

A photograph of a dimly lit interior space, likely a home, during a power outage. In the foreground, a person is seen from the back, holding a lit candle. The room is cluttered with various items on shelves and tables, including bottles, containers, and framed pictures. In the background, another person is visible, also using a candle for light. The overall atmosphere is one of darkness and reliance on traditional light sources.

Darkness All Around India

India Major Blackout 2012



Scale of Outages

July of 2012 was tough interval in case of electricity accessibility in India.

Blackouts lasted around 2 days: 30 and 31 July 2012.

350 million people are affected on first day, and 670 million are affected on second day.

Briefly 21 out of 28 Indian states faced problems.



Indian Electricity Grids

- Indian electricity are based on 5 different grids:
 - **Northern Grid**
 - **North-Eastern Grid**
 - **Eastern Grid**
 - **Western Grid**
 - **Southern Grid**
- **North-East-West (NEW) Grid**
 - Except Southern Grid all other grids are interconnected.
 - Aimed to ease power distribution, and de-stress transmission lines.

Generation of Electricity in India

- Indian electricity are based on two types of generators.
 - Coal-Fired Thermal Power Plants (Mostly Located in **Eastern Grid**)
 - Hydroelectricity (Mostly Located in **Northern** and **North-Eastern Grids**)
- Heaviest loads are on the following grids:
 - **North**
 - **West**
 - **South**



Origin of Event

July 2012: NEW grid was operating in a stressed and unsafe situation.

- Huge increase of agricultural demand in Northern grid.
- Excess power in Western grid resulted in very high outflows of power to Northern region.

Same time only 2 of 4 West-North interconnections were available.

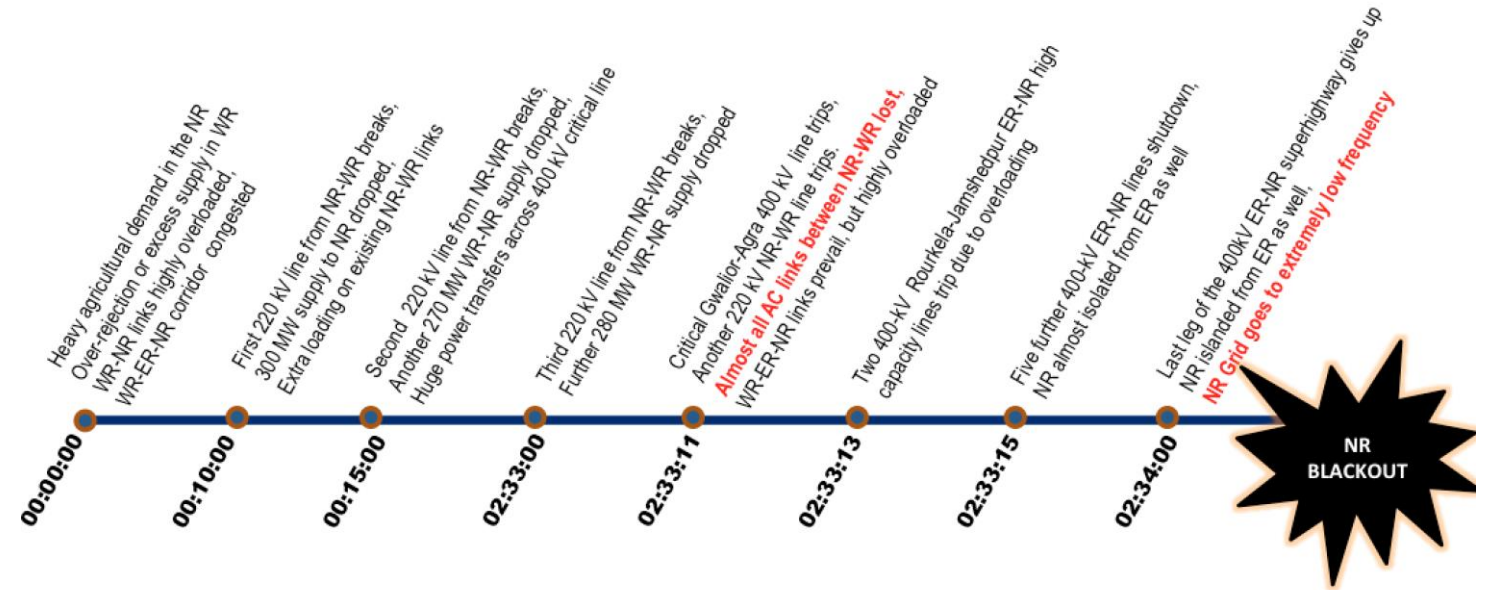
- One of the lines was being upgraded since 28 July.
- Other line went out of service because of equipment failure.
- So that, other 2 lines are forced to work on their limits.

