BUWAL Bundesamt für Umwelt, Wald und Landschaft
OFEFP Office fédéral de l'environnement, des forêts et du paysage
UFAFP Ufficio federale dell'ambiente, delle foreste e del paesaggio
UFAGC Uffizi federal d'ambient, guaud e cuntrada

Ordinance of Protection against Non-ionising Radiation (NISV)

Explanatory Report

23rd December 1999

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Summary

Non-ionising radiation is ubiquitous in today's environment. Damage to human beings has been established at high intensity and there are well-founded indications of detrimental effects at low intensity.

The environmental protection law requires that non-ionising radiation in the environment is limited to a magnitude which is neither harmful nor annoying for people. Moreover, influences which *could* become harmful or annoying must be limited at an early stage by the precautions of this law.

The ordinance fulfils this law order as follows:

1. It regulates the limitation of the emissions of fixed, local facilities such as overhead and cable lines for the transmission of electrical energy, substations, transformer stations, electrical household installations, railways, broadcasting and radar equipment.
2. It determines emission limits for protection against provenly harmful effects. These emission limits must be adhered to wherever people can remain. They apply to the entire radiation caused by all radiation sources present a given place.
3. Beyond this, the effects are principally held to influences as low by the precautions as is technically and operationally feasible and financially viable. The ordinance provides precautionary emission limits for this:
   - Facility limits for the radiation for one facility alone
   - Technical and operational regulations for facilities
4. New facilities
   - must comply with the emission limits
   - must comply with to the facility limiting values or fulfil alternative technical and operational requirements depending on the facility type at places with sensitive use (such as living spaces, schools and hospitals).
5. Old facilities
   - must comply with the emission limits
   - must comply with the facility limiting values or fulfil alternative technical and operational requirements depending on the facility type at places with sensitive use
   - must not cause a higher emission places with sensitive use when modified.
6. Specific requirements for individual facility categories
   - are specified in detail in Appendix 1 of the ordinance
   - make exceptions to the obligation of complying with facility limits possible in exceptional cases.

The ordinance is in harmony with EU legislation. In particular, it contains no product specifications which could have the effect of non-tariff trade hindrances.

1 Purpose of legislation

Electrical facilities and equipment produce electrical and magnetic fields. The general reference is to non-ionising electromagnetic radiation abbreviated by "non-ionising radiation" (NIR). In everyday language, the term "electrosmog" is also frequently used for this.

According to the German environmental protection act (USG; SR *814.01*), non-ionising radiation must be limited by precautions in as far as technically and operationally feasible and financially viable but at least to an extent it is neither harmful nor annoying to persons or the environment. The corresponding articles in the USG read as follows:

Article 1 Purpose

[1]This law shall protect persons, animals and plants, their communities and environments against harmful or annoying effects and maintain the fertility of the soil.

[2]Effects which could become harmful or annoying are to be limited at an early stage.

Article 11 Principle

[1]Air pollution, noise, vibrations and radiation will be limited at source by appropriate measures (emission limitation).

[2]Regardless of the existing burdens on the environments, emission is to be limited by precautions so far as this is technically and operationally feasible and financially viable.

[3]The emission limits will be narrowed when it is certain or has to be expected that the effects will become harmful or annoying under consideration of the existing ecological burdens.

Article 13 Emission limits

[1]The Bundesrat (upper house of the German parliament) fixes emission limits by ordinance for the assessment of the harmful or annoying effects.

[2]In this, it also takes account of the effects of emission on groups of persons with a higher degree of sensitivity such as children, the ill, senior citizens and prenatal mothers.

With this ordinance, the Bundesrat complies with the injunction of Article 39 USG to issue the execution specifications of the USG.

2 Non-ionising radiation in the environment

21 General

Non-ionising radiation encompasses all forms of radiation which - unlike the ionising radiation – have inadequate energy to modify the constituents of matter and of living beings (atoms, molecules). Electrical and magnetic fields, thermal radiation, light and ultraviolet radiation are forms of non-ionising radiation.

