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NUCLEAR SAFETY AND RADIATION PROTECTION ACT
(1995 No. 19)

NIGERIAN SAFETY REGULATIONS FOR LICENCING OF SITES FOR
NUCLEAR POWER PLANTS, 2021



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S. I. No. 17 of 2021

NUCLEAR SAFETY AND RADIATION PROTECTION ACT, 1995

NIGERIAN SAFETY REGULATIONS FOR LICENCING OF SITES
FOR NUCLEAR POWER PLANTS, 2021

[11th Day of January, 2021]

Commence-
ment.

In exercise of the powers conferred on it by Section 47 of the Nuclear Safety and Radiation Protection Act 1995 and all other powers enabling it in that behalf, the Nigerian Nuclear Regulatory Authority, with the approval of the President, makes the following Regulations—

PART I—GENERAL

1. The objectives of these Regulations are—

Objectives.

(a) the establishment of safety requirements for the elements of a site evaluation for a nuclear power plant (NPP) so as to characterize the site specific conditions necessary for the safety of the NPP ;

(b) the protection of the public and the environment from the radiological consequences of radioactive releases due to incidents, accidents or normal operation of NPPs ; and

(c) to establish a safety criteria to be applied as appropriate to site and site-power plant interaction in operational states and accident conditions, including those that may lead to emergency measures for—

(i) defining the extent of information on a proposed site to be presented by the applicant,

(ii) evaluating a proposed site to ensure that site related phenomena and characteristics are considered,

(iii) analyzing the characteristics of the population of the region and the capability of implementing emergency preparedness and response programmes over the projected lifetime of a NPP, and

(iv) defining site related hazard.

2. The scope of these regulations includes—

Scope.

(a) any site related factor and site-plant interaction factor relating to NPPs operational states and accident conditions, including those that may lead to emergency measures, natural and human induced events external to the power plant that are important to safety, and the external human induced events considered in these Regulations are all of accidental origin ;

(b) any severe event of low probability that relate to the siting of NPPs which have to be considered in designing a particular NPPs ;

(c) the investigation of the site of a NPP and covers the entire process of the site evaluation which consists of the selection, assessment, pre-operational and operational stages ; and

(d) the evaluation of a candidate site to be undertaken by the applicant.

Application.

3. These Regulations shall apply to any applicant desirous of siting and operating civil NPPs in Nigeria.

PART II—LICENSING OF SITES FOR NUCLEAR POWER PLANTS

Radiation
safety
requirements.

4. The principal radiation safety requirements related to justification of practice, dose limitation, optimization of protection, and dose constraints, as specified in NiBIRR shall apply to any NPP site.

Application
for license.

5.—(1) The applicant for a licence to site a NPP shall file an application for authorization with the Authority in such form as may, from time to time, be prescribed by the Authority.

(2) The application referred to in sub-regulation (1) of this regulation shall contain the Site Safety Analysis Report (SAR) and the SAR shall include Emergency Preparedness and Response Plan, the contents of which are specified in the First Schedule to these Regulations.

Stages of
licensing.

6. The licensing procedure for a nuclear power plant in Nigeria shall comprise of the following stages—

- (a) licensing of site ;
- (b) licensing of design and construction ;
- (c) licensing of commissioning ;
- (b) licensing of the operation ; and
- (d) licensing of decommissioning.

Procedure
for
submitting
an
application.

7. The applicant shall submit different applications for each stage mentioned in regulation 6 of these Regulations and the applications shall be in accordance with the applicable filing requirements as may be laid down by the Authority.

Review of
applications
by the
Authority.

8.—(1) The fees for the filing and review of an application for the issuance of a site licence shall be as determined by the Authority and provided for in the Schedule of Fees.

(2) The Authority may, without prior notice given to the applicant, review its fees from time to time.

(3) The Applications filed under these Regulations shall be reviewed in accordance with the applicable standards specified by the Authority.

9. The Authority shall, after consultation with the Nuclear Safety Committee (NSC) and Nuclear Emergency Committee (NEC), determine whether—

Consultation
with NSC
and NEC.

(a) there is a significant impediment to the development of the emergency preparedness and response plans that cannot be mitigated or eliminated by measures proposed by the applicant ;

(b) the major features of the emergency preparedness and response plans submitted by the applicant are acceptable to the Authority and in accordance with National Nuclear and Radiological Emergency Response Plan ; and

(c) the emergency preparedness and response plans submitted by the applicant provide reasonable assurance that adequate protective measures shall be taken in the event of a radiological emergency.

10.—(1) The Authority shall upon review of an application—

(a) notify—

(i) the relevant federal Agencies, state and local governments, and

(ii) other bordering states and stakeholders,

in the area where the NPP shall be sited; and

(b) organize public hearings.

Duty to
notify
relevant
agencies and
other
stakeholders.

(2) The procedure in sub-regulation (1) of this regulation shall be applied, provided that it shall not be construed to require that the environmental report, draft or final environmental impact statement include an assessment of the benefits of construction and operation of the NPPs or an analysis of alternative energy sources.

(3) During the public hearings referred to in sub-regulation (1) (b) of this regulation, the Authority shall not admit contentions proffered by any party concerning an assessment of the benefits of construction and operation of the plants, or an analysis of alternative energy sources if these were not addressed by the applicant in the early site application.

11.—(1) The Authority may, after the public hearings referred to in regulation 10 (1)(b) of these Regulations, issue a site license to the applicant in the form the Authority deems appropriate, where the Authority finds that—

Issuance of
site license.

(a) an application for a site license meets the applicable standards and requirements of the Act and these Regulations ;

(b) the applicant has made the necessary notifications to other agencies or bodies ;

(c) the site conforms with the provisions of the Act and these Regulations ;

(d) the applicant is technically qualified to carry out the activities authorized by the Authority ;

(e) the proposed inspections, tests, analyses and acceptance criteria are necessary and sufficient, within the scope of the site license, to provide

reasonable assurance that the facility has been constructed and will be operated in accordance with the terms and conditions of the license, the Act and these Regulations ;

(f) issuing the license will not be inimical to the security, health and safety of the public ; and

(g) any adverse environmental impact that results from the activities requested can be redressed.

(2) The site license shall specify the site characteristics, design parameters, and terms and conditions of the license as specified by the Authority.

(3) The Authority shall, before it issues a construction license which refers to a site license, ensure that the relevant terms and conditions of the site license have been met.

(4) Any term or condition of the site license that is not met at the time of issuing the construction license shall form part of the terms or conditions of the construction license.

Duration of
license.

12.—(1) Except as otherwise provided in these Regulations, a site license issued under these Regulations shall be valid for a period of 10 years from the date of issuance ;

(2) A site license continues to be valid beyond the date of expiration in any proceeding on a construction license application that refers to the site license and received before the date of expiration of the site license, or, if a timely application for renewal of the license has been received before the Authority has determined whether to renew the license.

(3) The applicant for a construction license may, at his own risk, refer, in his application, to a site for which a site license application has been submitted to the Authority but not granted.

(4) Upon issuance of a construction license, the site license referred to in sub-regulation (3) of this regulation shall be subsumed, to the extent referenced, into the construction license.

Application
for Renewal.

13.—(1) An application for renewal of a site license shall—

(a) be submitted to the Authority not less than 12 months before its expiration ; and

(b) contain updated information necessary for the application for renewal.

(2) Any person whose interests may be affected by the renewal of the license may request the Authority in writing for a hearing on the application for renewal.

(3) A site license, for which a timely application for renewal has been filed, remains valid until the Authority has determined whether or not to renew the license.

Criteria for
renewal.

14.—(1) The Authority shall—

(a) grant the applicant's application for renewal of a site license where it determines that the site complies with the provisions of the Act, these Regulations and any other applicable law at the time the site license was originally issued; and

(b) impose additional requirements that—

- (i) are necessary for adequate protection and safety of the public,
- (ii) are necessary for compliance with regulations and orders applicable and in effect at the time the site license was originally issued, or
- (iii) a substantial increase in overall public protection and safety of common defence and security to be derived from the new requirements, and the direct and indirect costs of implementation of those requirements are justified in view of this increased protection.

(2) The Authority shall deny an application for renewal where the applicant fails to comply with the provisions of these Regulations.

(3) A denial of renewal for failure to comply with the provisions of these regulations does not bar the licensee or another applicant from filing a new application for the site which proposes changes to the site or the way that it is used to correct the deficiencies cited in the denial of the renewal.

15.—(1) Subject to the approval of the Authority, an applicant may use a site for purposes other than those prescribed in the site license issued under these Regulations and this may include using it for other types of energy facilities.

Use of site
for other
purposes.

(2) The applicant shall give the authority details of the activities—

(a) to be carried out for other purposes other than those prescribed in the site license; and

(b) referred to in paragraph (a) of this sub-regulation at least 6 months in advance of any construction or site modification for the activities.

