

Power Grid Collapse-Is another Power Crisis brewing?

Recurring power underdrawal/overdrawal by States caused grid collapse

Northern Grid collapsed on 30th July, 2012, with subsequent collapse of Eastern and North-Eastern grids, it led to a complete black out situation which took more than 24 hours to recover. The Northern grid consists of nine states, such as Uttar Pradesh, Haryana, J&K, Punjab, HP, Delhi, Uttarakhand, Rajasthan and Chandigarh. **This is the first time in the Indian Power Grid history that three grids have collapsed simultaneously.**

Traditionally, all the Northern states have been power deficit, however, this year, the delayed and lower monsoon played spoilsport to worsen the demand supply mismatch. **CARE Research** believes that grid collapse occurred due to problems such as 1) continued under investment in generation capacity by northern states leading to acute power deficit 2) stagnant hydro capacity unable to address rising peaking demand and 3) recurring and excessive power overdrawal by states significantly beyond scheduled limits.

Table I: Power deficit situation worsened in the Northern states

State/System/Region	JUNE. 11				JUNE. 12				APR - JUNE. 11				APR - JUNE. 12			
	Req. (MU)	Availability (MU)	Surplus/Deficit (-)		Req. (MU)	Availability (MU)	Surplus/Deficit(-)		Req. (MU)	Availability (MU)	Surplus/Deficit(-)		Req. (MU)	Availability (MU)	Surplus/Deficit(-)	
Chandigarh	153	153	0.0	0	178	177	-1	-0.6	438	438	0	0	471	470	-1	-0.2
Delhi	2749	2747	-3.0	-0.1	2961	2946	-15	-0.5	7506	7500	-6	-0.1	7687	7658	-29	-0.4
<i>Haryana</i>	<i>3225</i>	<i>3219</i>	<i>-6.0</i>	<i>-0.2</i>	<i>4185</i>	<i>3657</i>	<i>-528</i>	<i>-12.6</i>	<i>8328</i>	<i>8151</i>	<i>-177</i>	<i>-2.1</i>	<i>10504</i>	<i>9523</i>	<i>-981</i>	<i>-9.3</i>
Himachal Pradesh	669	667	-2.0	-0.3	757	714	-43	-5.7	1998	1992	-6	-0.3	2272	2216	-56	-2.5
Jammu & Kashmir	980	769	-211.0	-21.5	1184	888	-296	-25	3302	2511	-791	-24	3631	2723	-908	-25
<i>Punjab</i>	<i>4454</i>	<i>4392</i>	<i>-63.0</i>	<i>-1.4</i>	<i>5437</i>	<i>5053</i>	<i>-384</i>	<i>-7.1</i>	<i>11384</i>	<i>11207</i>	<i>-177</i>	<i>-1.6</i>	<i>12231</i>	<i>11652</i>	<i>-579</i>	<i>-4.7</i>
<i>Rajasthan</i>	<i>3997</i>	<i>3975</i>	<i>-22.0</i>	<i>-0.6</i>	<i>4914</i>	<i>4476</i>	<i>-438</i>	<i>-8.9</i>	<i>12051</i>	<i>12000</i>	<i>-51</i>	<i>-0.4</i>	<i>13073</i>	<i>12351</i>	<i>-722</i>	<i>-5.5</i>
<i>Uttar Pradesh</i>	<i>6564</i>	<i>6028</i>	<i>-537.0</i>	<i>-8.2</i>	<i>8362</i>	<i>7081</i>	<i>-1281</i>	<i>-15.3</i>	<i>19341</i>	<i>17600</i>	<i>-1741</i>	<i>-9</i>	<i>23490</i>	<i>20351</i>	<i>-3139</i>	<i>-13.4</i>
Uttarakhand	884	867	-17.0	-1.9	1025	973	-52	-5.1	2627	2534	-93	-3.5	2931	2756	-175	-6
Northern Region	23676	22816	-860.0	-3.6	29003	25965	-3038	-10.5	66976	63932	-3044	-4.5	76290	69700	-6590	-8.6
All India	74183	70261	-3922	-5.3	85382	78031	-7351	-8.6	227658	212628	-15030	-6.6	248166	228000	-20166	-8.1

