

**CODE BASED**

**NATIONAL LEVEL**

**FAILURE ANALYSIS**

**SYSTEM**

## NOTE ON OUTAGE CODIFICATION FOR DISTRIBUTION SECTOR

Ministry of Power have sought the common standard codes for outages across all the Discoms/States for analysis and evaluation of outages in particular category/equipment. Also, financial implication of outage due to business loss and loss of supply of power needs to be analysed against each independent category. Presently, due to different forms of reporting done by various Discoms, it is not possible to analyse the same.

Distribution Division of CEA has undertaken the task to codify the various outages in sub-transmission and distribution segment to formulate a easy, comprehensive methodology to codify the outage so that the same suits to each and every Discom irrespective of its size and nature.

Accordingly, multi level codes varying from two to four digit have been developed and combined in particular sequence to provide analysis based on various categories, voltages, fault types, etc. This can be predetermined or can be customized through filter/sort mode in MS excel. The details are as below:

1. Multi level codes(alphanumeric) consisting of 2 digit to 4 digit codes have been devised. The first level of codes are alphabetic and rest level are numeric or alphanumeric.
2. First level code of four alphanumeric and are voltage dependent. Outage Equipment operating voltage or Primary or highest voltage of s/s is to be given here.
3. Second level codes are two alphabetic code and for equipment identification where outage has occurred.
4. Third level code is two digits and depend on major reason of outage.
5. Fourth level code is two digits and depend on detailed reason of outage depending on major reason selected in third level. These codes are variable and give sub-reason of outage. If no specific reason, then "00" is indicated.
6. Fifth level code is two digits, depend on fourth level reason of outage and also gives specific reason, equipment part and type of outage. If no specific reason, then "00" is indicated.
7. Each code is associated with code one level higher. However, there may not be any specific reason in next level, therefore such codes are kept as "00".
8. Procedure & database for codification and de-codification would be same for particular method.
9. This codification method is open ended and therefore more levels can also be added in the end without affecting the working of this codes. However, no. of digits and its nature i.e. alphanumeric/alphabetic/numeric should not be changed. This can be changed with appropriate changes in software but only by an expert.
10. More levels, if required can be inserted in between. Levels can also be interchanged keeping the no. of digits same. However, this require changes in software.

Level of codes alongwith details is given in Annexure-I.

Detailed Example showing code selection through combo box and decoding is given at Annexure-II.

Examples of various types outages is shown in Annexure-III.

Voltage Level  
Level-1

Item	Code
66 KV	66KV
33 KV	33KV
22 KV	22KV
11 KV	11KV
6.6 KV	06KV
3.3 KV	03KV
415V	415V

Equipment type  
Level-2

Items	codes
line/Cable	LL
transformer	TR
breaker	BR
bus coupler	BC
capacitor	CC
reactor	RR
insulator	IR
lighening arrestor	LA
Busbar	BB
tower	TW
Earthswitch	ES
Isolator	IS
LT Distribution box	DB
Solar Rooftop	SR

Major Categories of outages  
Level-3

Fault type	codes
Protection/Relay	01
Burst/Fire/Break	02
Grid side	03
Auxiliaries	04
Animal intrusion	05
Natural calamity	06
Maloperation	07
Maintenance	08
Miscreants/theft	09
Leakage	10
Mechanism fail	11
Communication	12
Spares & tools	13
Accidents	14

Auxiliaries -CT/PT/CVT/battery bank/UPS/DC supply i.e. items at 110 V AC/DC  
In case of Transformers, highest of primary or secondary voltage to be taken.

Level-4/3-1

Protection type	codes
Over current	01
Earth fault	02
P to P fault	03
NGR fault	04
Differential	05
Busbar fault	06
Bucholz Trip	07
Overflux	08
Wrong setting	09
Phase imbalance	10
Power factor	11
Consumer	12
Backfeed	13
Harmonics	14

Level-4/3-2

Burst/Fire/break	codes
Conductor snap	01
Joint break	02
Burst/fire/Damaged	03
Tower/pole collapse	04
Leakage	05
Hot spot/spark	06
Lead burnt	07
Cable damage	08

Level-4/3-9

Miscreants/theft	codes
Terrorism	01
Theft	02
Accidents	03
Strike	04
	05

Level-4/3-3

Grid Side	codes
Load shedding	01
Conjestion	02
Power swing	03
O/U drawl	04
O/U frequency	05
O/U voltage	06
Load encroach	07