This ordinance regulates the scope of the electrical and magnetic fields which arise in the transmission and application of electrical energy and at transmitting installations (frequency range 0 Hz to 300 GHz). In the ordinance and in these explanations, the term "non-ionising radiation" is used in this restricted interpretation.

22 Occurrence

Non-ionising radiation results in many facilities and equipment of today's living and working environment. It is unavoidable at all transmitting installations as well as in mobile telephones because it serves there as the actual means of transportation for information transfer. Transmitting aerials must issue radiation if they are to fulfil their purposes. However, the radiation emitted by all energy facilities and equipment, beginning with railways and extending through power cables of all sizes and transformers to electrical appliances in professional and household life are an unwanted by-product. At some sources, technical and design measures are known by which the fields can be reduced.

The emissions can differ very widely in their strength and have different ranges depending on their sources. It is generally applicable that the emissions fall at an increasing distance from the radiation source. The fields of high tension lines, railways and high-power transmitters have a comparatively long range. Cable lines, transformer stations and low-power transmitters have intermediate range. Low ranges are then to be found in electrical appliances.

23 The effects on persons

Medical science has addressed the question of the effects of non-ionising radiation in many examinations within the last decades. At the present time, the variety of the knowledge can be summarised as follows:

- *Intensive* non-ionising radiation endangers the health of people. The human body or parts thereof are heated, which leads to different, subsequently harmful reactions. Malfunctions of nerves and muscle cells due to electric currents which are induced in the body by intensive radiation have also been proven. These acute effects have in common that they do not appear below a definite intensity of the radiation (threshold).
  The emission limits of Appendix 2 of the ordinance are based on these proven detrimental effects and are defined so that such cannot occur.
- Biological effects also appear at *weaker* levels non-ionising radiation below the emission limits. For example, physiological changes were found in the metabolism of cells (calcium exchange). In laboratory animals, the production of the hormone Melatonin is influenced during the night. Persons increasingly complain of sleeplessness and other detriments to well-being in connection with weak electromagnetic fields. Finally, statistical examinations have raised a suspicion on a cancer-promoting effect of weak electromagnetic fields. For example, a group

of experts of the US National Institute of Environmental Health Sciences came to the conclusion in June 1998 after several years of assessing all examination reports that low-frequency electromagnetic fields are to be regarded as “possibly cancerogenic”.

Even if even further confirmations are required by the scientific community, the established consequences must be taken into account in the precautionary protection considerations made today. Precautions in compliance with the environmental protection act are specifically intended to minimise the yet unknown risks. The environmental protection act explicitly stipulates in Article 1, Paragraph 2 “Effects which *could* become harmful or annoying are to be limited at an early stage by precautions".

3 The protection concept of the ordinance

31 Principles

This ordinance places the protection of *persons* in the foreground. According to previous knowledge, it can be assumed that the remainder of the environment will not react more sensitively to non-ionising radiation than human beings and will therefore also be adequately protected.

With regard to the sources which cause radiation, the ordinance is restricted to *stationary facilities*. These particularly include high tension lines, railways and transmitting installations. Mobile equipment such as mobile telephones, electrical equipment and household appliances are also sources of electromagnetic fields. Emission limits are also intended for this equipment. However, Switzerland cannot fix technical requirements on equipment alone. Unlike stationary plants, equipment consists of products which are traded internationally. As early as 1993, parliament decided not to issue it’s own technical product standards which could have a restricting effect on trade. Technical product specifications are to be issued according to international technical standardisation. There already are such norms for microwave ovens and monitors; for mobile telephones, they are in preparation.

The protection concept of the ordinance is arranged so that it takes the two *main demands* of the environmental protection law into account:

- Harmful and annoying influences must be prevented.
- Influences which could become harmful or annoying must be limited as far as possible according to the precautions principle.