(3) Where the applicant applies to locate any other type of energy facility on the site, the Authority may impose additional requirements on the license.

16. Notwithstanding the provisions of these Regulations, the Authority may not, while there is a subsisting site license, modify or impose new site characteristics, design parameters or terms and conditions, including emergency planning requirements, on the site license unless it determines that a modification is necessary to—

Site license
modification.

(a) bring the license or the site into compliance with any applicable law in effect at the time the license was issued; or

(b) assure adequate public protection and common defence and security.

Resolving
matters of
issuance or
renewal of
site license.

17. In making the findings required for issuance of a construction license or in any enforcement hearing other than one initiated by the Authority, if the application for the construction license refers to a site license, the Authority shall treat as resolved those matters resolved in the proceedings on the application for issuance or renewal of the site license if the site license approved an emergency plan or major features that are—

(a) in use by a licensee of a nuclear power plant, the Authority shall treat as resolved changes to the site license emergency plan or any of its major features that are identical to changes made to the licensee's emergency preparedness and response plans occurring after issuance of the site license ; and

(b) not in use by a licensee of a nuclear power plant, the Authority shall treat as resolved changes that are equivalent to those that may be made without prior approval from the Authority had the emergency plan been in use by a licensee.

Updating
emergency
preparedness
information.

18. Where an applicant for a construction or operating license files an application that refers to a site license issued under these Regulations, the applicant shall update the emergency preparedness information that was earlier provided and discuss whether the updated information significantly changes the basis for compliance with any relevant requirement.

Hearings and
petitions.

19. In any proceeding for the issuance of a construction or operating license that refers to a site license, contentions on the following matters may be litigated in the same manner as other issues material to the proceeding—

(i) the nuclear power plant proposed to be built does not fit within one or more of the site characteristics or design parameters included in the site license ;

(ii) one or more of the terms and conditions of the site license have not been met ;

(iii) new or additional information is provided in the application that substantially alters the basis for a previous conclusion or constitutes a sufficient basis for the Authority to modify or impose new terms and conditions related to emergency preparedness ; or

(iv) any significant environmental issue that was not resolved in the site license proceedings, or any issue involving the impacts of construction and operation of the facility that was resolved in the site license proceedings for which significant new information has been identified.

Filing a
petition to
the
Authority.

20.—(1) Any person may file a petition to the Authority requesting that the site characteristics, design parameters, or terms and conditions of the site license be modified, or that the license be suspended or revoked.

(2) The Authority, on receipt of the petition referred to in sub-regulation (1) of this regulation, shall notify the applicant and grant the applicant and the person who filed the petition such time not exceeding three months to address the issues raised in the petition.

(3) The Authority shall consider the petition before construction commences and determine whether any immediate action is required and where the petition is granted, an appropriate order shall be issued.

(4) Any construction under the construction license shall not be affected by the granting of the petition unless the order is made immediately effective.

21.—(1) The applicant for a construction or operating license that refers to a site license may include in his application a request for a variance from—

Variation of
site license
or SAR.

- (a) any site characteristic ;
- (b) any design parameter ;
- (c) any terms and conditions of the site license ; or
- (d) the site SAR.

(2) The Authority shall apply the same technically relevant criteria applicable to the application for the original or renewed site license to decide whether to grant the variance referred to in sub-regulation (1) of this regulation.

(3) Where a construction license which refers to a site license is issued, any variance from the site license shall not be granted for that construction license.

22.—(1) The holder of a site license shall not amend the license, including the site SAR, without prior approval of the Authority.

Site license
amendment.

(2) Where the holder of a site license seeks to amend it, the request for an amendment shall be in the form of an application for a license amendment.

PART III—SAFEGUARDS AND SECURITY CONSIDERATIONS

23.—(1) The applicant for a site license under these Regulations shall—

Safeguard of
information
and threat
assessment.

- (a) safeguard any information regarding the site against unauthorized disclosure ;
- (b) provide a vulnerability assessment report of the site from the Office of the National Security Adviser ; and
- (c) develop and submit to the Authority security-related physical protection measures for nuclear power plant including gathering information about the nuclear power plant proposed siting location.

(2) The findings from this study shall be presented by the applicant in a Site Selection Threat Assessment (SSTA) report.

24. The applicant shall ensure that in the proposed physical protection requirements, appropriate detection, delay, and response considerations are taken into account.

Physical
protection.

Remote areas.

25. The applicant shall establish a comprehensive on-site nuclear response force capability for any remote site.

Transportation routes.

26. The following transportation routes in the vicinity of the site shall be considered and evaluated—

(a) availability of a standard gauge railway line between the site and the nearest seaport ;

(b) availability of high grade dual carriage way ; and

(c) availability of inland waterways.

Socio-economics.

27. The applicant shall ensure that—

(a) an evaluation of the suitability of any nuclear power plant site near a community shall demonstrate that the construction and operation of the nuclear power plant, including transmission and transportation corridors, and potential problems relating to community services will not adversely affect the distinctive character of the community nor the populations ;

(b) a preliminary investigation shall be made to address environmental justice considerations and to identify and analyze problems that may arise from the proximity of a distinctive community to a proposed site ;

(c) the evaluation of the suitability of a site shall include consideration of purpose and probable adequacy of socioeconomic impact mitigation plans for such economic impacts on any community ; and

(d) siting decisions shall reflect fair treatment and meaningful involvement of all people, regardless of race, ethnicity, culture, income or educational level to assure equitable consideration and to minimize disproportionate effects on different groups of the populations.

Noise.

28. The applicant shall ensure that noise levels at any proposed site comply with the applicable laws.

PART IV—CRITERIA FOR DETERMINATION OF EXCLUSION AREA BOUNDARY, LOW POPULATION ZONES AND POPULATION CENTRE DISTANCE

Evaluation of a site.

29.—(1) As an aid in evaluating a proposed site, a fission product release from the core, the expected demonstrable leak rate from the containment and the meteorological conditions pertinent to the site shall be assumed to derive an exclusion area, a low population zone and population centre distance.

(2) For the purpose of the analysis referred to in sub regulation (1) of this regulation, which shall set forth the basis for the numerical values used, the applicant shall determine the following—

(a) an exclusion area of such size that an individual located at any point on its boundary for two hours immediately following onset of the postulated fission product release would not receive a total radiation dose to the whole body in excess of 250 mSv or a total radiation dose in excess of 3000 mSv to the thyroid from iodine exposure ;

(b) a low population zone of such size that an individual located at any point on its outer boundary who is exposed to the radioactive cloud resulting from the postulated fission product release (during the entire period of its passage) would not receive a total radiation dose to the whole body in excess of 250 mSv or a total radiation dose in excess of 3000 mSv to the thyroid from iodine exposure ; and

(c) a population centre distance of at least one and one-third times the distance from the plant to the outer boundary of the low population zone, and for this purpose, the boundary of the population centre shall be determined upon consideration of population distribution.

30.—(1) For any site where multiple nuclear power plants are located, the applicant shall consider whether the power plants are—

Multiple
nuclear
power
plants.

(a) independent to the extent that an accident in one plant would not initiate an accident in another, the size of the exclusion area, low population zone and population centre distance shall be fulfilled with respect to each plant individually, the envelopes of the plan overlay of the areas so calculated shall then be taken as their respective boundaries ; and

(b) interconnected to the extent that an accident in one plant could affect the safety of operation of any other, the size of the exclusion area, low population zone and population centre distance shall be based upon the assumption that all interconnected power plants emit their postulated fission product releases simultaneously.

(2) The considerations referred to in sub-regulation (1) of this regulation may be reduced in relation to the degree of coupling between power plants, the probability of related accidents and the probability that an individual would not be exposed to the radiation effects from simultaneous releases, provided, that the basis for such a reduction in the source term shall be justified to the satisfaction of the Authority.

(3) The applicant shall demonstrate that the simultaneous operation of multiple reactors at a site will not result in total radioactive effluent releases beyond the allowable limits as prescribed by the Authority.

PART V—GENERAL REQUIREMENTS FOR EVALUATION AND ASSESSMENT OF SITES

31. The applicant shall investigate every stage of site evaluation process and the site evaluation process shall involve the following stages—

Site
investigation.

- (a) selection ;
- (b) characterization ;
- (c) pre-operational ; and
- (d) operational.

Suitability
of a site.

32. The applicant shall, when evaluating the suitability of a site for a nuclear power plant, consider the—

(a) effects of any external event occurring in the region of the particular site and hazardous phenomena associated with any human event initiated by sources external to the plant ;

(b) characteristics of the site and its environs that may influence the transfer to persons and the environment of any radioactive material that has been released through either dispersion in air, soil or water ;

(c) evaluation of seismic hazards for the nuclear power plant through the determination of ground motion hazards and the potential for surface faulting which could affect the feasibility of construction and safe operation of the plant ;

(d) hazards assessment of extreme and rare meteorological phenomena that could influence the release of radiation ;

(e) evaluation of the flood hazard so as to enable the identification of hazardous phenomena associated with flooding events ;

(f) the geotechnical engineering aspects relevant for the safety of a nuclear power plant ; and

(g) the population density and population distribution and other characteristics of the external zone in so far as they may affect the possibility of implementing emergency measures and the need to evaluate the risks to individuals and the population.

