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A STUDY OF BLACKOUT IN INDIA

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ABSTRACT

In India electric power installed capacity is 329.30 GW at Sept 2017 but at peak demand we have shortage of power due to huge transmission and distribution loss and low tarrifs. We always try to reduce transmission and distribution loss by different method. But in summer 30 July -31 July 2012 India suffer largest black out in world due to late coming of monsoon in Punjab and Haryana agriculture irrigation of paddy field pumps take more power from grid due to low power factor.

Keywords-Power sector in India, event, Blackout, TPS.

I.INTRODUCTION

In India there is black out takes place at 30 July to 31 July

2012 .It was largest blackout in world. In India having five region of electricity five out of three were collapse about 670 million people powerless. First northern grid collapse at 2:30am on 30 July 2012 due increase in load. Whole northern India was affected including Delhi. Day of second 31 July at around 1 PM on Tuesday half of India country like state of northern grid Delhi, Haryana, Himanchal ,Punjab, U.P, Jammu Kashmir ,state on eastern grid Bihar, Jharkhand ,Orissa ,West Bengal and state of north east grid Aruranchal Pradesh, Assam, Meghalaya ,Mizoram ,Nagaland and Sikkim facing blackout effect.

II. SEQUENCE OF 30JULY 2012

1-00:10 hours of 30th Jul 2012, 220 kV Badod- Modak As per SLDC MP's report the line tripped at 00:00 hours on overload. Loading reported at 300 MW.

2-01:35 hours of 30th July 2012, 220 kV Gwalior (PG) - Gwalior (MP)-2 As per SLDC MP's reports, the line tripped on overload with the antecedent flow being of the order of 270

MW from Gwalior MP to Gwalior PG.

3-02:33 hours of 30th July 2012, 220 kV Gwalior (PG) - Malanpur-1, As per SLDC MP's reports, this tripped on overload with antecedent load of 280 MW.

4-02:33:11: 976, 400 kV Bina- Gwalior–1, The 400 kV Bina- Gwalior-Agra circuit 2 was under planned outage for up gradation to 765 kV level. Circuit 1 tripped on operation of Main-2 protection at Bina end

6-02:33:13:927 Rourkela RTU reporting to ERLDC shows time o02:33:15:025 but the RTU is not time synchronized),

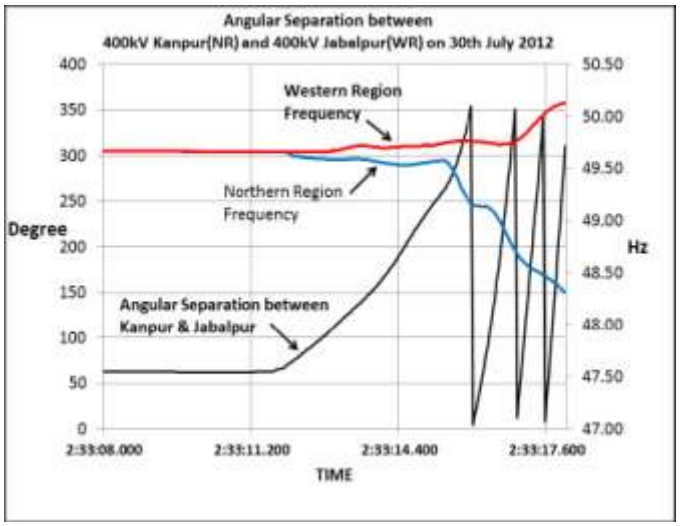
400 KV Jamshedpur- Rourkela-2, Main-2-> MICOM P442 has operated.

7-02:33:13:996 400 kV Rourkela- Jamshedpur-1, Main-2 distance protection operated at Rourkela end.

8-02:33:15:181, Muzaffarpur RTU not synchronized) 400 KV Gorakhpur Muzaffarpur -2, Tripped from Gorakhpur end on operation of Main-1 protection.

