equipment's. Failures of CT connectors, isolator contacts, etc have already been reported during such faults.

- 7.2 Short circuit studies indicate following fault levels at Vindhyachal Complex:

Sl. No.	Substation	3 Phase fault level	LG fault level
1	Vindhyachal STPS – I,II,III	59kA	64kA

	400kV		
2	Vindhyachal STPS – IV, V 400kV	56kA	59kA
3	Sasan UMPP 400kV	49kA	46kA
4	Vindhyachal Pool 400kV	50kA	48kA
5	Korba STPS	57kA	56kA

From the above table, it is evident that all the substations in Vindhyachal complex incl. Vindhyachal STPS and Sasan UMPP are exposed to very high fault currents.

Here, it may be noted that following was agreed in previous standing committee meetings of Western Region:

1. LILO of Vindhyachal STPS – Jabalpur 400kV S/c line at Sasan UMPP has been agreed to be delinked at Sasan UMPP in order to reduce SC levels in Sasan UMPP and Vindhyachal STPS (agreed in 29th WR SCM held on 10.09.2009)
2. Vindhyachal STPS I,II, III – Vindhyachal STPS IV,V interconnection was agreed as an interim arrangement till the commissioning of Vindhyachal STPS IV Transmission System (agreed in the 33rd WR SCM held on 21.10.2011)

7.3 After considering the above agreed schemes in short circuit studies, fault levels are seen to reduce considerably. The revised fault currents are tabulated below:

Sl. No.	Substation	3 Phase fault level	LG fault level
1	Vindhyachal (NTPC) – I,II,III 400kV	38kA	41kA
2	Vindhyachal (NTPC) – IV, V 400kV	24kA	26kA
3	Sasan UMPP 400kV	28kA	29kA
4	Vindhyachal Pool 400kV	29kA	30kA
5	Korba STPS	56kA	56kA

Since, Vindhyachal STPS IV Transmission system has already been commissioned, the 400kV interconnection between Vindhyachal STPS I, II, III and Vindhyachal IV, V of NTPC Ltd shall have to be opened.

Accordingly, Sasan Power Ltd. and NTPC Ltd. may update the status of opening of the following elements in their respective switchyards:

1. LILO of one ckt of Vindhyachal STPS – Jabalpur 400kV D/c line at Sasan UMPP.
2. Vindhyachal STPS I,II,III – Vindhyachal STPS IV,V 400kV interconnection

Members may deliberate.

8.0 Reactive compensation of various schemes agreed to be implemented through TBCB

8.1 The following transmission schemes has been approved in 36th / 37th /38th meeting of Standing Committee on Power System Planning in Western Region held on 29.08.2013/05.09.2014/ 17.07.2014 respectively.

Transmission System associated with Gadawara STPS (2x800MW) of NTPC (Part –A)

- (i) Gadawara STPS – Warora Pooling Station 765kV D/c line
(As per interim arrangement, LILO of existing Seoni – Bina 765kV S/c line at Gadawara STPP would be established. At a later date, LILO portion would be delinked from Seoni – Bina 765kV S/c line to restore the Seoni – Bina 765kV s/c direct, and the LILO portion would be extended to the Jabalpur 765/400kV Pooling Station to form the proposed Gadawara STPS – Jabalpur Pool765kV D/c line)
- (ii) Gadawara STPS – Pooling Station (near Warora) 765 kV D/c line
- (iii) Establishment of 2x1500 MVA, 765/400 Substations at Pooling Station (near Warora)
- (iv) LILO of both circuits of Wardha - Parli (PG) 400 kV D/c quad line at Pooling Station (near Warora)

Transmission System associated with Gadawara STPS (2x800MW) of NTPC (Part –B) now renamed as WRSS 15.

- (i) Pooling Station (near Warora) – Parli (new) 765 kV D/c line
- (ii) Parli (new) – Solapur 765 kV D/c line
- (iii) Establishment of 2x1500 MVA, 765/400 Substations at Parli (new)
- (iv) Parli (new) – Parli (PG) 400 kV D/c (Quad) line

Additional Transmission System Strengthening for Sipat STPS

- (i) Sipat – Bilaspur Pooling Station 765kV 3rd S/c line
- (ii) Bilaspur Pooling Station – Rajnandgaon 765kV D/c line

System Strengthening for IPPs in Chhattisgarh and other generation projects in Western Region

