Limitation of Harmonic Levels Notice 1981

PURSUANT to regulation 49 of the Electrical Supply Regulations 1976, the Secretary of Energy hereby prescribes the following limits in the level of harmonics from any apparatus or appliance.

1. (a) This notice may be cited as the Limitation of Harmonic Levels Notice 1981 and shall come into force 12 months from the date of its notification in the *Gazette*.

(b) This notice shall not apply to electrical signals introduced by any Electrical Supply Authority for the purposes of load control.

(c) The limits specified in clauses 8 and 9 hereof shall not apply to any Electrical Supply Authority.

2. For the purposes of this notice:

"Current" means root mean square current.

"Harmonic" means a sinusoidal component of an alternating current or voltage, with a frequency which is an integral multiple of the actual system frequency.

"Harmonic order (n)" means the number of times the harmonic frequency is an integral multiple of the actual system frequency.

"Point of common coupling" means that busbar electrically closest to any consumer through which any current must flow to that consumer and one or more other consumers.

"Voltage" means root mean square voltage.

3. (a) The phase to earth harmonic voltage at any point of common coupling with a nominal system voltage of less than 66 kV shall not exceed 4 percent for any odd numbered harmonic order or 2 percent for any even numbered harmonic order where these limits are expressed as a percentage of the nominal phase to earth system voltage.

(b) Any measurement of harmonic voltages to ascertain if they are within the limits set out in paragraph (a) hereof shall be made under the conditions and in the manner set out in the Schedule hereto.

4. (a) The total harmonic voltage distortion at any point of common coupling with a nominal system voltage of less than 66 kV shall not exceed 5 percent. The total harmonic voltage distortion (U_t) shall be calculated according to the following formula:

$$U_t = \sqrt{\sum_{n=2}^{50} U_n^2}$$

where U_n is the measured phase to earth harmonic voltage of harmonic order n expressed as a percentage of the nominal phase to earth system voltage.

(b) All harmonic voltages referred to in the formula set out in paragraph (a) hereof shall be measured within a thirty minute period under the conditions and in the manner set out in the Schedule hereto.

5. (a) The harmonic voltage corresponding to any of the odd numbered harmonic orders listed in the table below shall not at any point of common coupling at a nominal system voltage of 66 kV or above exceed the limit specified in the said table for that harmonic order.

Harmonic Order (n)	*Voltage Limit (Phase to earth harmonic voltage expressed as a percentage of the nominal phase to earth system voltage)*
3	2.3
5	1.4
7	1.0
9	0.8
11	0.7
13	0.6
15	0.5
17 to 21	0.4
23 to 49	0.3

(b) The harmonic voltage corresponding to any of the even numbered harmonic orders listed in the table below shall not at any point of common coupling at a nominal system voltage of 66 kV or above exceed the limit specified in the said table for that harmonic order.

Harmonic Order (n)	*Voltage Limit (Phase to earth harmonic voltage expressed as a percentage of the nominal phase to earth system voltage)*
2	1.2
4	0.6
6	0.4
8 and 10	0.3
12 to 50	0.2

(c) Any measurement of harmonic voltages to ascertain if they are within the limits set out in paragraphs (a) and (b) hereof shall be made under the conditions and in the manner specified in the Schedule hereto.

6. (a) The equivalent disturbing voltage shall not exceed one percent on any phase at any point of common coupling with a nominal system voltage of 66 kV or above.

(b) The equivalent disturbing voltage (E.D.V.) shall be calculated according to the following formula:

$$E.D.V. = 6.25 \times 10^{-5} \sqrt{\sum_{n=2}^{50} (nP_nU_n)^2}$$

Where P_n is the weighting given to frequency 50n in the psophometric weighting table.
U_n is the measured phase to earth harmonic voltage of harmonic order n expressed as a percentage of the nominal phase to earth system voltage.

(c) The psophometric weighting table referred to in paragraph (b) hereof is that which is labelled Table 1 and set out in paragraph 1.3.1 of Chapter XV of the International Telegraph and Telephone Consultative Committee (CCITT) Directives concerning the protection of communication lines against harmful effects from electricity lines.

(d) All harmonic voltages referred to in the formula set out in paragraph (b) hereof shall be measured within a thirty minute period under conditions and in the manner set out in the Schedule hereto.

7. The Secretary may determine equitable harmonic limits for each consumer at any point of common coupling so that the limits specified in Clauses 3, 4, 5 and 6 hereof are not exceeded.

8. (a) The harmonic current, flowing between any consumer and that consumer's point of common coupling, which corresponds to any of the odd numbered harmonic orders listed in the table below shall not exceed the limits specified in the said table for that harmonic order.

Harmonic Order	*Harmonic Current Limit (Amperes at nominal system voltage)*		
	220 kV	*110 kV*	*66 kV*
3	5.7	2.9	1.7
5	3.4	1.7	1.1
7	2.5	1.3	0.8
9	1.9	1.0	0.6
11	1.6	0.8	0.5
13	1.4	0.7	0.4
15	1.2	0.6	0.4
17	1.0	0.5	0.3
19 and 21	0.9	0.5	0.3
23	0.8	0.4	0.3
25 to 49	0.7	0.4	0.3

(b) The harmonic current, flowing between a consumer and that consumer's point of common coupling, which corresponds to any of the even numbered harmonic orders listed in the table below shall not exceed the limits specified in the said table for that harmonic order.

Harmonic Order	*Harmonic Current Limit (Amperes at nominal system voltage)*		
	220 kV	*110 kV*	*66 kV*
2	2.9	1.5	0.9
4	1.5	0.8	0.5
6	1.0	0.5	0.3
8	0.8	0.4	0.3
10	0.6	0.3	0.2
12 and 14	0.5	0.3	0.2
16 and 18	0.4	0.2	0.2
20 to 50	0.3	0.2	0.2

(c) Any measurement of harmonic currents to ascertain if they are within the limits set out in paragraphs (a) and (b) hereof shall be made under the conditions and in the manner specified in the Schedule hereto.

9. (a) The equivalent disturbing current for any of the nominal system voltages listed in the table below shall not at any point of common coupling exceed the value set out in the said table for that nominal system voltage.

Nominal System Voltage	*Equivalent Disturbing Current (E.D.I.)*
66 kV	0.8 amperes
110 kV	1.3 amperes
220 kV	2.6 amperes