9-02:33:15:400 400 kV Muzaffarpur-Gorakhpur-1 Tripped from Gorakhpur end due to operation of Main-1 protection apparently due to power swing/load encroachment.

10-02:33:15: 400kV Biharshariff- Balia-1 Both Main-1 (MICOM P442) and Main-2 (SIPROTEC) distance protection operated at Biharsharif end due to power swing.



11-02:33:15, 400kV Biharshariff-Balia-2 Both Main-1 (MICOM P442) and Main-2 (SIPROTEC) distance protection operated at Biharsharif end due to power swing.

12-02:33:15,400 KV Patna-Balia-1 Tripped at Patna end on operation of Main-2 protection due to power swing.

13-02:33 to 02:34 (anytime between S no 13-17 400 kV Sasaram (Pusauli)-Balia.

III.SEQUENCE OF 31JULY 2012

1- 07:59, 400 kV Zerda- Bhinmal Tripped on B-phase to earth fault and taken under shutdown subsequently.

2- 06:59, 400 kV Zerda- Kankroli Tripped on fault at 02:22,

03:10 and 06:59 hours on fault and taken under Shut down subsequently.

3-12:56:55:097, 220 kV Badod- Modak Tripped on overload

4- 12:58:48:727, 220 kV Badod-Kota Tripped on overload from Badod end.

5- 13:00:13:045 400 kV Bina-Gwalior 1 Tripped at Bina Dadri GPS & Dadri Thermal.

IV.BLACK START BY HYDRO STATIONS

- Uri HEP was black started at 13:33 hrs.
- Salal HEP black started at 13:47 Hr.
- Chamera-2 Hydro station at START Ups
- Auriaya GPS at 14:50 hrs.
- Startup supply to Rosa TPS at 16:21 hrs.
- Start up supply to Parichha TPS at 17:06 hrs.
- Start up power to Obra TPS was extende from Pipri hydro station (Black started) at 16:55 hrs.
- Startup power to Panipat TPS stage-2 at 15:40 hrs.
- Start up power to Panipat TPS Stage-1 at 16:00 hrs.
- Start up supply to Khedar TPS at 16:41 hrs.
- Startup supply to Badarpur TPS (BTPS) at around 14:40 hrs.
- Startup supply to Kota TPS at 13:23 hrs.
- Startup supply to Suratgarh TPS at 14:35 hrs.

  Power Supply to Delhi 15:08 hrs.
- Chamera-I black-started at 14:05 hrs. 13:00:15:022 220 kV Bina (MP) - Gwalior (MP)-2
- 13:00:15:068 220 kV Bina (MP) - Gwalior (MP)-1
- 13:00:15:548 220 kV bus coupler at Tarkera.
- 13:00:17:600 400 kV Jamshedpur- Rourkela-1
- 13:00:17:948 400 kV Ranchi- Maithon
- 13:00:19:645 400 kV Rourkela- Sterlite-2
- 13:00:19:945 400 kV Ranchi- Sipat-2 400 kV Ranchi- Sipat-1 was not in service at this instance due to a problem in isolator at Sip at end.
- 13:00:19:948 400 kV Raigarh- Rourkela-3.
- 13:00:19:974 400 kV Ranchi- Rourkela-1.
- 13:00:19:981 400 kV Talcher- Rourkela-2.
- 13:00:19:986 400 kV Talcher- Rourkela-1.
- 13:00:20:017 400 kV Ranchi- Raghunathpur.