Unsuitability
of a site.

33. The applicant shall consider a site unsuitable where—

(a) any of the requirements of regulation 32 of these Regulations have not been met ; and

(b) the deficiencies observed in the site evaluation cannot be compensated for by means of—

(i) design features,

(ii) measures for site protection, or

(iii) administrative procedures.

Investigation
and
assessment
of site.

34. The applicant shall—

(a) investigate and assess any site characteristic that may affect the safety of the nuclear power plant ;

(b) investigate and assess any characteristic of the natural environment in the region that may be affected by potential radiological impacts in operational states and accident conditions ; and

(c) ensure that all the characteristics referred to in paragraph (a) and (b) of this regulation are observed and monitored from time to time as may be determined by the Authority throughout the lifetime of the power plant.

35. The applicant shall—

(a) examine a proposed site for a nuclear power plant for the frequency and severity of external events and phenomena that may affect the safety of a power plant ;

(b) evaluate and monitor the foreseeable evolution of natural and human made factors, particularly population growth and distribution, in the region that may affect the safety of the nuclear power plant at any time during its projected lifetime ; and

(c) determine any hazard associated with external events that are to be considered in the design of the nuclear power plant.

Examination
of sites for
frequency of
external
events.

36. The applicant shall, when evaluating a site, consider—

(a) matters relating to safety during storage and transport of—

(i) input and output materials,

(ii) fresh and spent fuel, and

(iii) radioactive wastes ;

(b) the non-radiological impact of the power plant, due to chemical or thermal releases, and the potential for explosion and the dispersion of chemical products ; and

(c) the interactions between nuclear and non-nuclear effluents.

Matters
relating to
safety during
transportation
etc.

37.—(1) The applicant shall evaluate, for each proposed site, the potential radiological impacts in operational states and in accident conditions on people and the environment in the region that may lead to emergency measures with due consideration of the following—

(a) population distribution ;

(b) dietary habits ;

(c) use of land and water ; and

(d) radiological impacts of any other releases of radioactive material in the region.

Evaluation
of site for
radiological
impacts.

(2) The applicant shall, while carrying out the evaluation referred to in sub-regulation (1) of this regulation—

(a) make appropriate estimates of expected or potential releases of radioactive material ;

(b) consider the design of the installation and its safety features ;

(c) identify and evaluate the direct and indirect pathways by which radioactive materials released from the nuclear power plant may reach and affect the people and the environment ; and

(d) examine the site and design of the nuclear power plant to ensure that the radiological risks associated with radioactive releases that may affect the public and environment is acceptably low.

Safety in
external
events.

38. The applicant shall—

(a) investigate a proposed site with regard to all the site characteristics that may be significant to safety in external events ;

(b) identify and evaluate possible natural phenomena and human induced situations and activities in the region of a proposed site ;

(c) consider foreseeable changes in land use including the expansion of existing power plants and human activities or the construction of high risk power plants in site selection ; and

(d) collect and analyze for reliability, accuracy and completeness pre-historical, historical and instrumentally recorded information and records, as applicable, of the occurrences and severity of important natural phenomena or human induced situations and activities.

Appropriate
methods for
establishing
hazards of
major
external
phenomena.

39. The applicant shall—

(a) adopt appropriate methods for establishing any hazard that is associated with major external phenomena ; and

(b) ensure that the size of the region to which a method for establishing the hazard associated with major external phenomena is to be applied shall be large enough to include any—

- (i) feature and area that could be of significance in the determination of the natural and human induced phenomena under consideration, and
- (ii) characteristic of the event.

Population
distribution.

40. The applicant shall—

(a) study the proposed region to evaluate the—

- (i) present and foreseeable future characteristics, and
- (ii) distribution of the population of the region ; and

(b) ensure that in relation to the characteristics and distribution of the population, the combined effects of the site and the power plant shall be such that—

(i) for operational states of the power plant the radiological exposure of the population shall comply with the provisions of NiBIRR with account taken of international recommendations, and

(ii) the radiological risk to the population associated with accident conditions, including those that could lead to emergency measures being taken, is acceptably low.

Establishment
of an
external
zone.

41.—(1) The applicant shall establish an external zone for a proposed site and consider—

- (a) the potential for radiological consequences for people ;
- (b) the feasibility of implementing emergency preparedness and response plans ; and

(c) any external event that may hinder the implementation of the plans referred to in paragraph (b) of this regulation.

(2) Before the commencement of construction of a nuclear power plant, the applicant shall confirm that there will be no insurmountable difficulties in establishing an emergency plan for the external zone before the start of operation of the plant.

(3) Where the site region extends beyond national borders and for any site located near a coastline, the applicant shall investigate the relevant onshore or offshore area.

PART VI—EVALUATION OF SEISMIC HAZARDS

42. The applicant shall—

(a) investigate the hazards of ground motion and faulting associated with earthquakes and geological phenomena for every nuclear power plant ; and Scope of investigation

(b) ensure that the—

- (i) size of the region to be investigated,
- (ii) type of information to be collected, and
- (iii) scope and detail of the investigations,

shall be determined according to the nature and complexity of the seismotectonic environment ;

(c) investigate the effects of the rocks at the site ;

(d) collect and analyze all recorded earthquake data that have occurred in the region ;

(e) install strong motion accelerometers and seismometers permanently within the site area and maintained so as to operate continuously and record small and large events throughout the life time of the plant ; and

(f) investigate all geologic and seismic factors that may affect the design and operation of the proposed nuclear power plant irrespective of whether such factors are explicitly included in this regulation.

43. The investigations to be carried out by the applicant shall be on the scale basis specified in the Second Schedule to these Regulations. Scales of Investigation.

44. The applicant shall— Earthquakes.

(a) evaluate the—

- (i) seismological and geological conditions in the region, and
- (ii) engineering geological aspects and geotechnical aspects of the proposed site area ;

(b) collect and document information on any pre-historical, historical and instrumentally recorded earthquakes in the region ;

(c) to the greatest possible extent, use the information referred to in paragraph (b) of this regulation to ensure that any hazard associated with earthquakes is determined by means of seismotectonic evaluation of the region ;

(d) assess the site for any hazard caused by earthquake induced ground motion and consider the seismotectonic characteristics of the region and specific site conditions ; and

(e) perform an uncertainty analysis as part of the evaluation of seismic hazards.

Required
Investigation
for vibratory
ground
motion.

45. The applicant shall—

(a) conduct the investigations specified in the Third Schedule to these Regulations to obtain information needed to describe the vibratory ground motion produced by the Safe Shutdown Earthquake ; and

(b) use the provisions of the Fourth Schedule to determine which faults may be significant to determine the Safe Shutdown Earthquake.

Surface
faulting.

46. The applicant shall—

(a) use detailed methods and investigations to assess the potential for surface faulting for the site ;

(b) consider a fault capable if on the basis of geological, geophysical, geodetic or seismological data, any of the following conditions apply—

(i) it shows evidence of past movement or movements, significant deformations or dislocations, of a recurring nature within such a period that it is reasonable to infer that further movements at or near the surface could occur,

(ii) a structural relationship with a known capable fault has been demonstrated such that movement of the one may cause movement of the other at or near the surface, and

(iii) the maximum potential earthquake associated with a seismogenic structure is sufficiently large and at such a depth that it is reasonable to infer that, in the geodynamic setting of the site, movement at or near the surface could occur ; and

(c) consider an alternative site, where a capable fault that has the potential to affect the safety of the nuclear power plant exists.

Instrumenta-
tion and
monitoring.

47.—(1) The applicant shall—

(a) use solid-state digital instrumentation that will enable the processing of data at the power plant site within 4 hours of the seismic event ; and

(b) install a triaxial time-history accelerometer or seismometer permanently at the site throughout the life-time of the power plant at the following locations—

(i) free-field,

- (ii) containment foundation,
- (iii) two elevations, excluding the foundation, on a structure within the containment,
- (iv) an independent Seismic Category I structure foundation where the response is different from that of the containment structure, and
- (v) an elevation, excluding the foundation, on the independent Seismic Category I structure.

(2) The nuclear power plant designer shall determine the locations referred to in sub-regulation (1) of this regulation in order to obtain the most pertinent information consistent with maintaining occupational radiation exposures ALARA for the location, power plant, and maintenance of seismic instrumentation.

(3) The applicant shall install a local seismological network which shall be connected to the national seismological network in the site area of the power plant.

