9.0 Criteria for selection of site for Pollution measurement

9.1 Preliminary survey of information available on natural pollution

Detailed analysis of the information available from the previous studies on pollution severity levels in India, considering the presence of all potential pollution sources related to the territory characteristics (coastal areas, industries, cities, agricultural areas, etc.) will be made. This activity will permit to draw a first level map of the pollution severity level in India. On the basis of the above survey, which will be carried out jointly by CPRI & POWERGRID, some typical sites in Northern region power system will be defined, where a thorough study of the insulator pollution will be studied.

Finally, as per the suggestions given by IEC-60815, a questionnaire of systematic collection of field data will be collected, taking particular care for the electrical failures due to the pollution phenomenon. At the end of this activity, a report will be prepared with the defined version of the questionnaire.

9.2 Methodical collection of natural pollution data through systematic Distribution of the questionnaire.

The questionnaire set up at the end of the activity (a) will be systematically distributed in order to involve the medium voltage Indian network, which is widespread in the country. Besides, in this phase of activity, ESDD measurements on insulators removed from the service will also be carried out. In this way, very detailed information about the conditions of the external insulation in the different pollution areas present in India will be possibly acquired. A typical questionnaire is shown in Annexure 1.

9.3 Pollution monitoring at the sites which are of most significance

It is not economical to have too many number of pollution monitoring stations. Therefore, it is preferred to have these stations at most significant areas of pollution. It is also important to note that complete information can be obtained; mainly by most complex (expensive) stations.

Therefore, it is necessary to install a most complex station, where the pollution levels are significant.

The Northern region power system consists of 18000 circuit kilo meter of 220 kV and 400 kV transmission lines spread over Jammu and Kashmir, Haryana, Punjab, Uttar Pradesh, Delhi and Rajasthan.

It is observed that the source of pollution is mainly Industrial, Agriculture(fertilizer spray and burning of agriculture waste)and brick kilns. There is no sea coast in the vicinity. This region is prone for heavy fog during the winter.

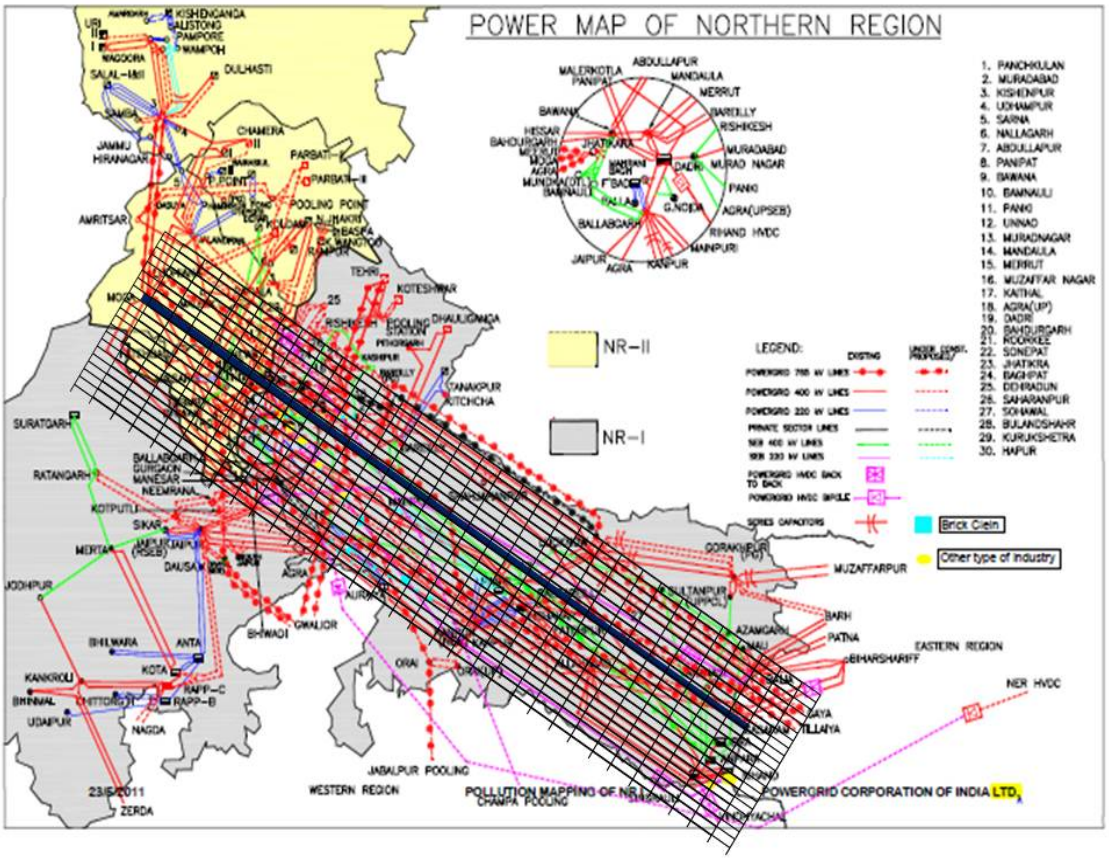
M/s PowerGrid have provided information on few locations of polluting sources which are close to their important 220 kV and 400 kV transmission lines.