Prior System Conditions: Blackout 1

- The networks were unreliable as many transmission lines were shut down for maintenance.

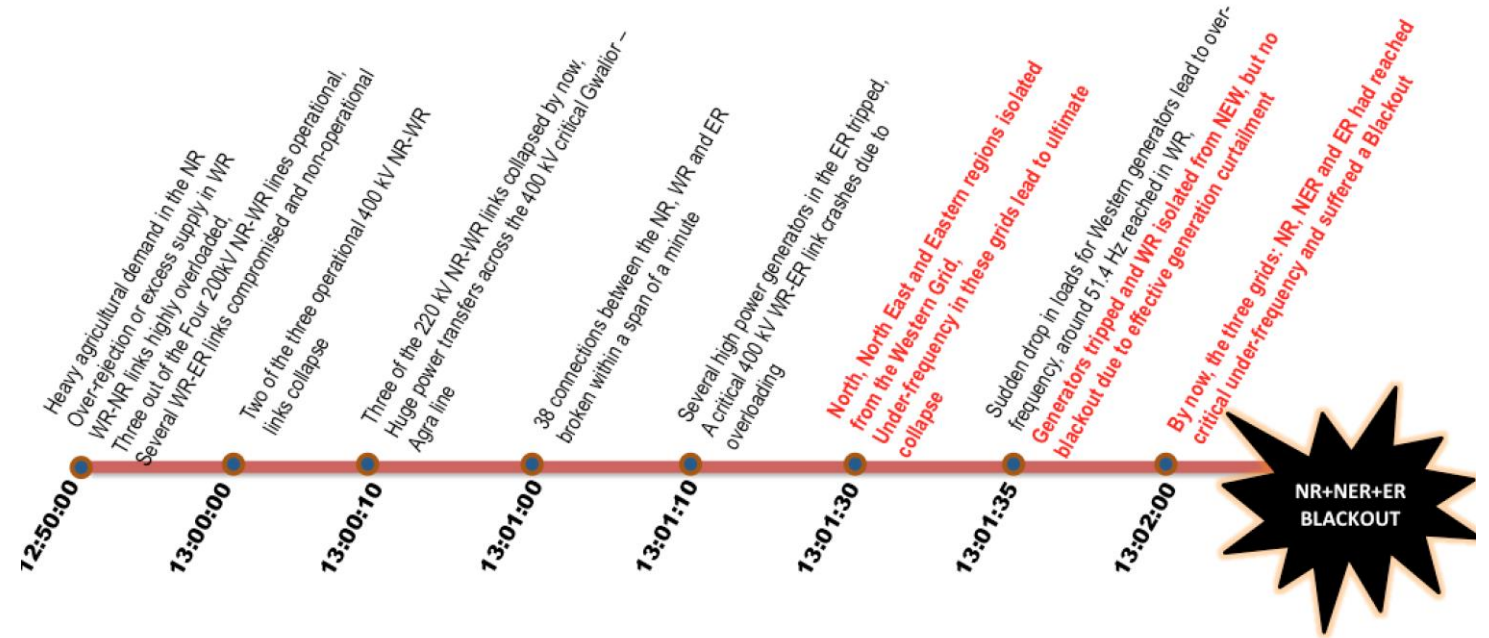
Blackout 1 Sequence

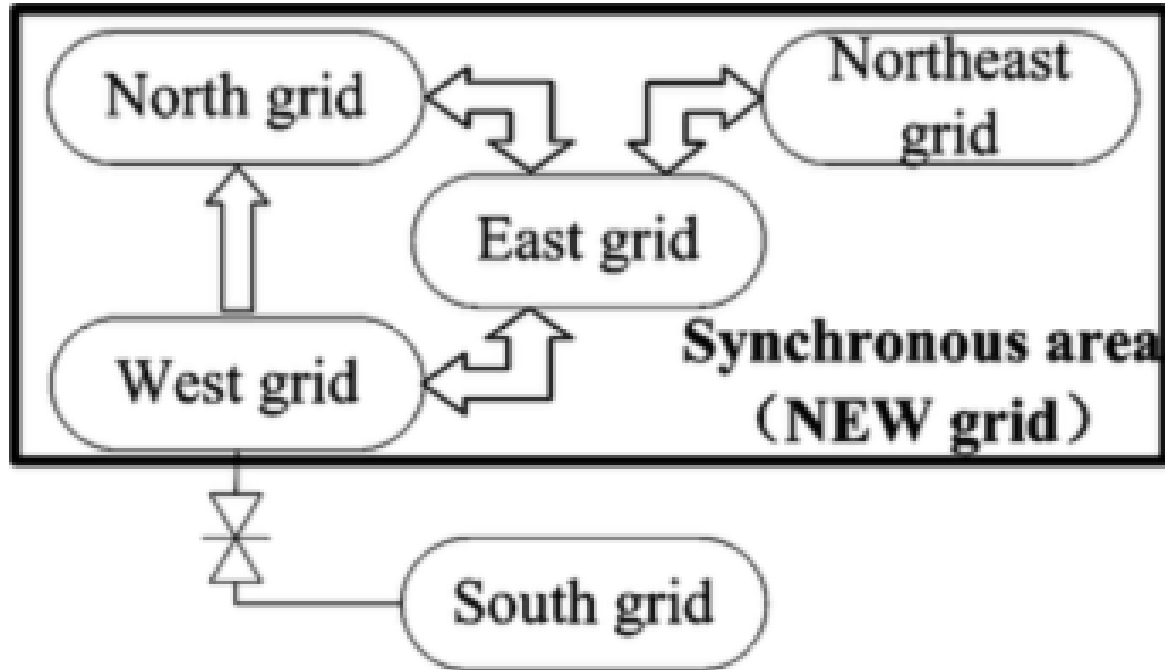
- One of the Bina-Gwalior 400 kV lines was overloaded, the line was protected.
- Later, 220 kV and 132 kV lines were triggered by a power surge and many connected lines were disabled.
- It took 16 hours for the system to restart.



Prior System Conditions: Blackout 2

- Exactly 1 day later, there was a second major outage. Many lines were already out of service.
- Due to overload, the voltage level starting from 400kV decreased to 362 kV.