Level-4/3-10

Leakage	codes
GIS-SF6	01
Vaccum	02
Oil	03
Air	04

Level-4/3-4

Auxiliaries	codes
CT/PT/CVT	01
Battery bank/UPS	02
DC/AC standby supply	03

Level-4/3-11

Mechanism fail	codes
Breaker	01
Vaccum	02
Isolator	03
Earth switch	04
Tr. Tap fail	05
Interlock	06

Level-4/3-5

Animal intrusion	codes
Lizard/snake	01
Monkeys	02
Big Jungle animal	03
Birds	04

Level-4/3-6

Natural calamity	codes
Heavy Rain	01
Fog/smog	02
Earthquake	03
Flood/Cyclone	04
Darkness	05
No approach	06
ROW	07
Strike	08

Level-4/3-7

Maloperation	codes
Loose/wrong wiring	01
Wrong setting	02
Saturation	03
Relay failure	04
Failure of aux. equipment	05
	06

Level-4/3-8

Maintenance	codes
Planned	01
Breakdown	02
Preventive	03
Opportunity	04
Augmentation	05
Construction	06
Repair	07
	08

Level-4/3-12

Communication	codes
PLCC	01
Optic Fibre	02
RTU	03
PMU	04

Level-4/3-13

Spares & tools	codes
Lugs/nut/bolt	01
Plier/cutter	02
Fuse/MCB	03
Discs/conductor/cable	04
Bushing/oil	05
Civil material	06
Grease etc.	07

Level-4/3-14

Accidents	codes
No Precautions	01
Engineer not present at work	02
Pole damage by vehicle	03
Line damage by vehicle	04
Electric shock to human/anim	05
Burning due to spark	06

Level-5/4/3-1-1

Protection type	codes
Not known	00
High load	01
Extra losses	02
Leakage	03
High/low PF	04
	05

Level-5/4/3-1-2

Protection type	codes
Not known	00
Short circuit	01
Smoke	02
Tree falling	03
Insulation failure	04
Disc failure	05

Level-5/4/3-1-3

Protection type	codes
Not known	00
Air swing	01
Smoke	02
spacer problem	03
Tree touching	04
Insulation failure	05
Disc failure	06

Level-5/4/3-1-4

Protection type	codes
Not known	00
NGR open	01
	02
	03
	04
	05
	06

Level-5/4/3-1-5

Protection type	codes
Not known	00
Internal Faults	01
Loose wiring	02
	03
	04
	05

Level-5/4/3-1-08

Protection type	codes
No specific	00
overvoltage	01
underfrequency	02
line loading low	03
shunt compensation	04
core material	05

Level-5/4/3-1-09

Protection type	codes
No specific	00
Distance	01
Phase sequence	02
CT/PT connections	03
Multiplier	04
Timer	05
Curve	

Level-5/4/3-1-10

Protection type	codes
No specific	00
unbalanced load	01
Traction	02
Phase open	03
breaker contact	04
	05

Level-5/4/3-1-11

Protection type	codes
No specific	00
Reactive load	01
Underloading	02
Overloading	03
Renewable gen.	04
SVC/capacitor out	05

Level-5/4/3-1-12

Protection type	codes
Not known	00
No light	01
Fuse blown	02
MCB trip	03
Socket Problem	04
Meter problem	05
Cable spark	06

Level-5/4/3-2-1

Burst/Fire/break	codes
Not known	00
Fall on tree	01
Fall on ground	02
Other conductor	03
On earth guard	04
	05

Level-5/4/3-2-2

Burst/Fire/break	codes
Not known	00
Bushing fail	01
Termination joint	02
Jumper fail	03
	04
	05

Level-5/4/3-2-3

Burst/Fire/break	codes
Not known	00
Tr. Tank fire	01
Tr. Tank burst	02
DB fire	03
DB burst	04
	05

Level-5/4/3-2-4

Burst/Fire/break	codes
Not known	00
High wind	01
Cyclone	02
Accident	03
Loose soil	04
Structure break	05
Terrorism	06

Level-5/4/3-2-5

Burst/Fire/break	codes
Not known	00
Tank oil	01
Reactor oil	02
Breaker vaccum	03
Conservator	04
Isolator	05
	06

Level-5/4/3-1-6

Protection type	codes
Not known	00
Internal Faults	01
Loose wiring	02
External fault	03
	04
	05

Level-5/4/3-1-7

Protection type	codes
No specific	00
Wdg fault	01
Oil quality low	02
Wdg Insulation poor	03
Maloperation	04
Oil level low	05

Level-5/4/3-1-13

Protection type	codes
Not known	00
Less/No load	01
Reverse flow	02
Excess generation	03