32 Preventing harmful or annoying influences

The protection of people against scientifically identified harmful or annoying influences is to be reached by compliance with the emission limits contained in Appendix 2 of the ordinance.

The emission limits of Appendix 2 are the limits published in April 1998 by the International Commission for Protection against Non-ionising Radiation (ICNIRP) for the (general) population. In compiling these values, the commission considered biological effects which could be repeated and reproduced in experimental examinations and which represent a health risk to humans. Effects from which a health risk could not be explicitly derived, single or not repeatable results and particularly epidemiological examinations were not taken into account by the ICNIRP in setting the limits for safety factors. Although the ICNIRP has included a safety factor in implementing the limits, this relates only harmful effects proven beyond doubt and taken into

account by the ICNIRP. The ICNIRP limits are therefore danger limits and not precautionary values.

This has the following concrete significance:

- In the low frequency range (power supply, railways):
  - The ICNIRP limits protect muscles (incl. the cardiac muscle) against unintended contractions and nerves (incl. the brain) against incorrect initiation of impulses.
  - **The ICNIRP limits do <u>not</u> take account of biological effects established in cell and animal experiments and were determined in individual cases with humans.** For example, the cellulose exchange in cells is affected (e.g. calcium binding and transport). In rats, the distribution of the hormone melatonin is reduced and in humans, neurodegenerative disturbances (e.g. chronic tiredness) and a weakening of the immune system have been determined. Such effects were proved experimentally in the range of 1-10 μT, effects at even lower magnetic flux densities were observed in individual cases. The epidemiologically founded, statistical evidence of an increased leukaemia risk after long-term exposure above 0.1 – 0.3 μT are also not taken into account by the ICNIRP limits.
- In the high frequency range (transmitters):
  - The ICNIRP limits protect the human body against inadmissible warming.
  - **The ICNIRP limits do <u>not</u> take account of so-called non-thermal effects**. For example, experiments with human beings have proved that sleep is influenced at 14 V/m. Mice developed lymph node cancer with a significantly higher frequency under the influence of mobile telephone radiation at an intensity in the vicinity of the ICNIRP limit. The results of the epidemiological examination of the short-wave transmitter at Schwarzenburg were also not taken into account, in which disturbed sleep occurred frequently at an average nightly exposure of approx. 0.4 V/m.

The ICNIRP limits are therefore suitable to avoid certain, proved harm with certainty. However, they are not able to satisfy the more extensive criteria of the environmental protection law. The USG requires that emission limits must not be determined by the standard of scientific knowledge, but also by the standard of experience. Not only the effects on the general population but also the effects on groups of persons with increased sensitivity such as children, the ill, aged and pregnant woman must also be taken into account.

In view of this situation, Switzerland should specify its own emission limits to fulfil the criteria of the USG. However, this was postponed, particularly because this is not yet possible on the basis of the existing data. Instead of this, the following concept was chosen:

- As emission limits, the limits of the ICNIRP were accepted for the time being. These limits are minimum requirements and must be adhered to everywhere and without exception where people could be. In today's environment, experience shows this to be the case in practically all places accessible to the population.
- If new and deeper knowledge is gained in the effects of weak non-ionising radiation, the emission limits must to be revised correspondingly, either within the scope of the ICNIRP or by the issue of Switzerland's own emission limits.
- The limited protection effect of the current emission limits shall be completed by effective precautionary measures in the meantime. For this reason, the principle of caution, i.e. the precautionary limitation of emission according to Articles 1 and 11 of the USG, assume particular significance in this case.

33 Precautions

The precautions cover the mentioned omissions of the ICNIRP limits and are future-oriented. The objective is to keep the risk of detrimental effects, some of which are only suspected or are not yet foreseeable as small as possible. According to Article 1 USG, it is unnecessary to give evidence of concrete harm. It is sufficient if the effects may cause harm or annoyances due to their properties (cf., commentary to the USG).