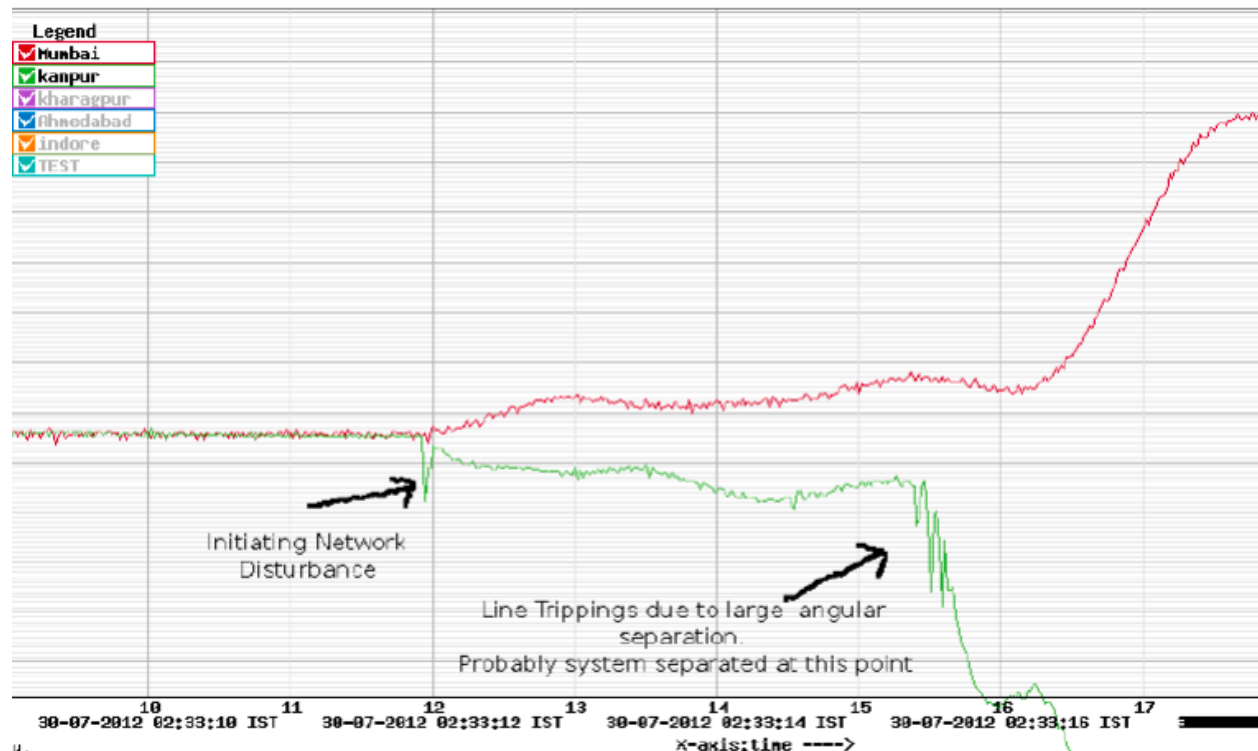




Blackout 2 Sequence

- North and west zones with distance relay due to overload separated from each other.
- Then, with the separation of the load, there was a power surge and a voltage spike occurred in the energized region.

Frequency Separation



- The high frequencies formed as a result of the high voltage generated also caused collapses in the region.

An aerial photograph of a city street, likely in India, showing a massive traffic jam. The street is filled with hundreds of cars, mostly white and yellow, stretching far into the distance. On the left side of the street, there is a large, multi-story building with a classical architectural style, featuring many columns and arches. The building appears to be a government or institutional structure. The surrounding area is densely packed with buildings and trees. The overall scene depicts a major urban congestion problem.

Impacts

- Millions of people affected during power outages.
- During 30-31 July, transportation and healthcare systems, industry, social life were affected in a bad way.



Who were the responsible parties?

- After the events, the vast majority of the Indian people held the government as responsible. According to DW's report, "The dominant opinion is that this government is not capable of managing crises. At the same time, it is trying to whitewash the disaster and is busy defending itself instead of taking responsibility for the incident."



Investigation

- The three-member investigation committee consisted of S. C. Shrivastava, A. Velayutham and A. S. Bakshi, and issued its report on 16 August 2012. It concluded that four factors were responsible for the two days of blackout:
- Weak inter-regional power transmission corridors due to multiple existing outages (both scheduled and forced);
- High loading on 400 kV Bina-Gwalior-Agra link;
- Inadequate response by State Load Dispatch Centers (SLDCs) to the instructions of Regional Load Dispatch Centres (RLDCs) to reduce over-drawal by the Northern Region utilities and under-drawal/excess generation by the Western Region utilities;
- Loss of 400 kV Bina-Gwalior link due to mis-operation of its protection system.
- The committee also offered a number of recommendations to prevent further failures, including an audit of the protection systems.



Penalties

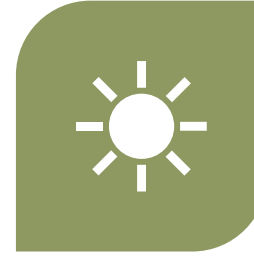
S. No.	Name of constituent /Organisation	Violations
1	Haryana, Punjab and UP (30.7.2012)	Section 29 of Electricity Act, 2003 and Regulations 5.4.2 (a), (g), (h) and (i) of Grid Code
2	Haryana, Punjab and Rajasthan (31.7.2012)	
3	Maharashtra, Gujarat, MP and Chhattisgarh (30.7.2012)	Section 29 of Electricity Act, 2003 and Regulations 6.4.12 of Grid Code
4	Maharashtra, Gujarat, Chhattisgarh (31.7.2012)	
5	WRLDC	Regulations 5.7.4 (g) (iv), 6.5.20 and 6.5.27 of Grid Code
6	NRLDC	Regulations 5.7.4 (g) (iv) of Grid Code
7	POWERGRID	Regulations 6 (4) (a) of CEA Technical Standards, Regulation 3 (e) of CEA Grid Standards and Regulations 5.7.4 (c) of Grid Code
8	NTPC (Sipat)	Section 29 of Electricity Act, 2003