Level-5/4/3-1-14

Protection type	codes
Not known	00
Relay heating	01
Measurement error	02
Cable heating	03
Neutral heating/voltage	04
Capacitor destruction	05
Transformer saturation	06

Level-5/4/3-2-6

Burst/Fire/break	codes
Not known	00
Corona	01
Bushing	02
Jumper	03
DB	04
Isolator	05
Insulator string	06
Pole	07

Level-5/4/3-2-6

Burst/Fire/break	codes
Not known	00
Corona	01
Bushing	02
Jumper	03
DB	04
Isolator	05

Level-5/4/3-2-7

Burst/Fire/break	codes
Not known	00
Termination	01
Meter lead	02
Transformer	03
	04
	05

Level-5/4/3-2-8

Burst/Fire/break	codes
Not known	00
Sheath broken	01
Insulation fail	02
conductor problem	03
External damage	04
Duct work by others	05

Level-5/4/3-3-1

Grid Side	codes
Not known	00
Manual LS	01
AULFS	02
DF/Dt	03
Planned LS	04
Instruction-SLDC	05

Level-5/4/3-3-2

Grid Side	codes
Not known	00
Line loadings	01
Over drawal	02
Under drawal	03
Reduced margin	04
Commercial	05

Level-5/4/3-3-3

Grid Side	codes
Not known	00
Large angle	01
Loop flow	02
	03
	04
	05

Level-5/4/3-3-4

Grid Side	codes
Not known	00
Over drawal	01
Under drawal	02
	03
	04
	05

Level-5/4/3-4-1

Auxiliaries	codes
Not known	00
Failure/Burst/Fire	01
Measurement error	02
Saturation	03
Loose connection	04
Accuracy	05

Level-5/4/3-4-2

Auxiliaries	codes
Not known	00
Battery voltage low	01
Battery backup	02
Battery old	03
Switching error	04
Battery charger	05

Level-5/4/3-4-3

Auxiliaries	codes
Not known	00
Circuit problem	01
Voltage drop	02
Aux. transformer	03
Switching error	04
Interconnections	05

Level-5/4/3-5-1

Animal intrusion	codes
Not known	00
Busbar SC	01
Cable SC	02
MCB/DB SC	03
	04
	05

Level-5/4/3-6-1

Natural calamity	codes
Not known	00
Line fault	01
Tr. Fault	02
Ingress of water	03
SC due to Moisture	04
Precautionary Measure	05

Level-5/4/3-6-2

Natural calamity	codes
Not known	00
Line fault	01
Tr. Fault	02
SC due to Humidity	03
	04
	05

Level-5/4/3-6-3

Natural calamity	codes
Not known	00
Tower collapse	01
Conductor snap	02
Tr. Collapse	03
S/s buidling	04
	05

Level-5/4/3-6-4

Natural calamity	codes
Not known	00
Tower collapse	01
Ingress of water	02
Tr. Collapse	03
S/s buidling collapse	04
Precautionary measure	05

Level-5/4/3-3-5

Grid Side	codes
Not known	00
Over Frequency	01
Under Frequency	02
	03
	04
	05

Level-5/4/3-3-6

Grid Side	codes
Not known	00
U/O generation	01
U/O loading of lines	02
high/low capacitance/reactar	03
voltage spikes	04
	05

Level-5/4/3-5-2

Animal intrusion	codes
Not known	00
Line SC	01
Bushing SC	02
LA fail	03
Spacers	04
	05

Level-5/4/3-5-3

Animal intrusion	codes
Not known	00
Line SC	01
Bushing SC	02
Pole tilt/collapse	03
	04
	05

Level-5/4/3-5-4

Animal intrusion	codes
Not known	00
Line SC	01
Bushing SC	02
	03
	04
	05

Level-5/4/3-6-5

Natural calamity	codes
Not known	00
Could not work	01
Could not reach	02
Extension of work	03
	04
	05

Level-5/4/3-6-6

Natural calamity	codes
Not known	00
Road damaged	01
Flood	02
Mud/paddy fields	03
ROW	04
Strike	05
Danger to life	06

Level-5/4/3-6-7

Natural calamity	codes
Not known	00
Manpower availability	01
	02
	03
	04
	05
	06

Level-5/4/3-6-8

Natural calamity	codes
Not known	00
Manpower availability	01
	02
	03
	04
	05
	06

## Level-5/4/3-7-1

Maloperation	codes
Not known	00
CT/PT/CVT	01
Battery bank/UPS	02
DC/AC standby supply	03
Relays	04
	05

## Level-5/4/3-7-2

Maloperation	codes
Not known	00
Distance setting	01
Time setting	02
Current %	03
Voltage %	04
Curve	05