Source: CEA, CARE Research

Table-I mentions the states, where the power deficit has worsened in July 2012 and during the quarter Apr-July 2012. States such as Haryana, Punjab, Rajasthan and UP have contributed to worsening power situation i.e. power deficit in these states increased sharply by 660bps, 570bps, 830bps and 710bps YoY to 12.6%, 7.1%, 8.9% & 15.3% respectively in July 2012.

Stalled capacity addition from states have pushed them to corner

The major structural reason for the grid failure stems from the fact that most of the states, which are overdrawing power from grid compared to the scheduled limits have hardly invested in capacity addition in the past few years. Please refer Table-II which discerns the following major trends in YoY capacity addition growth in June 2012 such as- 1) State generation sector of all of the major northern states (Except Delhi) have either added nil or negligible capacity to contain rising power demand 2) Most of the capacity addition has been

from the private sector and 3) muted capacity build-up (such as hydro or gas) to address peak power demand.

Table II: Capacity addition break-up in the major northern states

State	Ownership	Yearly Capacity Addition - June'12								Growth YoY (%)	
		Thermal			Total	Nuclear	Hydro		RES		Total
		Coal	Gas	Diesel	Thermal		Hydro	RES	Total		
Delhi	State	-	500	-	500	-	-	-	500	42%	
	Pvt + Central	546	37	-	583	-	49	16	648	14%	
	Total	546	537	-	1083	-	49	16	1148	20%	
Haryana	State	-	-	-	-	-	-	-	-	0%	
	Pvt + Central	1579	0.10	-	1579	(109)	20	8	1498	82%	
	Total	1579	0.10	-	1579	-109	20	8	1498	25%	
Punjab	State	0	-	-	0	0	0	1	1	0%	
	Pvt + Central	41	-	-	41	(208)	(547)	808	94	5%	
	Total	41	-	-	41	-208	-547	809	96	1%	
Rajasthan	State	-	-	-	-	-	(0.20)	-	(0.20)	0%	
	Pvt + Central	328	(0.02)	-	328	-	43	902	1272	33%	
	Total	328	(0.02)	-	328	-	43	902	1272	14%	
UP	State	601	-	-	601	-	1	2	603	13%	
	Pvt + Central	2410	-	-	2410	-	121	92	2623	45%	
	Total	3011	-	-	3011	-	122	93	3226	31%	
		5505	537	0	6042	-317	-313	1828	7240	19%	

Source: CEA; CARE Research

Additionally, the peak power deficit issue in these states was further accentuated by the diminishing reservoir levels of the storage based hydro power plants due to current dry spell with most of the northern states receiving low rains this year. Table III illustrates the 70% reduction in power generation from hydro power as on 29th July 2012, which has added to acute shortage in peak power situation resulting into excessive power overdrawal by states such as UP and Punjab. Further, these agricultural states with current sowing season are yet to ration the water usage, which led to sharp reduction in water head levels in the dams directly impacting the power generation.

Table III: Reservoir levels and power generation from large northern hydel plants

Name of Reservoir	Capacity (MW)	Parameters		Present Parameters		Last Year		Power gen. YoY (%)
		FRL (m)	MDDL (m)	Level (m)	Energy (MU)	Level (m)	Energy (MU)	
Bhakra	1325	513.6	445.6	477.8	407.6	497.5	995.0	-50.0%
Pong	396	426.7	384.1	394.5	116.6	414.4	656.2	-36.9%
Tehri	1000	829.8	740.0	775.7	270.0	818.7	982.3	-16.7%
Rihand	300	268.2	253.0	254.8	60.8	258.7	234.8	10.2%
Total		2038.3	1822.7	1902.7	855.0	1989.2	2868.3	-70.2%