A questionnaire (Annexure 1) based on IEC recommendations for selection of site for pollution level monitoring has been prepared by CPRI for circulation among field Engineers of POWERGRID.

Depending on the historical information on flashover events related to pollution, pollution source and type and distance of the line from the pollution source.

The location of the monitoring station with dummy insulators is at the junction of 25X 25 kilometer grid formed on the geographical map of the states under Northern Region. As it becomes higher number of grid inter section points where no history of flashover will not be considered. In other words the grid junctions in and around the known pollution sources will invariably become pollution monitoring stations. In addition if a large geographical area is found with number of identified source of pollution (from response to questionnaire) a grid size of 50 X 50 kilo meters will be adopted.

Presently only a total number of 150 locations have been proposed for pollution monitoring. Therefore the location to be considered for monitoring will be jointly decided by CPRI and POWERGRID. Figure shows the typical grid marked on the geographical map of states under NRPC.



9.4 Configuration of Dummy insulator string

The set up consists of two strings of cap and pin anti fog disc insulator strings consisting of ten units. The strings shall be strung at a height equivalent to the existing minimum live line insulator height. Both the string shall be mounted on the same tower. One string will be used for ESDD measurement and other string shall be used for layer conductance measurement.

The periodicity of pollution monitoring (ESDD/ NSDD and layer conductance Measurement)is every 4 months. The procedure of measurement is described in section of this report.

Care shall be taken to ensure that no pollutant shall be disturbed during dismantling and re installation.

Annexure 1

CENTRAL POWER RESEARCH INSTITUTE
BANGALORE

Questionnaire to collect information on the behavior of in service insulators in polluted area

Company:	
Identification of project and/or location:	
Person to consult for complementary information, address, telex, telephone:	
A-1 GENERAL INFORMATION:	
Nominal voltage of the system and highest voltage for equipment:	
Date of construction:	
Type of system:	
Maintenance (not involving changes of insulator):	
For overhead line	
Type of tower (sketch): Pl attach	
Number of circuit:	
Ground clearance of string (in meters):	
Type of insulator sets (pl attach the drawings)	
Insulators protective fittings	
Date of energizing	

Cleaning – yes or no – frequency: *Washing – yes or no – frequency:* *Greasing – yes or no – frequency.*	

A-2 INFORMATION ON THE SITE	
Map of areas crossed and routing of the line. For polluted areas only, the different climate zones crossed b the line (mark them on the map). For substations, place, orientation and altitude.	
A-3 INFORMATION OF WEATHER CONDITIONS	
Type of climate: temperate, tropical, equatoric continental:	
Dominant wind; direction, average speed in kilometers per hour:	
Dew: sometimes, often, never :	
Fog: sometimes, often, never:	

A-4 INFORMATION ON POLLUTION ***For example:***	
Seaborne pollution (high percentage of salt) – small amount of insoluble matter	
Saline pollution other than coastal – small amount of solids	
Sand-based pollution or ground dust (for example, desert)	
Industrial pollution with large amounts of soli deposits (except cement)	
Industrial pollution with large amounts of cement	
Chemical industrial pollution (gas, smoke)	
Mixed pollution (indicate in this case the main components, for example, cement factories, brick kiln, lime kilns , etc)	
A-5 DATA ON INSULATION	
For overhead lines	
Position of string: *Vertical (suspension)* *Horizontal (in tension)* *Angle (in degrees)* *Number of units per string* *Type of insulator (drawing)* *Spacing* *Creepage distance of unit* *Indicate any modification in the initial insulation*	

Indicate any modification in the initial insulation	

For substations:	
Type of insulator:	
Post insulator (solid core):	
Pedestal insulator	
Bushing	
Hollow insulator	
Profile and spacing of shed (give details)	
Total creepage distance	
A-6 SCHECULE OF INCIDENTS	
Date and time	
Situation of the tower (for line) and place of apparatus in substation	
Critical meteorological conditions at the moment of incidents	
Relative humidity	*Storm*
Rain	*Wind (direction, speed)*
Drizzle	*Time between last rainfall and incident*
Fog	
Temperature	*Other*

Type of incident	
Flashover:	
Heavy corrosion of metal parts:	
Punctured dielectric:	
Visible damage to dielectric	
Erosion or tracking	
For a string of insulators place of damaged units in the string	
Comments of the incident indicating any speci circumstances.	