V. RESTORATION

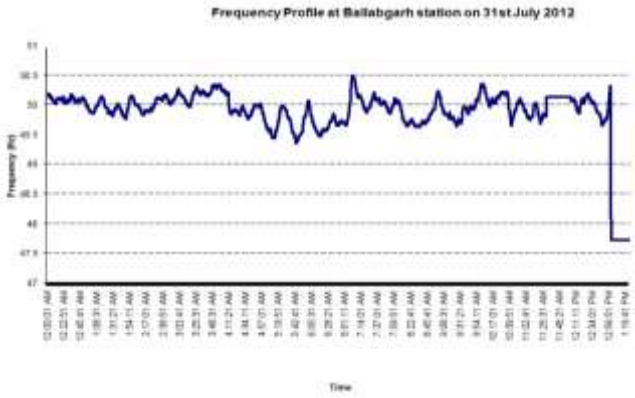
a) Restoration Process in Northern Region

- Extension of Power Supply
- Western Region supply was extended by charging Gwalior-Agra I. This was further extended to Kanpur, Ballabgarh, and Delhi etc.

- Western Region supply was also extended by 220 kV Morak-Badod. This was further extended to Western Rajasthan System.
- Western Region supply was also extended from 400kV Vindhyachal TPS to 400kV Vindhyachal Back to Back station through AC bypass mode.
- Western Region supply was also extended from 220kV Mehgaon & 220kV Malanpur lines.

b) Extension of startup supply to Power Stations

- Singrauri STPS AT 13:46 hrs.
- Rihand STPS at 13:53hrs
- Anpara TPS at 16:20 hrs.
- Jhajjar TPS at 13:43 hrs.
- Unchahar TPS at 14:58 hrs.
- Tanda TPS at 15:57 hrs.
- Narora Atomic Power Station at 15:53 hrs



c) Restoration of Traction Supply

- 1400kV Gwalior-Agra charged at 13:43 hrs.
- Start up supply to Auriaya GPS Power supply for traction sub-stations at Shikohabad, Etahwah at 14:33 hrs.
- Traction power at Sarojininagar was restored at 16:27 hours.
- Power supply from Pong HEP BBMB was extended to Jallandhar at 16:15hrs.
- Power supply extended from NJPC to Abdullhapur-PG.
- Further power supply for traction sub-stations at Kurali, Ghagar, Anadpur Sahib, Rajpura and Jagdhari were restored at 15:18 hrs

S. No	Name of feeder	Time
1	Pappan Kala1	14:13
2	Pappan Kala 2	14:14
3	Dial	14:16
4	Mehrauli	14:20
5	Mundaka	14:27
6	Sarita Vihar	14:38
7	Rohini	14:48
8	Park Street	15:50

Delhi metro restoration

d) Restoration Process in Eastern Region

Restoration of Traction Supply

- Power supply was extended to Khursrupur traction substation from Fatuha at19:15 hrs.
- Power supply was extended to Paharpur traction substation from Bodhgaya at 19:35 hrs.
- Power supply was extended to Mokama traction substation from Hatidah at 19:40 hrs.
- Power supply was extended to Lakhisarai traction at 19:45 hrs.
- Power supply was extended to Jhajha traction substation from Jamul at 19:55 hrs.
- Power supply was extended to Gaya traction substation from Chandauti at 19:56 hrs.
- Power supply was extended to Jehanabad traction substation at 20:06 hrs.
- Power supply was extended to Rafiganj traction substation at 20:07 hrs.
- Power supply was extended to Japla traction substation from Sonenagarat 20:22 hrs. Power supply was extended to Sonenagar traction substation at 20:25 hrs.
- Power supply was extended to Chapra traction substation at 21:56 hrs.
- Power supply was extended to Hazipur traction substation at 22:02 hrs.
- Power supply was extended to Kudra traction substation at 22:20 hrs.
- Power supply was extended to Karamnasa traction substation at 22:25 hrs.
- Power supply was extended to Arrah traction substation at 22:30 hrs.
- Power supply was extended to Danapur traction substation from Khagaul at 22:35 hrs.
- Power supply was extended to Dumroan traction substation from Dumroar at 22:40 hrs.

e) Eastern Central Railway

- Power Supply was extended from CTPS (DVC) to Rajohara traction substation at 15:32 hrs.
- Power Supply was extended from BTPS (DVC) to Barhi.

f) East Coast Railway

- Power Supply was extended from Narendrapur to Solari traction substation at 15:30 hrs
- Power Supply was extended from Baripada to Balasore to
- Bhadrak traction substation at 15:30 hrs.