According to the USG, precautionary emission limits must be specified in as far as this is technically and operationally feasible and financially viable. Expressed differently: avoidable burdens must be avoided. Emission reduction measures which are practically possible must also be actually implemented.

To make this principle applicable in the practice, concrete requirements are specified in Appendix 1 of the ordinance which apply to the construction, operation, modification and the replacement of particular plant equipment. The requirements for older equipment are usually less stringent than for new installations.

Precautionary emission limits are particularly significant where persons stay regularly for long periods. Such places are described in the ordinance as *places with sensitive use*. If places with sensitive use are located within the effective range of an installation, more stringent emission limits apply to this installation. At this place, the installation limits must be complied with in nearly all installations.

Precautionary emission limits for stationary installations are specified in the ordinance by:

- Limitation of the radiation created by an installation to an installation limit
- Or as an alternative, by technical and operational regulations for the installation

The *installation limit* is a precautionary emission limit for the radiation produced by an installation alone. It has an different function than the emission limit and is determined on the basis of different criteria:

- The installation limit be set as low as technically and operationally feasible and financially viable regardless of the existing environmental burden (Art. 11 Sect. 2 USG). The installation limits of Appendix 1 of the ordinance are therefore significantly lower than the emission limits of Appendix 2.
- Low installation limits are also necessary because the installation limit only refers to the radiation produced by the installation alone as a precautionary emission limit for a single installation. Since the radiation of several installations can overlap, it must be ensured by a sufficiently strict limitation of the emission of the single installations that the emission limit is not exceeded by cumulation of the radiation. In addition, the possibility of constructing and operating new, additional installations in the future must also be kept open with regard to the emission.

The installation limit must not be complied with everywhere, but only in places with sensitive use.

By his reference to places with sensitive use, the installation limit also has a spatial aspect. Not only the technical and operational data of the installation are significant. The location of the installation with respect to the surroundings affected by it are also important.

The installation limits of Appendix 1 of the ordinance were fixed so that it is (usually) technically and operationally feasible and financially viable to uphold them. However, in individual cases it is possible that an installation limit cannot be complied with due to special spatial conditions. Problems in complying with the installation limits could occur particularly in:

- old installations, because the spatial situation already exists there;
- large single sources such as powerful radio transmitters;
- linear sources such as high tension lines and railway tracks.

In such cases, the ordinance provides the possibility of granting exceptions. The granting of exceptions is specific to the installations. It is possible only if Appendix 1 specifically provides for exceptions and if the conditions required for this are fulfilled.

The installation limit is intended initially to ensure that the radiation at the source is limited and new installations are not constructed too closely to existing places with sensitive use. Conversely, it must also be ensured by *space planning* that new sensitive uses are kept away from existing installations. To carry this out, the ordinance makes demands on the definition of building zones. It thus particularly prevents residential areas from extending to the immediate proximity of these infrastructure installations as has occurred repeatedly in the past.

It remains to be noted that the ordinance does not contain any precautionary emission limits for installations operated with *direct current* (direct current railways, trolley bus lines, direct current power cables). Such installations produce mainly static fields which already exist in the natural environment (geomagnetic field, static electrical field at the earth's surface), by which the natural fields are usually stronger than the static fields of technical origin.

4 Explanation of the ordinance text

41 Structure of the ordinance

The ordinance consists of a main section and two appendices.

The main section is divided into five chapters:

- The *1st chapter* (general stipulations) names the purpose and scope of the ordinance and defines the essential concepts.
- The *2nd chapter* (emission) sets out the requirements on new and old installations. The 1st section contains regulations to be observed commonly for new and old installations equally. The 2nd and the 3rd sections contain additional, special regulations for new and old installations. The 4th section regulates the co-operation of the installation operators and control by the authorities.
- In the *3rd chapter* (emission) determines how emission is to be measured, calculated and assessed.
- The *4th chapter* (requirements on the definition of building zones) regulates the prerequisites for the definition of new building zones.
- The *5th chapter* (concluding stipulations) contains the executive responsibilities (1st section) as well as the interim rulings and the date of coming into force (2nd section).