N.B -FRL- Full Reservoir Level, MDDL- Minimum Drawdown level

Source: NRLDC; CARE Research

No investment in T&D, lacking grid discipline

Over the last decade, most of these state distribution companies remained in precarious situation with negligible reduction in AT&C losses (AT&C losses>35-40%), stagnant tariff vis-à-vis rising power purchase costs, irregular subsidy payments by states, high cross subsidization resulting into severe cash crunch. Recently, the distribution companies of the northern states such as Haryana and UP have even filed for debt restructuring. Thus, decade of under investments in T&D resulted in poor management of load forecasting abilities with 1) lack of accurate control over load management at feeder level to ascertain exact nature and

behavior of demand and 2) lack of investment in T&D equipments i.e. under frequency relays which would have averted grid collapse by segregating the notorious load sections from the regional grid. Interestingly, these states are not even left with an option of buying power from open market as the state grid is overloaded with no spare capacity to wheel the power. Consequently, despite penalty mechanism introduced by the regulator in the form of Unscheduled Interchange (UI), it is cheaper for these states to overdraw power from the grid rather than buying power through other channels.

States such as Punjab, Haryana and UP are agriculture based with large dams playing vital role in irrigation of farmlands. Thus, agricultural pumping power load increases sharply in the Rabi sowing season. Due to lower monsoon this year, the northern states’ power demand remained at elevated level (~5GW peak deficit in July 12) leading to exacerbated power deficit situation.

Despite the current installed power generation and transfer capacities being stretched, northern states such as UP, Haryana and Punjab regional load dispatch centres exercised no caution and have continuously overdrawn power from the regional grid (even when the grid frequency went below 49.5Hz) vis-à-vis their scheduled limits leading to wide variation in the system frequency slippage as shown in Table IV. This eventually triggered grid collapse on 30th July 2012.

Table IV: Deterioration of northern grid frequency

Date	% of time in the day frequency		Daily Overdrawal (+ve)/ Underdrawal (-ve) by State constituents in Northern Region in MU								
	within 49.5-50.2 Hz	below 49.5 Hz	UP	Haryana	Punjab	Uttarakhand	Rajasthan	HP	J&K	Delhi	Chandigarh
10-Jul-12	95.3	4.5	15.53	23.98	11.29	4.49	10.54	0.34	-0.57	-7.78	-0.8
11-Jul-12	96.11	3.72	26.13	20.51	4.43	2.99	3.67	-0.92	-0.97	-9.12	-0.74
12-Jul-12	93.3	6.6	31.78	15.57	3.79	2.72	-5.69	-1.33	-1.1	-11.79	-0.9
13-Jul-12	99.2	3.5	21.16	15.19	6.98	1.87	-12.21	-0.31	0.43	-2.46	-0.7
14-Jul-12	93.7	4.2	24.48	8.74	7.02	2.3	-7.96	0.1	-2	-8.5	-1.24
15-Jul-12	91.1	3.7	27.1	7.7	4.01	2.61	10.61	-0.91	-0.11	-10.43	-1.47
16-Jul-12	70.9	29.1	36.33	0.73	-0.94	3.18	15.01	0.46	0.83	-7.96	-0.73
Average	91.37	7.9	26.07	13.2	5.23	2.88	2	-0.37	-0.5	-8.29	-0.94
Maximum	99.2	29.1	36.33	23.98	11.29	4.49	15.01	0.46	0.83	-2.46	-0.7
Minimum	70.9	3.5	15.53	0.73	-0.94	1.87	-12.21	-1.33	-2	-11.79	-1.47

Source: NRLDC; CARE Research

Severe underdrawal led to Northern grid collapse on 30th July 2012 at 2.35 a.m.; the grids collapsed again the very next day with Eastern and North Eastern grids joining the Northern grid, this time because of excessive overdrawal by Northern states. The Northern Regional load Dispatch Centre (NRLDC) has filed a petition with central regulatory commission (CERC) and expressed its inability to take any punitive actions against the overdrawn states.

