

MANAGEMENT OF IMPRESSED VOLTAGES AND METHODS OF CONTROL

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PURPOSE AND SCOPE

The purpose of this document is to give guidance to National Grid and its Contractors on the sources of Impressed Voltage, giving guidance on the means by which the hazards emanating from impressed voltage can be controlled.

The tables located in sections 1, 2, & 3 in the main body of the document identify the areas where Impressed Voltages are likely to occur, what the source of the Impressed Voltage is likely to be, the area of concern, proposed method of control and the associated reference documents. It is not by any means a full and exhaustive list and should be considered as instructive advice when considering carrying out work on HV equipment.

The procedure shall apply to all Electricity Transmission works / projects that comprise both the capital plan and maintenance programmes and sets out what needs to be considered throughout both the scheme development process through TP 500 for Capital Projects and for National Grid Maintenance under PS (T) EPS 11.0, Maintenance Policy to help develop and maintain a safe system of work.

The document itself does not constitute a safe system of work but does give guidance on known situations of where Impressed Voltages can occur and actions to be applied for their control.

PART 1 – PROCEDURAL

1 EQUIPMENT SUBJECT TO NATIONAL GRID SAFETY RULES

NB: This equipment will always be subject to earthing or induced voltage working techniques, the drain earths etc. of which are subject to Type Registration.

Ref	Plant Area	Source of IV					Area of Concern	Method of Control	Reference Documents	Further Work Required
		Cap Couple	Ind Couple	Cond Couple	Trap	Ch				
1.1	OHL (Double circuit)	✓	✓	✓	-	De-energised OHL may be subject to a) Capacitive coupling from live OHL on other side of tower. Voltage to earth typically 30kV max. b) Inductive coupling from live OHL or other side of tower. Balanced 3 phase currents on live OHL may induce currents up to 10% of 3 phase current in de-energised OHL, egg. 4000A 3 phase induces 400A in earthed de-energised line. Single phase current of 9kA in live OHL may induce a voltage of 40kV and 1.5kA circulating current in de-energised line of 50km. c) Substation ROEP results in transferred potential along an earthed OHL.	All IV managed through earthed working techniques.	NG Safety Rules NSI4	No	

Ref	Plant Area	Source of IV					Area of Concern	Method of Control	Reference Documents	Further Work Required
		Cap Couple	Ind Couple	Cond Couple	Trap	Ch				
1.2	OHL Single Circuit Adjacent to a DNO Live Circuit	✓	✓	✓			De-energised OHL may be subject to a) Capacitive coupling from live OHL on other side of tower. Voltage to earth typically 30kV max. b) Inductive coupling from live OHL or other side of tower. Balanced 3 phase currents on live OHL may induce currents up to 10% of 3 phase current in de-energised OHL, egg. 4000A 3 phase induces 400A in earthed de-energised line. Single phase current of 9kA in live OHL may induce a voltage of 40kV and 1.5kA circulating current in de-energised line of 50km. c) Substation ROEP results in transferred potential along an earthed OHL.	All IV managed through earthed working techniques	NG Safety Rules NSI4	

Ref	Plant Area	Source of IV					Area of Concern	Method of Control	Reference Documents	Further Work Required
		Cap Couple	Ind Couple	Cond Couple	Trap	Ch				
1.3	Double Circuit OHL off Line Build adjacent to a DNO OHL circuit	✓	✓	✓			De-energised OHL may be subject to a) Capacitive coupling from live OHL on other side of tower. Voltage to earth typically 30kV max. b) Inductive coupling from live OHL or other side of tower. Balanced 3 phase currents on live OHL may induce currents up to 10% of 3 phase current in de-energised OHL, egg. 4000A 3 phase induces 400A in earthed de-energised line. Single phase current of 9kA in live OHL may induce a voltage of 40kV and 1.5kA circulating current in de-energised line of 50km. c) Substation ROEP results in transferred potential along an earthed OHL.	All IV managed through earthed working techniques	NG Safety Rules NSI4	

Ref	Plant Area	Source of IV					Area of Concern	Method of Control	Reference Documents	Further Work Required
		Cap Couple	Ind Couple	Cond Couple	Trap	Ch				
1.4	Open Terminal Air Insulated Substation	✓	✓	✓			De energised equipment will be subject to: Inductive coupling from live substation equipment operating adjacent to the de energised circuit. Capacitive coupling from live substation equipment operating adjacent to de energised equipment Conductive coupling, occurring on cross site cable instalatlations	Application of Primary Earths and Drain Earth	National Grid Safety Rules, NSI 2, NSI5 NSI 8	