Detail stipulations are to be found in the appendices for single installation categories as well as the installation and emission limits.

- *Appendix 1* (precautionary emission limits) is subdivided into eight installation categories. It determines the installation limits for the individual categories and names the general conditions (technical and operational measures for new or old plants) under which an exception can be granted.
- *Appendix 2* (emission limits) contains the limits for emissions at a single frequency and cumulation regulations for emissions at several frequencies.

42 On the main section of the ordinance

1st chapter: General stipulations

Article 1 Purpose

The purpose of the ordinance is the protection of humans against harmful or annoying non-ionising radiation. It is therefore intended to fulfil the requirements of Article 1 USG for the field of non-ionising radiation not regulated until now.

According to the wording of Article 1, the purpose of the ordinance is confined to the protection of *humans*. The remaining environment (e.g. animals, plants, soil) are thus protected indirectly and sufficiently since it does not react more strongly than man to non-ionising radiation according to today's standards of knowledge.

Article 2 Scope of validity

Paragraph 1: The ordinance regulates manner and scope of the limitation of emission for stationary *installations.* This also includes installations which are principally mobile, but are operated for long periods at the same location. Also included are installations in companies and military installations whose emission have an effect on publicly accessible areas. The ordinance also applies to installations in the environment whose emissions have an effect on workplaces.

Paragraph 2: However, the ordinance does not apply to emission originating from industrial equipment have effects on the personnel. In this case, the regulations regarding the protection of employees and accident and occupational disease prevention are applicable. Medical facilities which produce emissions (e.g. diathermia machines, magnetic resonance scanners) are completely excluded from the scope of validity. It is the responsibility of the attendant physician to weigh the expected medical benefits against the incumbent risks.

Electrical appliances are also excluded from the scope of validity. The regulations of the federal legislation regarding the safety of technical facilities and appliances (SR *819.1*) and regarding technical hindrances to trade (SR *946.51*), which are harmonised with European legislation, are applicable in these cases.

Paragraph 3: Finally, the limitation of the effects of radiation from electrical or electronic medical life aids, e.g. heart pacemakers, is not included in the ordinance. This area is regulated in the ordinance on electromagnetic compatibility (SR *734.5*).

Article 3 Terms

Paragraphs 1 and 2: Old installations specify installations which were approved before the ordinance came into force. If approval is issued after the ordinance has come into force, the subject is consequently a *new installation*. For old and new installations, partially differing regulations are laid down by the 2nd chapter and in Appendix 1.

New *and* old installations which are transferred to another location or replaced at the present location are regarded as new installations as of this time and these must therefore fulfil the currently applicable requirements for new installations. The replacement of railway installations on the existing lines is exempted from this because neither the distance to places with sensitive use nor the arrangement of the trolley wire can be changed in this case.

New installations apply as new installations throughout their entire service lives, even if they are modified (cf. Article 6). The modification of old installations must be distinguished by this: this is regulated in Article 9 (general regulations) and in Appendix 1 (exception stipulations for single installation categories).

Paragraph 3: Places with sensitive use: These are firstly rooms in which persons can be assumed to stay for longer periods. Living spaces, school rooms, hospital wards and senior citizens homes as well as workplaces at which employees mainly stay, e.g. offices, particularly included. Secondly, children's playgrounds are listed separately because certain suspicions exist regarding detrimental effects inflicted primarily on children. However, for reasons of legal certainty, only children's playgrounds which are explicitly specified as such in legal development planning can be taken into account. For example, the garden of a private home does not apply as a place with sensitive use, whereas a jointly used playground in a built-up area which is a part of the building planning does apply. Finally, open spaces must be treated in the same manner as if the buildings made possible by the currently valid planning already exist. The use made possible by the legal planning is also usually implemented. On such sites, all buildings are significant which could be constructed within the legal planning provisions (bordering distances, building height, number of floors) or by special utilisation planning.