## Level-5/4/3-7-3

Maloperation	codes
Not known	00
CT	01
PT	02
CVT	03
Relays	04
	05

## Level-5/4/3-7-4

Maloperation	codes
Not known	00
Mechanical	01
Numerical	02
Static	03
	04
	05

## Level-5/4/3-8-1

Maintenance	codes
Not known	00
Line/Cable	01
DT/Transformer	02
Auxiliary	03
Reactor	04
Capacitor	05
General	06
Inspection	07
Insulator	08
Fibre Optic	09

## Level-5/4/3-8-2

Maintenance	codes
Not known	00
Line/Cable	01
DT/Transformer	02
Auxiliary	03
Reactor	04
Capacitor	05
General	06
Inspection	07
Insulator	08
Fibre Optic	09

## Level-5/4/3-8-3

Maintenance	codes
Not known	00
Line/Cable	01
DT/Transformer	02
Auxiliary	03
Reactor	04
Capacitor	05
General	06
Inspection	07
Insulator	08
Fibre Optic	09

## Level-5/4/3-8-4

Maintenance	codes
Not known	00
Line/Cable	01
DT/Transformer	02
Auxiliary	03
Reactor	04
Capacitor	05
General	06
Inspection	07
Insulator	08
Fibre Optic	09

## Level-5/4/3-9-1

Miscreants/theft	codes
Not known	00
Bomb blast	01
Air Strike	02
War	03
Law & Order	04
	05

## Level-5/4/3-9-2

Miscreants/theft	codes
Not known	00
Tapping overhead	01
Tapping underground	02
Tapping meter	03
Meter alteration	04
Non payment	05

## Level-5/4/3-9-3

Miscreants/theft	codes
Not known	00
Law & order	01
No access	02
No manpower	03
ROW	04
	05

## Level-5/4/3-9-4

Miscreants/theft	codes
Not known	00
Court case	01
Subjudice	02
Compensation	03
Stay order	04
	05

Level-5/4/3-7-5

Maloperation	codes
Not known	00
CT/PT/CVT	01
Battery bank/UPS	02
DC/AC standby supply	03
Relays	04
	05

Level-5/4/3-8-5

Maintenance	codes
Not known	00
Line/Cable	01
DT/Transformer	02
Auxiliary	03
Reactor	04
Capacitor	05
General	06
Inspection	07
Insulator	08
Fibre Optic	09

Level-5/4/3-8-6

Maintenance	codes
Not known	00
Line/Cable	01
DT/Transformer	02
Auxiliary	03
Reactor	04
Capacitor	05
General	06
Inspection	07
Insulator	08
Fibre Optic	09

Level-5/4/3-8-7

Maintenance	codes
Not known	00
Line/Cable	01
DT/Transformer	02
Auxiliary	03
Reactor	04
Capacitor	05
General	06
Inspection	07
Insulator	08
Fibre Optic	09

Level-5/4/3-10-1

Leakage	codes
Not known	00
Breaker	01
Line/Cable	02
Disconnecter switch	03
Earthing switch	04
Busbar	05
Transformer	06

Level-5/4/3-10-2

Leakage	codes
Not known	00
Breaker	01
	02
	03
	04
	05
	06

Level-5/4/3-10-3

Leakage	codes
Not known	00
Tr. tank	01
Breaker	02
Tr. Bushing	03
Tr. Taps	04
	05

Level-5/4/3-10-4

Leakage	codes
Not known	00
Breaker	01
	02
	03
	04
	05

Level-5/4/3-11-1

Mechanism fail	codes
Not known	00
Breaker spring	01
Breaker contact	02
	03
	04
	05

Level-5/4/3-11-2

Mechanism fail	codes
Not known	00
Pressure gauge	01
Compressor	02
	03
	04
	05

Level-5/4/3-11-3

Mechanism fail	codes
Not known	00
handle	01
contact	02
	03
	04

Level-5/4/3-11-4

Mechanism fail	codes
Not known	00
handle	01
contact	02
	03

Level-5/4/3-11-5

Mechanism fail	codes
Not known	00
solenoid valve	01
contact	02
Online	03
Offline	04