(4) The applicant shall ensure that—

(a) the seismic instrumentation system is operable and operated at all times ;

(b) the seismic instrumentation system operates during all modes of plant operation, including periods of plant shutdown ; and

(c) the maintenance and repair procedures provide for keeping the maximum number of instruments in service during plant operation and shutdown.

(5) The applicant shall install seismographic instruments and collect data 2 years before the final site selection to confirm low seismic activity of the selected site and surrounding areas.

PART VII—METEOROLOGICAL EVENTS

48. The applicant shall investigate the—

(a) extreme values of meteorological variables and rare meteorological phenomena for the site of any nuclear power plant ; and

(b) meteorological and climatological characteristics for the region around the site.

Investigation
of meteorological
events.

49.—(1) The applicant shall—

(a) in order to evaluate their possible extreme values, document the following meteorological phenomena—

- (i) wind,
- (ii) precipitation,
- (iii) snow,
- (iv) temperature,
- (v) storm surges,
- (vi) squall,

Extreme
values of
meteorological
phenomena.

- (vii) hail, and
- (viii) dust or sand storms ;

(b) use data that has been collected continuously for a minimum thirty years from the nearest meteorological observation station to evaluate any long term meteorological phenomena and any variations in it ;

(c) observe on site meteorological data continuously for a minimum of two years at each of the candidate sites ; and

(d) describe the output of the site evaluation in a way that is suitable for design purposes for the power plant and consider uncertainties in this evaluation.

Lightning.

50. The applicant shall—

(a) evaluate the potential for the occurrence, frequency, and severity of lightning for the site ; and

(b) provide Isokeraunic maps and data for the region.

Tornadoes.

51. The applicant shall—

(a) on the basis of detailed historical and instrumentally recorded data for the region, assess the potential for the occurrence of tornadoes in the region of interest ;

(b) ensure that any hazard associated with tornadoes is derived and expressed in terms of—

- (i) rotational wind speed,
- (ii) translational wind speed,
- (iii) radius of maximum rotational wind speed,
- (iv) pressure differentials, and
- (v) rate of change of pressure parameters ; and

(c) consider the assessment of the hazard and missiles that could be associated with tornadoes.

Tropical cyclones.

52. The applicant shall—

(a) evaluate the potential for a tropical cyclone in the region of the site and where this evaluation shows that there is evidence of a tropical cyclone or a potential for tropical cyclone, the applicant shall collect related data ;

(b) on the basis of the available data and the appropriate physical models, determine any hazard associated with tropical cyclones in relation to the site ; and

(c) in the assessment of any hazard of a tropical cyclone, consider missiles that may be associated with it.

53. The applicant shall—

Data for
design
purposes.

(a) collect the following data on storm parameters for tropical cyclones—

- (i) minimum central pressure,
- (ii) maximum wind speed,
- (iii) horizontal surface wind profile,
- (iv) shape and size of the eye,
- (v) vertical temperature and humidity profiles within the eye,
- (vi) characteristics of the tropopause over the eye,
- (vii) positions of the tropical cyclone at regular, preferably six hourly, intervals, and
- (viii) sea surface temperature;

(b) specify the maximum credible wind speed referred to in paragraph (a) of this regulation at the site ; and

(c) during the lifetime of the nuclear power plant, assess the possible effects of climate evolution and its consequences in relation to the hazards.

54. The applicant shall assess and evaluate any site located in desert areas for the accumulation of any hazard associated with sand dunes.

Sand dunes.

55. The applicant shall—

Flooding.

(a) conduct an investigation to identify any site vulnerable to—

- (i) coastal flooding, and
- (ii) river flooding ;

(b) evaluate the potential for flooding during the—

- (i) regional analysis of the site selection phase for a nuclear power plant,
- (ii) development project, and
- (iii) site assessment phase ; and

(c) document every preliminary assessment to demonstrate that the—

- (i) plant would not be affected by any potential flooding, or
- (ii) potential for flooding is insignificant and has a negligible effect on safety.

56. The applicant shall—

Floods due
to
precipitation
and other
causes.

(a) assess the region to determine the potential for flooding due to—

- (i) precipitation or snow melt,
- (ii) high tide,
- (iii) storm surge,
- (iv) seiche, or
- (v) wind waves

that may affect the safety of the nuclear power plant and where there is a potential for flooding, the applicant shall collect and examine all pertinent data relating to the flood ;

(b) establish a program of hydrological or hydrogeological investigations ;
 (c) develop a suitable meteorological and hydrological model while considering the limits on—

- (i) the accuracy and quantity of the data,
- (ii) the length of the historical period over which the data were accumulated, and
- (iii) all known past changes in relevant characteristics of the region ;
- (d) examine the possible combinations of the effects of several causes;
- (e) assess, for the hazard model, the potential for flooding by a combination of high tide, wind effects on bodies of water and wave actions in coastal sites and sites on estuaries ;
- (f) derive the hazards for the site due to flooding from the model ;
- (g) use the following parameters to characterize any hazard due to flooding—

- (i) the height of the water,
- (ii) the height and period of the waves,
- (iii) the warning time for the flood,
- (iv) the duration of the flood, and
- (v) the flow conditions ;

(h) investigate the potential for instability of any coastal area or river channel due to erosion or sedimentation.

57. The applicant shall—

(a) evaluate the region to determine the potential for tsunamis or seiches which may affect the safety of a nuclear power plant on the site ;

(b) collect and evaluate pre-historical and historical data relating to tsunamis or seiches affecting the shore region around the site to determine the relevance and reliability of the data to the evaluation of the site ;

(c) on the basis of the available pre-historical and historical data from the region and comparison with similar regions that have been studied with regard to these phenomena, the frequency of occurrence, magnitude and height of regional tsunamis or seiches shall be estimated and shall be used in determining the hazards associated with tsunamis or seiches, with account taken of any amplification due to the coastal configuration at the site ;

(d) evaluate the potential for tsunamis or seiches to be generated by regional offshore seismic events on the basis of known seismic records and seismotectonic characteristics by the applicant ; and

(e) derive the hazards associated with tsunamis or seiches from known seismic records and seismotectonic characteristics as well as from physical or analytical modelling which include potential draw-down and run-up that may result in physical effects on the site.

Water waves
induced by
earthquakes
or other
geological
phenomena.

58.—(1) The applicant shall analyse any information relating to upstream water control structures to determine whether the nuclear power plant can withstand the effects resulting from the failure of any of the upstream structures.

Floods and waves caused by failure of water control structures.

(2) Where the nuclear power plant—

(a) can safely withstand the effects of the failure of any of the upstream structures, then the structures shall not be examined any further in this regard ; and

(b) may not be able to safely withstand all the effects of the failure of any of the upstream structures, then the hazards associated with the nuclear power plant shall be assessed including all such effects, otherwise such upstream structures shall be analysed.

(3) Where the temporary blockage of any river upstream or downstream may cause flooding and any associated phenomena at the proposed site, the applicant shall examine the possible ways of water storage.

PART VIII—GEOTECHNICAL HAZARDS

59.—(1) The applicant shall evaluate the site and its vicinity to determine the potential for slope instability that may affect the safety of the nuclear power plant.

Slope instability.

(2) Where the evaluation referred to in sub-regulation (1) of this regulation indicates that there is a possibility of slope instability which may affect the safety of the nuclear power plant, the hazard shall be evaluated by using parameters and values for the site specific ground motion.

60.—(1) The applicant shall—

(a) examine geological maps and other appropriate information for the region for the existence of natural features like caverns, karstic formations and human made features ;

Collapse, subsidence or uplift of the site surface.

(b) evaluate the possibility of the collapse, subsidence or uplift of the site surface ; and

(c) where the evaluation shows that there is a potential for collapse, subsidence or uplift of the surface that could affect the safety of the nuclear power plant, provide practicable engineering solutions.

(2) Where the practicable engineering solutions referred to sub-regulation (1) (c) of this regulation are—

(a) provided by the applicant, the applicant shall use reliable methods of investigation to obtain a detailed description of subsurface conditions ; and

(b) not provided by the applicant, the site shall be deemed unsuitable.

Soil
liquefaction.

61.—(1) The applicant shall—

(a) source and investigate the information on the design profile that is needed to evaluate the liquefaction potential for soils susceptible to liquefaction ; and

(b) evaluate the potential for liquefaction of the subsurface materials of the proposed site using parameters and values for site specific ground motion.

(2) The evaluation referred to in sub-regulation (1) (b) of this regulation shall include the use of any accepted method of soil investigation and any analytical method to determine the hazards.

(3) Where the potential for soil liquefaction is found to be unacceptable, the site shall be deemed unsuitable unless practicable engineering solutions are demonstrated to be available.

Behaviour of
foundation
materials.