Paragraph 7: Contact currents: These are currents which flow on contact from objects which are *not* connected directly to a voltage source. The object in question operates only as a mediator between the electric or magnetic field of a strong source and the contacting person. Examples of this are vehicles under a high tension cable or in the proximity of powerful radio station. Such currents are significant in the frequency range from 0 Hz to approx. 100 MHz.

Currents which can flow to a person in contact with electrical conductors or electrical equipment connected to a voltage source are restricted by the heavy current ordinance (SR *734.2*).

2nd chapter: Emissions

1st section: Common regulations for new and old installations

Article 4 Precautionary emission limits

Paragraph 1: According to the environmental protection act, influences which could become harmful or annoying must limited at an early stage (so-called precautionary emission limits, cf. Art. 1, Para. 2, and Art. 11, Para. 2 USG). The individually necessary measures for old and new installations, subdivided according to installation categories, are contained in Appendix 1. With the exception of the household installations, an installation limit is defined for all categories as emission limits. This limits the radiation produced alone by the installation in question. However, due to the specific location conditions, it will hardly be possible to enforce compliance with the installation limits in every case. The authorities will permit exceptions if these are provided for in Appendix 1. In this case, the installation operator must meet and prove the technical

or operational measures also contained in Appendix 1 regarding emission limits to show that he has taken all other measures which are technically and operationally possibly and financially viable to limit radiation. This principle corresponds to Article 11 Paragraph 2 USG. The burden of proof of this lies with the installation operator.

Paragraph 2 is intended for such installations which are uncommon or whose significance to the emission of non-ionising radiation will change in the course of the time. The authorities thereby have a means of specifying installation limits or technical and operational requirements in individual cases for installation types not explicitly regulated by Appendix 1. However, this may only be employed in as far as this is technically and operationally feasible and financially viable for the installation operator.

Article 5 Supplementary and increased emission limits

Paragraphs 1 and 2: The emission limits according to Appendix 2 are to be complied with under all circumstances. The USG does not provide for any exceptions to this. If the transgression of an emission limiting value is certain or must expected, the authorities must order further emission limits until the emission limits are complied with. This also applies to all installations if they cause a transgression of the emission limit in conjunction with other installations only. If the emission limits cannot be complied with by technical or operational measures, the installation must be transferred to another location or closed down.

Paragraph 3: If only the contact current (cf. Art. 3, Para. 7) is excessive, the measures are primarily to address the objects which are charges by the radiation. An effective measure is, for example, to earth such conductive objects. Measures to address the installation which emits the radiation must only be taken as a secondary step.

2nd section: Special regulations for new installations

Article 6

A new installation (cf. Art. 3, Para. 2) will be regarded as a new installation throughout it's service life and must always fulfil the corresponding requirements. This principle also applies consequently to modifications of a new installation.

3rd section: Special regulations for old installations

Article 7 Mandatory refurbishment

Old installations (cf. Art. 3 Para. 1) which do not comply with the precautionary emission limits defined in Article 4 and in Appendix 1 or the supplementary or increased emission limits according to Article 5 must be refurbished. Exemption from this refurbishment is possible only if the plant is shut down within the refurbishment period.

Article 8 Refurbishment period

The maximum refurbishment periods for the individual installation types are regulated by Appendix 1. If Appendix 1 does not contain any details on the refurbishment period, the authorities will stipulate a refurbishment period of not more than five years. The stipulated period may be extended on application by not more than half. The maximum ordinary refurbishment period is thereby – after extension – seven and a half years (e.g. for railways). A shorter maximum period

of three years applies to the supplementary or increased emission limits (*Para. 2);* this period cannot be extended.