CERC has now issued directions to these states to strictly adhere and maintain grid discipline, detailing 1) the constituent states should not resort to any overdrawal when the grid frequency is below 49.5 Hz and comply with provisions of Grid code 2) the states should ensure that Under Frequency Relays (UFR) are kept in service all the times and feeders used for load shedding are different from feeders used for manual load shedding so that grid security is not compromised and 3) all users/ SLDC/SEBs/distribution licensee should comply

with direction of RLDC/SLDC and carry out requisite load shedding or back down generation capacity in case of transmission line congestion to ensure safety and reliability of system.

According to Revati Kasture, Head, CARE Research-“CERC should ensure that the states to strictly abide by the Grid code and ask SLDC/RLDCs to devise a contingent plan, if the state draws power from grid beyond the stipulated overdrawal limits. Moreover, State Transmission Utilities (STUs), in addition of being transmission licensees, are also currently performing this function creating conflict of interest. Appropriate regulatory mechanisms and penalty structures to separate SLDC/RLDCs from states is required for their effective functioning.

The power sector has been facing various issues which has deteriorated its health over the past two years. **D. R. Dogra, MD and CEO - CARE Ltd. Says-** “The precarious situation of power sector can only be addressed through key structural reforms such as 1) Coal pooling mechanism to improve power generation from coal based plants 2) investment in hydel capacity (especially storage based or pumped storage power plants) to effectively manage peaking load 3) Allow open access to reduce regional deficits and 4) incentivise states to invest in T&D to curb AT&C losses and make the power distribution business model self sustainable.”

Contact:

Revati Kasture

Head - CARE Research

revati.kasture@careratings.com

+91-22-6754 3465

Divyesh Shah

Asst General Manager

divyesh.shah@careratings.com

+91-22-6754 3441

Piyush Nimgaonkar

Deputy Manager

piyush.nimgaonkar@careratings.com

+91-22-6754 3656

Disclaimer

This report is prepared by CARE Research, a division of Credit Analysis & REsearch Limited [CARE]. CARE Research has taken utmost care to ensure accuracy and objectivity while developing this report based on information available in public domain. However, neither the accuracy nor completeness of information contained in this report is guaranteed. CARE Research operates independently of ratings division and this report does not contain any confidential information obtained by ratings division, which they may have obtained in the regular course of operations. The opinion expressed in this report cannot be compared to the rating assigned to the company within this industry by the ratings division. The opinion expressed is also not a recommendation to buy, sell or hold an instrument.

CARE Research is not responsible for any errors or omissions in analysis/inferences/views or for results obtained from the use of information contained in this report and especially states that CARE (including all divisions) has no financial liability whatsoever to the user of this report. This report is for the information of the intended recipients only and no part of this report may be published or reproduced in any form without prior written permission of CARE Research.

Credit Analysis and Research Limited proposes, subject to receipt of requisite approvals, market conditions and other considerations, to make an initial public offer of its equity shares and has filed a draft red herring prospectus (“DRHP”) with the Securities and Exchange Board of India (“SEBI”). The DRHP is available on the website of SEBI at www.sebi.gov.in as well as on the websites of the Book Running Lead Managers at www.investmentbank.kotak.com, www.dspml.com, www.edelcap.com, www.icicisecurities.com, www.idbicapital.com, and www.sbcaps.com. Investors should note that investment in equity shares involves a high degree of risk and for details relating to the same, see the section titled “Risk Factors” of the DRHP.

This press release is not for publication or distribution to persons in the United States, and is not an offer for sale within the United States of any equity shares or any other security of Credit Analysis & Research Ltd. Securities of Credit Analysis & Research Ltd., including its equity shares, may not be offered or sold in the United States absent reistration under U.S. securities laws or unless exempt from reistration under such laws.