62. The applicant shall—

(a) conduct preliminary foundation work for the site ;

(b) investigate the geotechnical characteristics of the subsurface materials, including their uncertainties and determine a soil profile for the site in a form suitable for design purposes ;

(c) assess the stability of the foundation material under static and seismic loading ; and

(d) study the groundwater regime and the chemical properties of the groundwater.

Conditions
for
improvement
of
foundation.

63. The applicant shall—

(a) improve the condition of the foundation where—

(i) the foundation material is not capable of carrying the building loads without unacceptable deformation (settlements),

(ii) there are cavities that can lead to subsidence, or

(iii) there are heterogeneities on the scale of the building size that can lead to tilting or unacceptable differential settlements ;

(b) where the condition of the foundation needs to be improved, perform the following tasks—

(i) determine the existing in-situ profile,

(ii) determine the required profile for foundation material,

(iii) select the particular technology by which improvements in the foundation can be made over excavation and compacted backfill, rock removal, densification by various methods, solidification by cement or permanent dewatering,

(iv) carry out prototype testing programme to verify experimentally the methods proposed to improve the subsurface conditions,

(v) prepare of the specification for field operations after the proposed technology has been verified,

(vi) carry out an investigation to determine whether the specifications were met at the completion of the improvement programme, and

(vii) incorporate of any improvement in foundation material into the design profiles used in the assessments.

64. The applicant shall include the following in a complete analysis of seismic-soil-structure interaction—

Analysis of seismic-soil-structure interaction.

- (a) site response analysis ;
- (b) foundation scattering analysis ;
- (c) foundation impedance analysis ;
- (d) structural modelling ; and
- (e) analysis of the coupled system interaction response.

65. The applicant shall—

Settlement and heaves.

- (a) perform an assessment of settlement under static loads ;
- (b) due to the presence of pipes, conduits and tunnels providing connections between the facilities, investigate the possibility of differential settlements or heaves between the buildings of a nuclear power plant ; and
- (c) estimate the short term and long term settlements occurring during the operating lifetime of the plant.

66. The applicant shall—

Dynamic analysis.

(a) compute time dependence by applying the classical theory of consolidation and any other sophisticated non-linear analysis and in saturated soils, consider the following components—

- (i) settlement without drainage due to shear for fully saturated soils,
- (ii) settlement caused by consolidation, and
- (iii) settlement caused by creep ;

(b) where no structure-soil-structure interaction analysis was carried out—

(i) perform a soil- structure interaction analysis building by building and combine the individual displacements of the building to obtain the dynamic part of the differential displacement ; and

(ii) consider horizontal and vertical components for the purpose of sub-paragraph (i) of this paragraph ; and

(c) assess for soft soil sites, the residual settlement after an earthquake by the best available means.

67. The applicant shall—

Effects of induced vibrations.

(a) design foundations for structures subjected to vibrations or with vibration loads in such a way that vibrations shall not cause excessive settlement ; and

(b) for the purpose of paragraph (a) of this regulation, take precautions to ensure that resonance shall not occur between the frequency of the pulsating load and a critical frequency in the foundation-ground system.

Natural
slopes.

68. The applicant shall—

(a) investigate natural slopes surrounding the nuclear power plant with regard to the safety of the power plant ; and

(b) consider the external effects of earthquakes and heavy rain falls in the safety evaluation for assessing the potential hazards of natural slopes.

Dykes and
dams.

69. The applicant shall—

(a) monitor dams and dykes and permanently carry out maintenance during construction and operation to prevent possible damage such as internal erosion of dykes ; and

(b) monitor permeability throughout the operating lifetime of the plant.

Seawalls,
break waters
and
revetments.

70. The applicant shall ensure that structures are properly designed to prevent soil erosion, flooding and structural failures which may jeopardize the safety of important facilities.

Retaining
walls.

71. The applicant shall—

(a) evaluate active pressures of the earth due to an earthquake by considering an artificial gravity inclined in the unfavourable direction and shall consider the vertical component of the seismic acceleration as acting upward or downward ;

(b) consider the passive pressure of the earth and shall address failure modes that involve sliding surfaces as well as the failure modes that involve the retaining capacity of the wall ; and

(c) ensure that soil behind the foundation shall not be susceptible to liquefaction under SL-2 earthquake conditions.

Embedded
structures.

72. The applicant shall—

(a) consider the possible cracking of concrete and the need to limit the stress in reinforced bars and concrete in the design of the foundation ; and

(b) pay special attention to the design of the construction joints of buildings.

Buried
pipes,
conduits and
tunnels.

73. The applicant shall—

(a) consider the layout of buried pipes or conduits in the site investigation programme ; and

(b) include an assessment of the potential effects of any corrosive environmental agent on the piping material, in the site investigation programme.

PART IX—EXTERNAL HUMAN INDUCED EVENTS

74. The applicant shall—

(a) investigate any external human induced event that may affect safety in the site evaluation stage for every nuclear power plant site ;

(b) examine the region for any facility and human activity that have the potential, under certain conditions, to endanger the nuclear power plant in its lifetime ; and

(c) address public acceptance issues in the site evaluation stage.

Investigation
of external
human
induced
events.

75. The applicant shall—

(a) assess the risk of aircraft accidents on the site, taking into account the characteristics of future air traffic and aircraft ;

(b) where the assessment referred to in paragraph (a) of this regulation shows that there is a potential for an aircraft accident on the site that may affect the safety of the nuclear power plant, assess the hazards ;

(c) ensure that the hazards associated with an aircraft crash to be considered include impact, fire and explosions ; and

(d) where the assessment indicates that the hazards are unacceptable and where no practicable solutions are available, declare the site unsuitable.

Aircraft
accidents.

76. The applicant shall—

(a) identify any activity in the region that involves the handling, processing, transport and storage of chemicals that have a potential for explosion or for the production of gas clouds capable of deflagration or detonation ;

(b) express any hazard associated with chemical explosions in terms of overpressure and toxicity taking into account the effect of distance ; and

(c) declare a site unsuitable where the hazards referred to in paragraph (a) and (b) take place in its vicinity and there are no practicable solutions available.

Chemical
explosions.

77. The applicant shall investigate the region for any power plant—

(a) in which flammable, explosive, asphyxiant, toxic, corrosive or radioactive materials are stored, processed, transported and otherwise dealt with that, if released under normal or accident conditions ; and

(b) that may give rise to missiles of any type,
that may affect the safety of the nuclear power plant.

Investigation
of dangerous
and hazardous
materials
close to
nuclear power
plant site.

78. The applicant shall

(a) evaluate the potential effects of electromagnetic interference, eddy currents in the ground and the clogging of air or water inlets by debris ; and

(b) where the effects referred to in paragraph (a) of this regulation may produce an unacceptable hazard and a practicable solution is not available for it, declare the site unsuitable.

Evaluation
of effects of
electromagnetic
interference
etc.

Identification
of transport
access to the
site.

Future
human
activities.

Identification
of potential
sources of
fire.

Ship
collision.

Atmospheric
dispersion of
radioactive
material.

79. The applicant shall identify—

- (a) any shipping lane near the site ; and
- (b) railway rolling stock and road traffic and their loads for any busy route, junction, marshalling yard and loading area.

80. The applicant shall consider any future human activity currently in the planning stage that may lead to an increased risk of radiological consequences or to any source of interacting events which do not exceed the screening probability level but may grow to reach that level.

81.—(1) The applicant shall—

- (a) survey the site and its surroundings to identify potential sources of fire ;
 - (b) ensure that the area to be examined for the possible occurrence of fires that may affect items important to safety shall have a radius equal to the SDV for this type of hazard ; and
 - (c) pay attention to any source causing possible common mode failures.
- (2) The parameters and properties that define the magnitude of a fire shall be—
- (a) maximum heat flux ;
 - (b) magnitude of hazards from burning fragments and smoke ; and
 - (c) duration of the fire.

82. Where the probability of a ship collision is found to be greater than the SPL, the applicant shall conduct a detailed analysis to assess the consequences of such an impact and the parameters to be analyzed shall include—

- (a) impact velocity ;
- (b) impact area ;
- (c) mass and stiffness of the ship ;
- (d) substances transported ; and
- (e) potential secondary effects such as oil spills and explosions.

**PART X—SITE CHARACTERISTICS AND THE POTENTIAL EFFECTS OF
THE NUCLEAR POWER PLANT IN THE REGION**

83.—(1) The applicant shall—

- (a) develop a meteorological description of the region which shall include—
 - (i) descriptions of the basic meteorological parameters,
 - (ii) regional orography,
 - (iii) wind speed and direction,
 - (iv) air temperature,
 - (v) precipitation,
 - (vi) humidity,
 - (vii) atmospheric stability parameters, and
 - (viii) prolonged inversions ;

(b) prepare and implement a programme for meteorological measurements at or near the site with the use of instruments capable of measuring and recording the main meteorological parameters referred to in paragraph (a) of this sub-regulation at appropriate elevations and locations ;

(c) collect data for at least one year ; and

(d) assess the atmospheric dispersion of radioactive material released on the basis of the data obtained from the investigation of the region using appropriate models.