Level-5/4/3-11-6

Mechanism fail	codes
Not known	00
Switch	01
Contactactor	02

Level-5/4/3-12-1

Tr. Taps	codes
Not known	00
Contact	01
Ratio	02
Interturn	03
Voltage	04

Level-5/4/3-12-2

Tr. Taps	codes
Not known	00
Contact	01
Ratio	02
Interturn	03
Voltage	04

Level-5/4/3-13-1

Communication	codes
Not known	00
Capacitor	01
Filter	02
Circuit	03

Level-5/4/3-13-2

Communication	codes
Not known	00
Fibre cut	01
Jointing	02
Interference	03

Level-5/4/3-13-3

Communication	codes
Not known	00
No data	01
Non-current data	02
Mapping into SCADA	03

Level-5/4/3-13-4

Communication	codes
Not known	00
No data	01
Non-current data	02
Mapping into SCADA	03

Level-5/4/3-14-1

Spares & tools	codes
Not known	00
Non-availability	01
Outage delayed	02
start of work delayed	03

Level-5/4/3-14-2

Spares & tools	codes
Not known	00
Non-availability	01
Outage delayed	02
start of work delayed	03

Level-5/4/3-14-3

Spares & tools	codes
Not known	00
Non-availability	01
Outage delayed	02
start of work delayed	03

Level-5/4/3-14-4

Spares & tools	codes
Not known	00
Non-availability	01
Outage delayed	02
start of work delayed	03

Level-5/4/3-15-1

Accidents	codes
Not known	00
Gloves/Earth mat	01
Failed to switch off	02
No grounding	03
Static electricity	04

Level-5/4/3-15-2

Accidents	codes
Not known	00
Arrived late	01
No supervision	02
No permissions	03
Wrong orders	04

Level-5/4/3-15-3

Accidents	codes
Not known	00
Pole tilt	01
Pole collapse	02
Vehicle accident	03
Wrong driving	04

Level-5/4/3-15-4

Accidents	codes
Not known	00
Pole tilt	01
Pole collapse	02
Vehicle accident	03
Wrong driving	04

Level-5/4/3-13-5

Communication	codes
Not known	00
No data	01
Inter-mittant data	02
Mapping into SCADA	03

Level-5/4/3-14-5

Spares & tools	codes
Not known	00
Non-availability	01
Outage delayed	02
start of work delayed	03

Level-5/4/3-14-6

Spares & tools	codes
Not known	00
Non-availability	01
Outage delayed	02
start of work delayed	03

Level-5/4/3-14-7

Spares & tools	codes
Not known	00
Non-availability	01
Outage delayed	02
start of work delayed	03

Level-5/4/3-14-8

Spares & tools	codes
Not known	00
Non-availability	01
Outage delayed	02
start of work delayed	03

Level-5/4/3-15-5

Accidents	codes
Not known	00
Supply Leakage	01
Domestic supply	02
Industrial supply	03
Agricultural	04
Commercial	05

Level-5/4/3-15-6

Accidents	codes
Not known	00
Fire in buildings	01
Fire in godown	02
Fire in fiels/jungle	03
Fire in substation	04

**Annexure-II**

Discom	Element	From Date	From time	ToDate	to time	code4	Remarks
ABC	Transformer	12-Feb-17	15:00	12-Feb-17	17:00	33KV-TR-01-07-01	33/11KV transformer tripped on Bucholz winding temp. high

Level-1	Level-2	Level-3	Level-4	Level-5
33 KV ▼ 2	transformer ▼ 2	Protection/Relay ▼ 1	Bucholz Trip ▼ 7	Wdg fault ▼ 2

33KV	TR	01	07	01
------	----	----	----	----

Item	Code
66 KV	66KV
33 KV	33KV
22 KV	22KV
11 KV	11KV
6.6 KV	06KV
3.3 KV	03KV
415V	415V

Items	codes
line/Cable	LL
transformer	TR
breaker	BR
bus coupler	BC
capacitor	CC
reactor	RR
insulator	IR
lighening arrestor	LA
Busbar	BB
tower	TW
Earthswitch	ES
Isolator	IS
LT Distribution box	DB
Solar Rooftop	SR

Fault type	codes
Protection/Relay	01
Burst/Fire/Break	02
Grid side	03
Auxiliaries	04
Animal intrusion	05
Natural calamity	06
Maloperation	07
Maintenance	08
Miscreants/theft	09
Leakage	10
Mechanism fail	11
Communication	12
Spares & tools	13
Accidents	14

Protection type	codes
Over current	01
Earth fault	02
P to P fault	03
NGR fault	04
Differential	05
Busbar fault	06
Bucholz Trip	07
Overflux	08
Wrong setting	09
Phase imbalance	10
Power factor	11
Consumer	12
Backfeed	13
Harmonics	14

Protection type	codes
No specific	00
Wdg fault	01
Oil quality low	02
Wdg Insulation poor	03
Maloperation	04
Oil level low	05