Article 9 Modification of old installations

Paragraph 1: Appendix 1 defines which events are regarded as "modifications" of old installations *(*see the respective section "terms") specific to each installation. In principle, two requirement apply to the modification of old installations: Firstly, the radiation must not be more intensive than before the modification at places with sensitive use at which the installation limit was already exceeded before the modification. Secondly, the installation limit must be complied with at all places with sensitive use. To prove this, the owner of the installation will submit an updated location data sheet to the authorities even if the modification was not subject to approval (cf. Art. 11).

For other modifications not described in Appendix 1 (e.g. the simple replacement of masts for overhead cables or of overhead line systems), these requirements do not apply and no clarifications must be made.

If an old installation is not only modified, but completely replaced at it's present locations or transferred to a different location, this is equivalent to the construction of a new installation with regard to the planning and investments. The replaced or transferred installation is therefore regarded as new installation and the corresponding requirements for a new installation consequently apply (cf. Art. 3, Para. 2 Bst. b and c). For the special arrangements for railways, see the commentary of Article 3.

Paragraph 2: Appendix 1 provides a means of making exceptions to the fundamental requirements when old installations are modified according to article 9 (cf. Appendix 1, the respective section "Modification of old installations"). The installation operator must prove that he has met the reasonable technical and operational measures for the granting of the exception.

4th section: Co-operation and inspections

Article 10 Mandatory co-operation

This stipulation cements Article 46 Paragraph 1 USG. The liability principle applies to the costs (cf. Art. 2 USG).

Article 11 Mandatory reporting

The owner of an installation must submit a location data sheet to the authorities when he intends to construct a new installation, to modify, to transfer or to replace an installation at a new location. As far as official permission is required for this, the location data sheet is submitted together with the application documents. If no permission is required for the modification of the installation (according to the associated definition in Appendix 1), the location data sheet of the authority which originally approved the plant must be submitted before the implementation of the modification.

No location data sheet must be submitted for old installations which remain in operation in the present form. However, it may be appropriate for the clarification of the necessity of refurbishments to complete a location data sheet for installations potentially in need of refurbishment.

Article 12 Inspections

In principle, the duty to inspect the equipment and operation of installations is the responsibility of the respective executive authority. Measurements and calculations are scheduled to verify compliance with the installation limit. The BUWAL will compile a measurement recommendation for the execution of the measurements in conjunction with the affected parties. As in other environmental matters, the executive authority may delegate certain clarifications to the installation owners or to third parties (e.g. suitable private enterprises, cf. Art. 10, mandatory co-operation). It will not be necessary to inspect all old installations. The executive authority will rather set priorities for the inspection of the installations.

Today, the inspection of electrical household installations is already the responsibility of the companies subject to inspection (such as power plants). This will remain so. The electrical inspectors must be trained correspondingly so that they also can verify the requirements on new household installations according to this ordinance.

Paragraph 3: Installations which operate with exceptional approvals will be inspected more strictly.

3rd chapter: Emission

Article 13 Validity of the emission limits

The emission limits are intended to protect persons against the scientifically certain, harmful effects of radiation and provide the basis for supplementary or increased emission limits according to Article 5. They are summarised numerically in Appendix 2 and comply with the international limits of the ICNIRP (International Commission for Non-ionising Radiation Protection). The emission limits must not only be complied with at places with sensitive use, but everywhere where people can stay (e.g. including on meadows, in woods or on paths).

Article 14 Measurement of the emission

This article determines when, how and where emissions are to be measured.

Paragraph 1: Emissions are measured or calculated by the authorities if there is reason to assume that they exceed one or more emission according to Appendix 2.

Paragraph 2: Measurements and calculations must be carried out according to the latest standards of technology. The BUWAL will compile corresponding methods together with the concerned parties.

Paragraph 3 specifies that emissions at workplaces which originate from sources inside or outside the company are to me measured and assessed separately. The working hygiene limits for physical effects of the SUVA[1] apply to the emissions from internal company sources For emissions from sources external to the company, the emission limits according to Appendix 2 of this ordinance are applicable.