Main Preventive Measures to Overcome Power Outages



IMPLEMENTING AND
INTEGRATING SMARTER AND
NEWER FORMS OF SUPPLY



DEVELOPING AND
EXPLOITING RENEWABLE
ENERGY SOURCES AND LOW
CARBON BASELOAD
TECHNOLOGIES



ENERGY-EFFICIENT
BUILDINGS

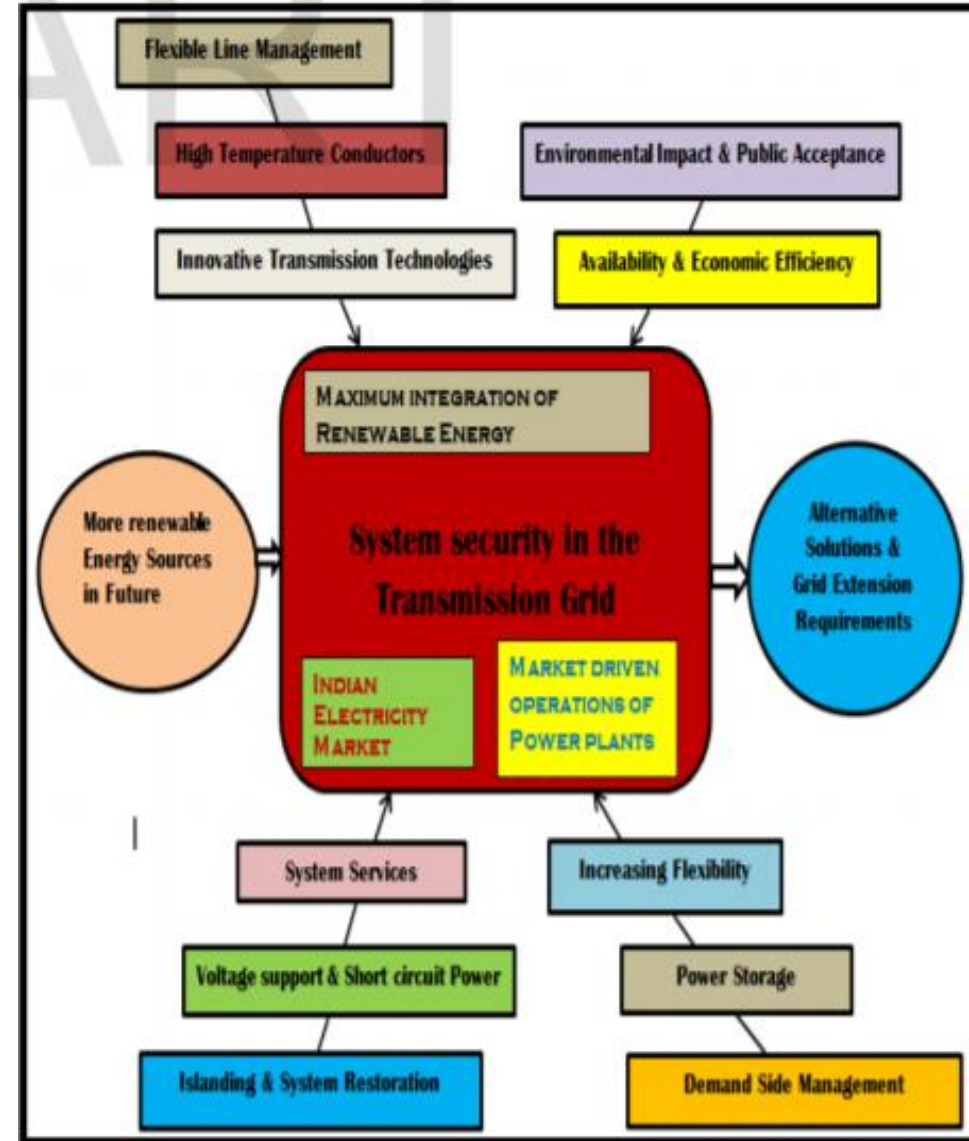


COST-EFFECTIVE ENERGY
SAVINGS



PROPERLY EDUCATING AND
GIVING TECHNICALLY
SOUND TRAINING TO
OPERATORS IN POWER
PLANTS

Depicting Preventive Measures against Power Fails





What can India Do to Help Eliminate such Wide-ranging Outages?

Renewable Energy

- Solar Energy

Power grid must be made smarter

- Reducing the need for installing additional transmission and distribution systems

All, provide long-term environmental and economic growth for India.

Thank You For
Listening Us!