- (i) **400kV interconnections at Gwalior 765/400kV S/s:**
 - Gwalior 765/400 kV – Morena 400 kV D/C (Quad) line
 - Establishment of 2X315 MVA, 400/ 220 kV substation at Morena
- (ii) **Additional evacuation line from Vindhyachal-IV & V STPP (3x500 MW):**
 - Vindhyachal-IV & V STPP – Vindhyachal Pool 400 kV 2nd D/C (Quad) line
- (iii) **Additional System Strengthening Scheme for Chhattisgarh IPPs (Part A):**
 - Sasan UMPP – Vindhyachal Pooling station 765 kV 2nd S/C line
 - LILO of one circuit of Aurangabad – Padghe 765 kV D/C line at Pune GIS
 - Raigarh (Kotra) - Champa Pool 765 kV 2nd S/C line.
 - Champa Pool) – Dharamjaigarh 765 kV 2nd S/C line.

Additional System Strengthening Scheme for Chhattisgarh IPPs (Part B):

- (i) Raipur Pool – Rajnandgaon (TBCB) 765 kV D/c line.
- (ii) Rajnandgaon (TBCB) – Warora Pool (TBCB) 765 kV D/c line.

8.2 The schemes have already been notified along with reactive compensation in 32nd /33rd Empowered Committee on Transmission held on 06.02.2014 / 30.09.2014 respectively. The details for reactive compensation are as below

Bus Reactors

Sl. No.	Substation	Rating
Transmission System associated with Gadarwara STPS (2x800MW) of NTPC (Part –A)		
1	765/400kV, 2x1500MVA Warora Pooling Station	765kV, 1x330MVAR
2	Gadarwara STPS Switchyard	765kV, 1x330MVAR
Transmission System associated with Gadarwara STPS (2x800MW) of NTPC (Part –B) now renamed as WRSS-15		
3	765/400kV, 2x1500MVA Parli (New) Substation	765kV, 1x330MVAR
System Strengthening for IPPs in Chhattisgarh and other generation projects in Western Region		
4	400/220kV, 2x315MVA Morena Substation	400kV, 1x125MVAR
Additional System Strengthening Scheme for Chhattisgarh IPPs – Part B		
5	765kV Rajnandgaon Switching Station	765kV, 1x330MVAR

Line Reactors:

Sl. No.	Transmission Line	Line Reactors (MVAR)		NGR (Ohm)	
		From End	To End	From End	To End
Transmission System associated with Gadarwara STPS (2x800MW) of NTPC (Part – A)					
1	Gadarwara STPS – Warora Pooling Station 765kV D/c line	2x330*	2x330		
2	Warora Pool – Parli (PG) 400kV D/c quad line (formed after LILO of Wardha – Parli (PG) 400kV D/c quad line at Warora Pooling Station)	2x80*	--	2x500	--
Transmission System associated with Gadarwara STPS (2x800MW) of NTPC (Part – B) now renamed as WRSS-15					
3	Warora Pooling Station – Parli (New) 765kV D/c line	2x330*	2x330		
Additional System Strengthening Scheme for Sipat STPS					
6	Bilaspur Pooling Station – Rajnandgaon 765kV D/c line	2x240*			
Additional System Strengthening Scheme for Chhattisgarh IPPs – Part B					

	Rajnandgaon – Warora Pooling Station 765kV D/c line#	2x330*	2x 240* (to be included in TBCB scope)		
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**switchable line reactor*

As per PFCCL (SPV of the project), the length of Rajnandgaon – Warora Pooling Station 765kV D/c line is coming out to be about 275KM after route survey. Addition of 2x240MVar switchable line reactor at Warora Pooling station for Rajnandgaon – Warora Pooling Station 765kV D/c line may be taken up under Additional inter-Regional AC link for import of power into Southern Region (Warora – Warangal line). (Presently under RFP stage)