(2) The models referred to in sub-regulation (1) (d) of this regulation shall include all significant site specific and regional topographic features and characteristics of the nuclear power plant that may affect atmospheric dispersion.

84. The applicant shall—

(a) describe the surface hydrological characteristics of the region which shall include the—

- (i) main characteristics of any natural or artificial water body,
- (ii) major structures for water control,
- (iii) location of any water intake structure, and
- (iv) information on water use in the region ;

(b) investigate and measure the surface hydrology to determine the—

- (i) dilution and dispersion characteristics for any water body,
- (ii) re-concentration ability of sediments and biota, and
- (iii) determination of transfer mechanisms of radionuclides in the hydrosphere and of exposure pathways ; and

(c) assess the potential impact of the contamination of surface water on the population using the collected data and information in a suitable model.

85. The applicant shall—

(a) develop a description of the groundwater hydrology of the region, which shall include—

- (i) descriptions of the main characteristics of the water bearing formations and their interaction with surface waters, and
- (ii) data on uses of groundwater in the region ;

(b) carry out hydrogeological investigations to permit the assessment of radionuclide movement in hydrogeological units and the investigation shall include the—

- (i) investigations of the migration and retention characteristics of the soils,
- (ii) dilution and dispersion characteristics of the aquifers, and
- (iii) physical and physicochemical properties of underground materials, mainly related to transfer mechanisms of radionuclides in groundwater and their exposure pathways; and

Dispersion
of
radioactive
material
through
surface
water.

Dispersion
of
radioactive
material
through
groundwater.

- (c) assess the potential impact of the contamination of groundwater on the population by using the data and information collected in a suitable model.

PART XI—OTHER IMPORTANT CONSIDERATIONS

86. The applicant shall—

- (a) collect and assess historical data concerning any phenomenon that may adversely affect the safety of the nuclear power plant ; and

- (b) where it is confirmed that any of the phenomena referred to in

paragraph (a) of this regulation may occur, assess and provide design

bases for the phenomenon.

87.—(1) The applicant shall—

- (a) in the design of systems for long term heat removal from the core, consider the following site related parameters—

- (i) air temperature and humidity,
- (ii) water temperatures, and
- (iii) available flow of water, minimum water level and the period of time for which safety related sources of cooling water are at a minimum level, with account taken of the potential for failure of water control structures ; and

- (b) identify any potential natural and human induced event that may cause a loss of function of systems required for the long term removal of heat from the core and where the probability and consequence of the event cannot be reduced to acceptable levels, the hazards for the nuclear power plant associated with such events shall be established.

- (2) The Authority shall, where any of the hazards referred to in this regulation are at an unacceptable level and there is no practicable solution for it, declare the site unsuitable.

88. The applicant shall—

- (a) determine the distribution of the population within the region of the location of the nuclear power plant ;

- (b) collect and keep up to date, over the lifetime of the nuclear power plant, information on existing and projected population distributions in the region, including resident populations and transient populations ;

- (c) pay attention to—

- (i) the population living in the immediate vicinity of the nuclear power plant,
- (ii) densely populated areas and population centres in the region, and
- (iii) residential institutions ;

Historical
data
concerning
adverse
weather
phenomenon.

Long term
heat removal
from core.

Population
distribution.

(d) use the most recent census data for the region, or information obtained by extrapolation of the most recent census data to obtain the population distribution, or carry out a special study ; and

(e) analyze the census data referred to in this regulation to give the population distribution in terms of the direction and distance from the power plant and evaluate the potential radiological impacts of normal discharges and accidental releases of radioactive material, including reasonable consideration of releases due to severe accidents.

89.—(1) The applicant shall specify the use of land and water in the region to assess the potential effects of the nuclear power plant for the purpose of preparing emergency preparedness and response plans.

Uses of land and water in the region.

(2) For the purpose of sub-regulation (1) of this regulation, the applicant shall include land and water bodies that may be used by the population or may serve as a habitat for organisms in the food chain.

90. The applicant shall—

(a) before commissioning of the nuclear power plant, assess the ambient radioactivity of the atmosphere, hydrosphere, lithosphere and biota to determine the effects of the power plant ; and

Ambient radioactivity.

(b) use the data obtained in paragraph (a) of this regulation as a baseline in future investigations.

91.—(1) The applicant shall, during the lifetime of the nuclear power plant, monitor—

Monitoring of hazards.

(a) the characteristics of natural and human induced hazards ;

(b) the demographic, meteorological and hydrological conditions of relevance to the nuclear power plant ; and

(c) any hazard or condition considered in these Regulations which is pertinent to the licensing and safe operation of the nuclear power plant.

(2) The monitoring referred to in sub-regulation (1) of this regulation shall be carried out from the start of construction of the power plant up to decommissioning.

PART XII—QUALITY ASSURANCE FOR SAFETY IN SITING NUCLEAR POWER PLANTS

92. The applicant shall—

(a) establish a quality assurance programme (QA) as part of the management programme for every nuclear power plant installation stage ; and

(b) consider the requirements and needs of the QA programme for a particular stage during the stage preceding it so that they are fully established prior to the commencement of the stage.

Quality assurance programme.

Quality
assurance
programme
on
management
activities.

93. The applicant—

- (a) shall define the procedure for controlling any siting activities;
- (b) shall review and approve the procedure referred to in paragraph (a) of this regulation before issuance and ensure that any subsequent amendment to the procedure is controlled ; and
- (c) may delegate or request suppliers or other organizational units to develop and implement all or part of the QA programme, but shall retain overall responsibility for its implementation and effectiveness.

Grading.

94.—(1) The applicant shall—

- (a) ensure that nuclear safety shall be the fundamental consideration in the identification of the items, services and processes to which the QA programme applies ; and
- (b) use a graded approach based on the relative importance to nuclear safety of each item, service or process and the graded approach shall reflect a planned and recognized difference in the applications of specific QA requirements.

(2) The graded approach referred to in sub-regulation (1) (b) of this regulation shall consider the—

- (a) intended end use of the knowledge and data that results from siting activities, particularly in terms of their effect on nuclear safety ;
- (b) ability to demonstrate, test or repeat results ;
- (c) scale and technical complexity of the siting activity and if a new or proven concept or model is being applied, or an extension of a new application ;
- (d) managerial complexity of the activity, the involvement and coordination of multiple disciplines, work units or internal and external organizations, with divided or contingent objectives and responsibilities ;
- (e) extent to which other siting work, or later work depends on the results of the siting activities ; and
- (f) expectations or desired use or application of the results.

Project
manager for
siting.

95. The applicant shall—

- (a) appoint a project manager for siting who shall be responsible for siting activities and shall be the head of the siting organization ; and
- (b) ensure that the project manager for siting has the necessary resources within the siting organization to—
 - (i) implement an effective QA programme,
 - (ii) ensure that siting work is carried out in accordance with requirements, procedures and instructions, including the implementation of specified requirements, and

(iii) ensure that any siting work undertaken, including work by service organizations, is done in accordance with planned programmes of work.

96. The applicant shall—

Interfaces.

(a) develop an organizational chart showing the parties involved, the interfaces between them and the lines of reporting and communication ;

(b) ensure that interface arrangements are agreed upon with other organizational units performing the work which shall be defined in writing and shall be included in procurement documents where appropriate indicating—

- (i) the responsible organization,
- (ii) consultants and various specialists,
- (iii) laboratories,
- (iv) the principal designer,
- (v) the regulatory body, and
- (vi) local authorities.

97. The applicant shall ensure that personnel are well trained and qualified to perform their assigned work and understand the safety consequences of their activities.

Training and qualification.

98.—(1) The applicant shall—

Planning.

(a) plan and coordinate siting activities and define the—

(i) siting activities to be performed in manageable units (work breakdown structure),

(ii) planned sequential order and duration of the siting activities, and

(iii) resource allocation for each activity ;

(b) when planning any siting activity, consider the requirements for studies, evaluations and analyses relative to site survey, site evaluation and site confirmation, and their safety importance for—

(i) the identification, preparation and control of procedures and work instructions,

(ii) special equipment, software or materials, and

(iii) competent personnel.

(2) The supplier shall—

(a) produce detailed work plans that it will be carrying out ; and

(b) obtain the siting organization's approval of the work plans where necessary.

99. The applicant shall—

Non-conformance control and corrective actions.

(a) establish a non-conformance control and corrective actions process that defines how the following are to be dealt with—

(i) errors in data, data collection, recording or reporting, calculations, reasoning, assumption and conclusions, and software coding and measuring, and

- (ii) non-conformance with procedures and specifications ; and
- (b) make available procedures and specifications before the start of work on the gathering and analysis of data.

Document control and records.