In *Paragraphs 4 and 5*, the physical values to be measured or calculated are specified. These depend directly upon the definition of the respective emission limits in Appendix 2. Usually, not all listed physical emission values must be determined in each concrete situation. It is sufficient to concentrate on those for which Appendix 2 makes the strictest requirements. Paragraph 4 also

[1] Limits at the workplace 1997, SUVA Lucerne, 1997

contains the ruling that that the emission limits of Appendix 2 must not be exceeded even for short periods.

Article 15 Assessment of the emission

After the measurement of the emission (Art. 14), it must be determined whether the emission limits according to Appendix 2 have been exceeded. This assessment is incumbent upon the authorities alone.

4th chapter: Requirements on the definition of building zones

Article 16

The rulings of Article 16 cement the planning principles of the space planning act (Art. 3 Para. 3 Bst. b RPG). The regulation oblige the cantons and boroughs only to define building zones where the installation limits are complied with or can be complied with by planning or structural measures. Planning or structural measures must be determined obligatorily in the basic building orders of the boroughs. For example, usage of the area above railway lines (track superstructures) is inadmissible because the installation limit is exceeded typically up to a limit of 10 to 15 metres above the trolley wire. Inclusion in building zones may only be carried out in this case if it is ensured that the lower floors of the future track superstructure contain no places with sensitive use (planning measure) or if the magnetic field is screened (structural measure).

In the planning stage of building zones, cantons and boroughs have far-reaching decision making competence. Moreover, planning is conducted with a long-term view. The cantons and boroughs should therefore not only take account of the existing, emitting installations in the definition of building zones, but also include such installations in their decisions which are specified in concepts and schemes of the federal government or at the general planning level of the canton.

The requirements on development planning will have particular effects at overhead cables, distribution stations and switching equipment, railways and powerful transmitting installations primarily because the radiation of these plants has a relatively long range.

5th chapter: Concluding stipulations

1st section: Execution

Article 17 and 18 Execution by the cantons / by the federation

As in the other ordinances of the USG, no new approval methods will be created in the scope of NIR. The execution is assigned to the authorities already responsible for permission, planning approval or concession apportionment of installations. These are mainly Federal authorities. In many installation categories, a Federal authority will assign the specified permission for a defined plant location (e.g. electric power plants, railways, air traffic control facilities, radio transmitters, commercial radio installations). Where this is not the case (e.g. in mobile radio communication aerials or in amateur radio installations), the responsibility for this lies with the canton authorities because the location of the plant is known only during the planning permission procedure.

Article 18 complies with the specifications of federal law regarding the co-ordination and simplification of decision methods (BBl *1999* 5043) which will become effective on January 1st, 2000. The wording corresponds to the ordinances of the UGS adapted for implementation.

Article 19 Co-ordinating authority

This article determines that the authorities will co-operate according to the principles of the development planning act if a transgression of the emission limits is caused by several plants together. In practice, this situation will very seldom appear.

2nd section: Interim stipulations and date of coming into force

Article 20 Interim stipulations

The time until which old installations in need of refurbishment must be refurbished is determined by the date of issue of the refurbishment order (Art. 20) and the refurbishment period specified in the order (Art. 8 in conjunction with Appendix 1). Old installations which do not comply with the stipulated, precautionary emission limits must therefore usually be refurbished seven years at the latest after the ordinance has come into force. An extension of the refurbishment period granted to the installation operator by not more than half remains open (cf. Art. 8, Para. 1, third sentence).

If the authority is unable to issue refurbishment orders for all installations in due time, it will issue refurbishment order in due time for the most urgent cases of refurbishment. This ruling of Article 20 conforms with that of Article 42 Paragraph 2 of the air purity ordinance (SR *814.318.142.1*), which has been proven in practice.