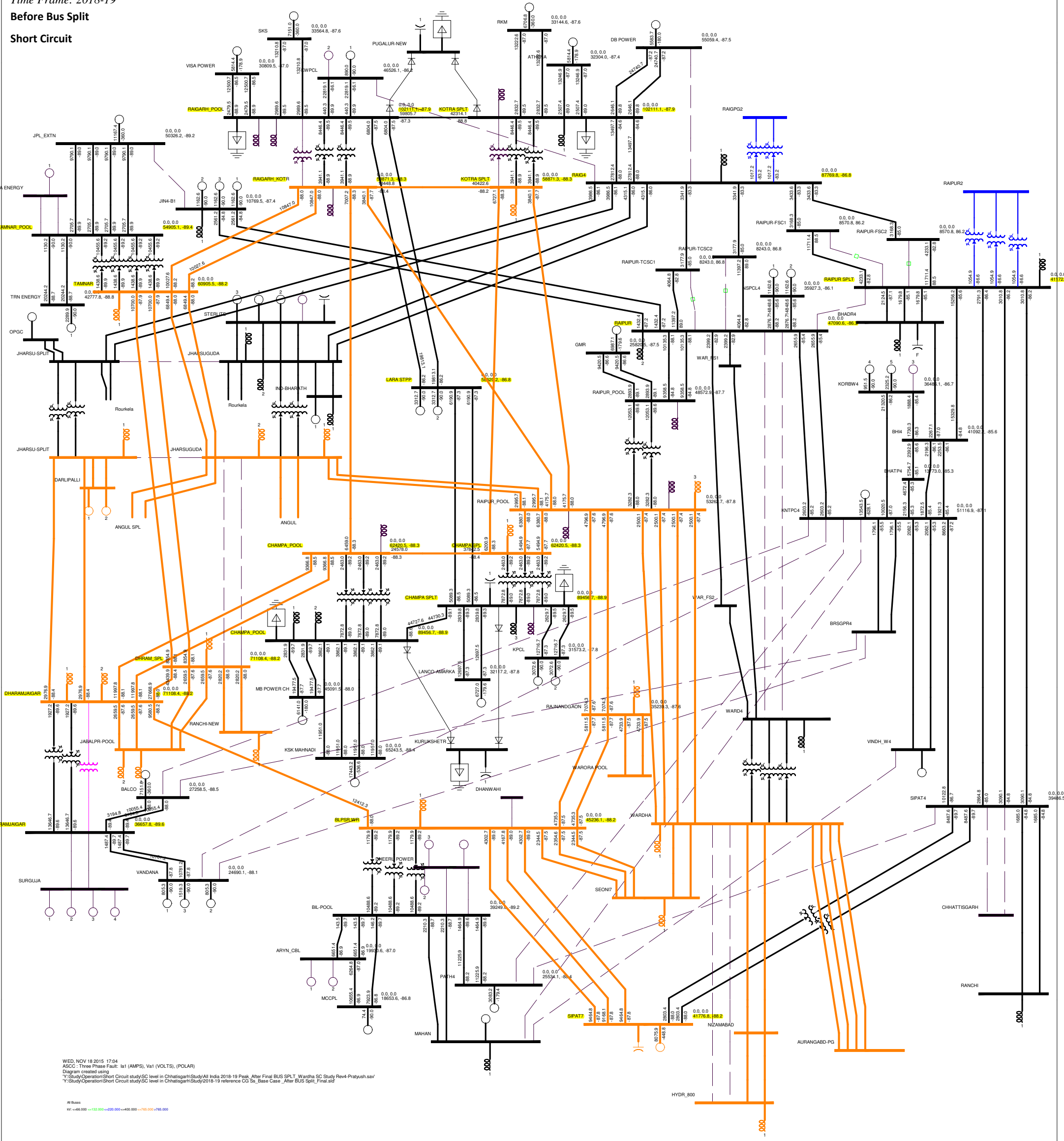
Members may deliberate.

SC level of CG S/s- Study for BUS Splitting

Time Frame: 2018-19

Before Bus Split

Short Circuit



WED, NOV 18 2015 17:04
ASCC : Three Phase Fault: I=1 (AMPS), V=1 (VOLTS), (POLAR)
Diagram created using
"Y:\Study\Operation\Short Circuit study\SC level in Chhattisgarh\Study\AI India 2018-19 Peak_After Final BUS SPLIT_Wardha SC Study Rev4-Prayush.sav"
"Y:\Study\Operation\Short Circuit study\SC level in Chhattisgarh\Study\AI India 2018-19 reference CG Ss_Base Case_After BUS Split_Final.sld"