100. The applicant shall—

- (a) establish the procedure for the preparation, review, approval, issuance, modification and control of documents ;
- (b) establish a records system which shall include the arrangements and responsibilities for the categorization, receipt, indexing, storage, retrieval and disposal of siting records ;
- (c) prepare and retain sufficient records during siting work to enable the process to be repeated if necessary and the records shall support final conclusions and permit tracing of results to source data and information ;
- (d) identify permanent records for siting activities ; and
- (e) ensure that all records and data prepared pursuant to paragraph (c) and (d) of this regulation are retrievable and protected from loss or damage.

Provision of a suitable working environment.

101. The applicant shall provide and maintain a suitable working environment so that personnel can work safely and satisfactorily without having unnecessary physical and psychological stress.

Sources of data.

102. The applicant shall specify the data to be collected during site survey, site evaluation and site confirmation.

Data format.

103. The applicant shall—

- (a) decide the format and standards to be used for collecting, classifying and presenting the data ;
- (b) document the decisions referred to in paragraph (a) of this regulation ; and
- (c) ensure that tests, samples and field data are identifiable in field logs and in other relevant reports and the work project number, sample number and type, and the location and date of sampling shall be included.

Measuring and testing equipment.

104. The applicant shall use measuring and test equipment approved by the authority for siting activities, data collection, inspections and tests.

Verification.

105.—(1) The applicant shall ensure that work performed during siting shall be verified and the type and extent of verification activity shall be specified.

(2) The verification planning shall identify the activity to be verified and shall include the—

- (a) extent of verification ;
- (b) verifier, which may be a peer, a review committee or a third party ;
- (c) method of verification and the reporting requirements ; and
- (d) point in the work cycle where the verification is to be performed.

(3) The applicant shall review the documents which form part of, or support, siting decisions to confirm that they are correct, satisfactory, and complete as to assumptions, support data and conclusions.

(4) The applicant shall—

(a) verify calculations by alternative analyses and the analyses, assumptions, initial conditions, boundary conditions and results documented ; and

(b) specify appropriate verifications for field and laboratory activities.

106. The applicant shall—

Work
Planning.

(a) ensure that siting activities are organized and performed in such a way that relevant information will be found, collected and scrutinized ;

(b) plan any siting activity to ensure that—

(i) data are adequate and are recorded correctly,

(ii) analytical techniques, equipment and instructions are used correctly,

(iii) data are correctly interpreted,

(iv) computer programs are adequate and are used correctly,

(v) samples are collected, handled, shipped and stored properly,

(vi) samples are correctly and adequately identified, and

(vii) technicians and operators of instruments or equipment are adequately trained ; and

(c) ensure that the test programme documents include—

(i) the tests or experiments to be performed and their general sequence,

(ii) the objectives of the tests or experiments,

(iii) the testing criteria, and

(iv) the reporting requirements.

107. The applicant shall ensure that—

Procurement.

(a) procured services meet established requirements ;

(b) procurement activities conform to the regulatory requirements and as applicable, to the provisions of recognized codes, standards and specifications used in the design, manufacture, power plant and operation of items and services ;

(c) nuclear safety shall be the fundamental consideration in the identification of the items, services and processes to which the QA programme applies ;

(d) a graded approach based on the relative importance to nuclear safety of each item, service or process is used ; and

(e) the graded approach is applied throughout the supply chain

Work
control.

108. The applicant shall—

(a) control siting activities, including those associated with compiling, gathering and analyzing the data and reporting conclusions and recommendations to ensure the results and the supporting documents such as maps, drawings, photographs, calculations, field notes and historical information are traceable to their source ;

(b) ensure that any document containing data which have been interpreted, analyzed or validated, experimental results, results from field measurements or tests, and any other formal document which is produced during the data gathering and data analyses is independently reviewed and checked ; and

(c) adequately document conclusions to permit traceability to original input requirements, and to make it possible to study information, experimental data, field measurements, and models and their interpretation.

Computer
modelling.

109. The applicant shall—

(a) apply the QA programme to the design, testing, application and change control of any quantitative model used in siting ;

(b) develop the model referred to in paragraph (a) of this regulation in accordance with technically sound methods and practices and shall accurately reflect the acquired data and appropriately represent the system or subsystems ;

(c) protect the data used for developing the models against loss, theft, damage or destruction, and shall be traceable to their source ; and

(d) perform a sensitivity analysis to assess the potential uncertainties resulting from the use of the model.

Physical
models.

110. The applicant shall—

(a) use mainly physical laboratory models to test hydrodynamic and aerodynamic processes and the models shall be validated and justified ; and

(b) determine and specify the limitations of the model referred to in paragraph (a) of this regulation.

Collection
of data.

111.—(1) The applicant shall acquire data according to the appropriate methods and practices, to ensure that they are protected against loss, damage or destruction, traceable to source and readily retrievable.

(2) The availability, precision, nature and scope of data to be collected by the applicant shall be compatible with the methods and models in which they will be used.

Reviewing
data,
calculations
and results.

112.—(1) The applicant shall—

(a) check the collected data—

(i) for accuracy, applicability and completeness, and

(ii) to ensure that the data have been accurately transcribed ; and

(b) ensure that critical reviews of reports, analyses, calculations and other output documents are carried out by a review committee.

(2) The review committee shall—

(a) comprise—

(i) persons who were not involved in performing the work, and

(ii) the project manager for siting and specialists in the discipline to be reviewed ; and

(b) submit its report to the applicant.

113.—(1) Data, analyses, calculations, tests and reviews, proposals, recommendations, conclusions and decisions regarding siting shall be recorded to allow for evaluation.

Output
documenta-
tion and
reporting.

(2) Where all the information necessary to finalize conclusions is not available, such limitations shall be identified by the applicant.

(3) The applicant shall ensure that output documents discuss the identified input requirements.

(4) The applicant shall ensure that reports describing the intermediate and final results in different areas of investigation, and an analysis of them, are prepared and transmitted to the appropriate management.

(5) The reports referred to in sub-regulation (4) of this regulation shall describe—

(a) the relationship of the results to previously known information, tests or theories ;

(b) a description of the data gathering activities ;

(c) a description of significant problems that occurred during data gathering activities ;

(d) studies, analyses and testing ; and

(e) a summary of the work, including considerations, conclusions and recommendations.

(6) Field reports shall cover all results and observations and shall include—

(a) the applicable procedure or instruction used ;

(b) all pertinent data and notes ;

(c) data, results and observations in the form specified (for example tables, curves, narrative) ; and

(d) discussions of significant conditions encountered, errors introduced and the accuracy of results.

(7) Laboratory reports shall also include the identification of activity or test done, equipment used, sample tested, date of the test, and procedure used.

Site survey.

114. The applicant shall—

(a) carry out a site survey to identify any site that may be suitable for detailed characterization in the siting process ; and

(b) ensure that prior to the site survey referred to in paragraph (a) of this regulation, a preliminary report is written, reviewed and approved and the report shall be used by the survey team members as a reference for writing each individual interim report at the completion of each phase.

Survey plan.

115. The applicant shall develop a site survey plan which shall include—

(a) the procedure to be used for the site survey and the proposed separation into phases, for example regional analysis, screening, comparison and ranking ;

(b) the site characteristics to be considered ;

(c) the type and degree of comprehensiveness of the data required ;

(d) all possible sources of required data ;

(e) the parallel or serial approach to be used for collecting data ;

(f) provisions for checking and reviewing results and calculations ;

(g) provisions for collecting information from sources known only to local experts ;

(h) the identification and description of the tasks to be performed ;

(i) diagrams showing the sequence of the various tasks, the methods and criteria to be used for performing regional analyses and for screening, comparison and ranking ;

(j) an outline of procedures for applying these criteria and a list of sources of information needed for their application ; and

(k) key events and requirements for interim reporting after each identified phase.

Final survey report.

116.—(1) The applicant shall ensure that the final survey report is comprehensive and clear as to its intent and conclusions.

(2) The final survey report shall contain—

(a) the complete results and analysis ;

(b) a clear presentation of the data, the procedures and considerations and recommendations ;

(c) limitations or uncertainties of the data, analyses, computer programs and procedures ;

(d) a complete description of the region studied ;

(e) a comparison of the sites investigated ;

(f) the reasons for rejecting unacceptable sites ; and

(g) the preferred candidate sites.

117. The applicant shall ensure that—

- (a) during the site evaluation, any site selected during the survey phase is studied in sufficient detail ;
- (b) during the site confirmation the characteristics of the site chosen shall be completed and monitored ; and
- (c) the collection of data shall continue throughout the construction stage and shall be required during operation.

Site
evaluation
and
confirmation.