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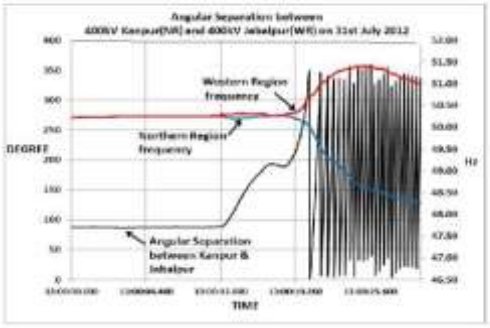

VI .RECOMMENDATION OF COMMITTEE

- Review protection scheme.
- Synchrophasor measurement from PMU should be explored for protection system.
- Frequency band lightning.
- Faster algorithm of calculation of TTC
- Installation of adequate static and dynamic reactive compensator should be planned.
- Existing PMU and availability of their output.
- RLDC and accuracy of time synchronization should be monitotered on daily basis especially under dynamic conditions.
- The synchrophasor based WAMS employing PMU offer wide application for real time monitoring and control.
- Number of PMU should be installed to improve the visibility and monitoring.
- Possible voltage collapse predictions, sensing global power system conditions and improve local measurement system.
- The communication network should be strength by putting fiber optics communications.
- UPS-RTU and communication equipment should be undisrupted power supply with proper backup so in case of power failure system will not disturb.
- Telemetry facility available at all generation station and transmission lines
- Island effect to try made iseland based frequency sensing relay so in case of urgent grid fail electrical is land can be formed.
- An audit device such as HVDC, TCSC, SVC .Ensure their stability feature enabled.
- For smooth operation grid should have good telemetry network.

VII. POLICY RECOMMENDATION

- The present organization setup load dispatch centre need to review.
- Training and certification of operators needs attentions.
- Implementation of various regulation issues under electricity act 2003 and look into violation seriously.

- Real time security desk in the entire shift to managed capable of carrying out TTC calculation in NDLC and SDLC.
- Intra state transmission system needs to plan and strength in better way to avoid problem a frequent congestion.
- Special task force in which involving of expert from academician, Power operators and utilities to carry out detail analysis of present grid conditions.
- Sufficient financial incentive need to given to certified system operators such that specialized activity will perform.

VII. CONCLUSION

This paper analyzes the event, restoration and main reasons of the 30 July 2012 and 31July 2012 Indian blackout. In the light of the problems of infrastructural construction, technical management and dispatch planning of the Indian grid, it discusses and puts forward advices on coordinative development and interactive operation of source-grid-load, construction of safe and stable defense for wide area, as well as dispatching and controlling management mechanism for Chinese grid based on comparative perspective.

List of Major power outage in world

S. No	**Article**	**Millions of people**	**Lactation**	**date**
1	2012 India blackout	620	North India	30 July 2012-31
2	2001 India blackout	230	India	2 January 2001
3	2014 Bangladesh	150	Bangladesh	1 November 2014
4	2015 Pakistan	140	Pakistan	26 January 2015
5	2005 Java – Bali	100	Indonesia	18 Aug 2005
6	1999 southern brazil	97	Brazil	11 march 1999
7	2009 Brazil and Paraguay	87	Brazil	10November 2009-11 November
8	2015 Turkey	70	Turkey	31 March 2015

9	2003 North east black	55	Canada	14 august 2003-15
10	2003 Italy	55	Italy	28 September
11	2003 Kenya	44	Kenya	7 June 2016
12	1978 Thailand	40	Thailand	18 march 1978
13	2016 Sri	21	Sri Lanka	13 march 2014
14	1965 North east black	21	United State	9 November 1965

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