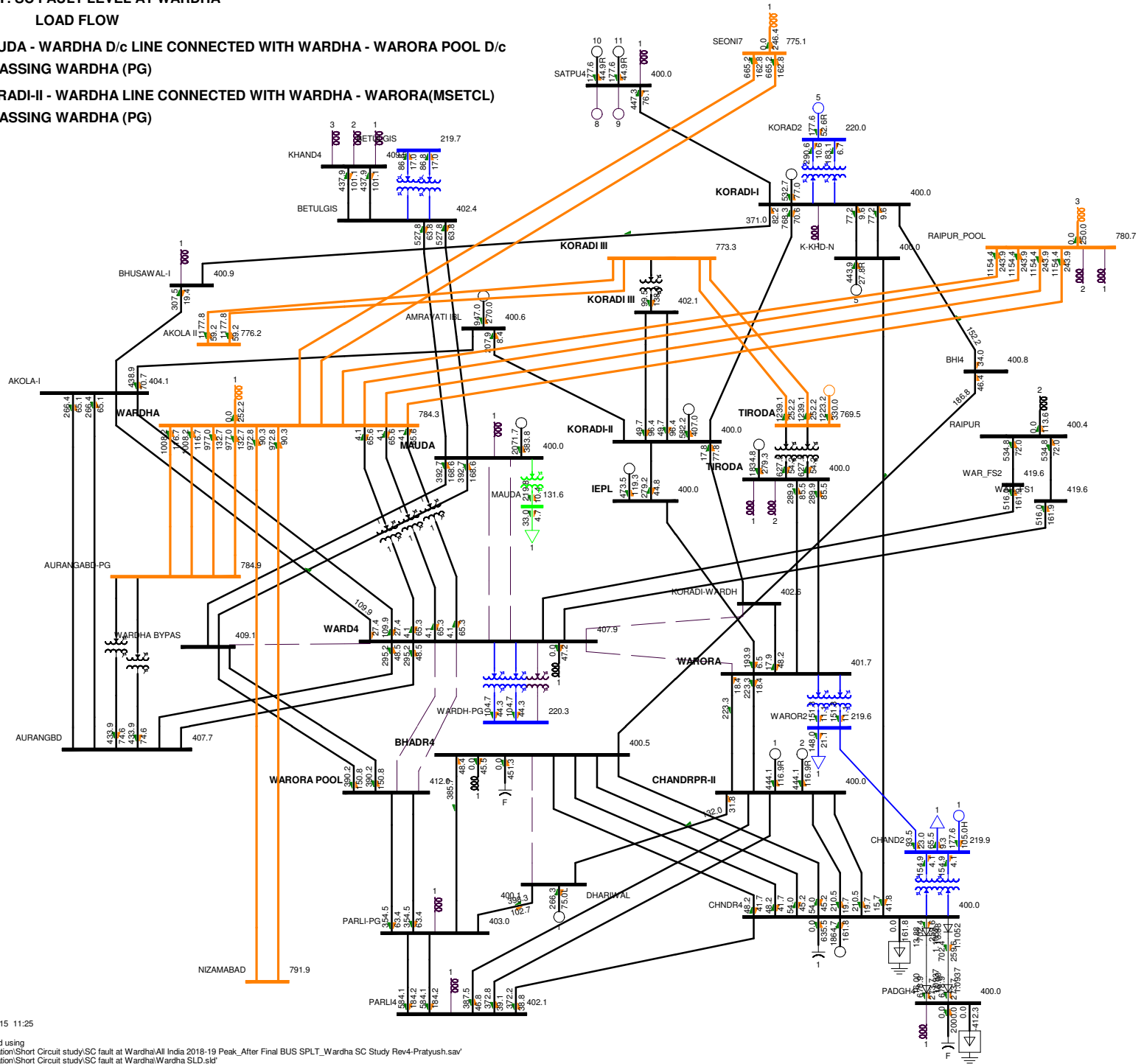
All Busbar
V=66.000 ~122.000 ~240.000 ~400.000 ~765.000 ~765.000

STUDY: SC FAULT LEVEL AT WARDHA

LOAD FLOW

(a) MAUDA - WARDHA D/c LINE CONNECTED WITH WARDHA - WARORA POOL D/c BYPASSING WARDHA (PG)

(b) KORADI-II - WARDHA LINE CONNECTED WITH WARDHA - WARORA(MSETCL) BYPASSING WARDHA (PG)



TUE, NOV 17 2015 11:25

Diagram created using
*Y:\Study\Operation\Short Circuit study\SC fault at Wardha\All India 2018-19 Peak_After Final BUS SPLT_Wardha SC Study Rev4-Pratyush.sav\
*Y:\Study\Operation\Short Circuit study\SC fault at Wardha\Wardha SLD.sld