118. The applicant shall—

- (a) check the survey activities conducted during the work to ensure satisfactory performance and maintain the records of the survey activities ;
- (b) record and report unusual circumstances when encountered ;
- (c) specify and conduct adequate checks while the work is in progress to ensure that work is performed according to requirements ; and
- (d) implement controls during the fieldwork to ensure that the—
 - (i) location of a measurement or of an item such as a geological feature is accurately recorded,
 - (ii) type and number of borings, excavations, geophysical and geological surveys, and samplings of soil, rock ground, water and air are identified,
 - (iii) proper sample handling, storage and shipping methods are used to prevent disturbance or changes in properties or in data, and
 - (iv) preservation of sample integrity and identification are maintained during laboratory work.

Field and
laboratory
work.

119.—(1) The applicant shall—

- (a) develop performance indicators to measure whether performance is satisfactory or not, with particular emphasis on safety ; and
- (b) ensure that the manager and any personnel performing assessment activities have the appropriate qualification, training and experience.

(2) An independent assessment shall be conducted.

Assessment.

120.—(1) The assessment unit shall establish a system for internal audits with the approval of the management of the organization.

Internal
Audits.

(2) The applicant shall ensure the assessment unit establishes the system for internal audits.

121. The assessment unit shall manage the external audits of suppliers for management.

External
Audits.

122. The applicant shall establish a programme of surveillance of work performance.

Surveillance.

123.—(1) The applicant shall establish a programme of peer evaluation which shall consist of experts in all areas of evaluation.

Peer
evaluation.

(2) The following are to be addressed by independent assessment during siting—

- (a) interfaces ;
- (b) work planning for field activities ;
- (c) methods for handling errors and non-conformances ;
- (d) traceability of data ;
- (e) specifications for data format, work instructions, field samples and output documents ;
- (f) selection and monitoring of special service organizations ; and
- (g) conduct of field and laboratory work.

PART XIII—OFFENCES AND PENALTIES

Offences
and
penalties.

124.—(1) Any person who contravenes the provisions of these Regulations commits an offence and is liable on conviction to the punishment under the Act and any other extant law or guidelines made pursuant to the Act.

(2) Notwithstanding the provisions of subsection (1), the Authority may impose penalties such as administrative fines, suspension, revocation of authorization, sealing of facilities or a combination of these.

PART XIV—MISCELLANEOUS

Interpretation.

125. In these Regulations—

“*absorbed dose*” means the quotient $\frac{dE}{dm}$ (in Gy) where dE is the mean energy imparted by ionizing radiation to matter in a volume element and dm is the mass of matter in the volume element ;

“*accelerometer*” means an instrument that records the acceleration of the ground during an earthquake ;

“*activity*” means the quotient $\frac{dN}{dt}$ (in Bq or Ci) where dN is the expectation value of the number of spontaneous nuclear transformations from the given energy state in the time interval dt ;

“*aggradation*” means a rise in the level of a river channel or flood plain ;

“*ALARA*” means As Low As Reasonably Achievable, social and economic factors taken into cognizance ;

“*applicant*” means any person including their agents who applies to the Authority for authorization to undertake any of the actions covered by the scope of these regulations ;

“*approved*” means approval by the Authority ;

“*authority*” means the Nigerian Nuclear Regulatory Authority established under Section 1 of Act 19 of 1995 ;

“*authorization*” means permission granted in a document by the Authority to a legal person who has submitted an application to carry out a practice

within the scope of these Regulations, which may take the form of a registration or a license ;

"*capable fault*" means a fault that has a significant potential for relative displacement at or near the ground surface ;

"*chronic exposure*" means exposure persisting in time ;

"*collective dose*" means an expression for the total radiation dose incurred by a population, defined as the product of the number of individuals exposed to a source and their average radiation dose (man.Sv) ;

"*decontamination*" means the removal or reduction of contamination by a physical or chemical process ;

"*design basis external events*" means the external event or combination of external events considered in the design basis of all or any part of a facility ;

"*dose limit*" means the value of the effective dose or the equivalent dose to individuals from controlled practices that shall not be exceeded ;

"*dosimeter*" means an instrument used for measuring the absorbed dose of radiation ;

"*employer*" means a legal person with recognized responsibility, commitment and duties towards a worker in his or her employment by virtue of a mutually agreed relationship, and a self-employed person is regarded as being both an employer and a worker ;

"*effective dose*" means the quantity E, defined as a summation of the tissue equivalent doses, each multiplied by the appropriate tissue weighting factor :

$$E = \sum_T W_T H_T$$

where H_T is the equivalent dose in tissue T and w_T is the tissue weighting factor for tissue T. From the definition of equivalent dose, it follows that :

$$E = \sum_T W_T \cdot \sum_R W_R \cdot D_{T,R}$$

where w_R is the radiation weighting factor for radiation R and $D_{T,R}$ the average absorbed dose in the organ or tissue T. The unit of effective dose is J.kg⁻¹, termed the sievert (Sv) ;

"*exclusion area*" means defined as a parcel of land within or surrounding a nuclear facility on which there is no permanent dwelling and over which the licensee has the legal authority to exercise control ;

"*external events*" means events unconnected with the operation of a facility or activity which could have an effect on the safety of the facility or activity ;

"*external zone*" means the area immediately surrounding a proposed site area in which population distribution and density, and land and water uses are considered with respect to their effects on the possible implementation of emergency measures ;

"fault" means a tectonic structure along which differential slippage of the adjacent earth materials has occurred parallel to the fracture plane, which is distinct from other types of ground disruptions such as landslides, fissures, and craters, a fault may have gouge or breccia between its two walls and includes any associated monoclinical flexure or other similar geologic structural feature ;

"fission product release" means for these calculations shall be based upon a major accident, hypothesized for purposes of site analysis or postulated from consideration of possible accidental events that would result in potential hazards not exceeded by those from any accident considered credible. Such accidents have generally been assumed to result in substantial meltdown of the core with subsequent release of appreciable quantities of fission products ;

"hydrologically homogeneous region" means a region for which a hydrological model can be used to transfer hydrological data using the same parameters, systematically varied, as functions of definable space variable characteristics of the region ;

"ionizing radiation" means radiation capable of producing ion pairs in biological materials ;

"interacting event" means an event or a sequence of associated events that, interacting with a facility affect site personnel or items important to safety in a manner which could adversely influence safety ;

"isokeraunic maps and data" means the average annual days with thunderstorm of the world and a ground ; flash density map of five years of data ;

"license" means an authorization granted by the Authority on the basis of a safety assessment and accompanied by specific requirements and conditions to be complied with by the licensee ;

"licensee" means the holder of a current license granted for a site, practice or source who has recognized rights and duties for the practice or source, particularly in relation to protection and safety ;

"limit" means the value of a quantity used in certain specified activities or circumstances that shall not be exceeded ;

"management" means all activities, administrative or operational, that are involved in the manufacture, supply, receipt, storage, use, transfer, import, export, transport, maintenance or disposal of radioactive sources ;

"monitoring" means the measurement of dose or contamination for reasons related to the assessment or control of exposure to radiation or radioactive substances, and the interpretation of the results ;

"NiBIRR" means Nigeria Basic Ionizing Radiation Regulations, 2003 ;

"notification" means a document submitted to the Authority by a legal person to notify an intention to carry out a practice or any other action within the scope of these Regulations ;

"NPP" means an abbreviation for Nuclear Power Plants ;

"occupational exposure" means all exposures of workers incurred in the course of their work, with the exception of exposures from practices or sources exempted by the scope of the Regulations ;

"operating basis earthquake" means that earthquake which—

(i) considering the regional and local geology and seismology and specific characteristics of local subsurface material, could reasonably be expected to affect the plant site during the operating life of the plant, and

(ii) produces the vibratory ground motion for which those features of the nuclear power plant necessary for continued operation without undue risk to the health and safety of the public are designed to remain functional ;

"practicable" means social, technical, economic factors taken into consideration ;

"practice" means any human activity that introduces additional sources of exposure or exposure pathways or extends exposure to additional people or modifies the network of exposure pathways from existing sources, so as to increase the exposure or the likelihood of exposure of people or the number of people exposed ;

"public exposure" means exposure incurred by members of the public from radiation sources, excluding any occupational or medical exposure and the normal local natural background radiation but including exposure from authorized sources and practices and from intervention situations ;

"qualified expert" means an individual who, by virtue of certification by appropriate boards, societies, professional licensees, academic qualifications and experience, duly recognized as having expertise in any specialized field e.g. medical physics, radiation protection, occupational health, fire safety, quality assurance or any relevant engineering or safety specialty ;

"radiation safety officer" means an individual technically competent in radiation protection and safety matters relevant for a given type of practice who is designated by the registrant or licensee to oversee the application of the requirements of these Regulations ;

"radiation source" means anything that may cause radiation exposure, such as by emitting ionizing radiation or releasing radioactive substances or materials, and a complex or multiple power plants situated at one location or site may, as appropriate, be considered a single source for the purposes of application of these Regulations ;

"radioactive substances" means substances that emit ionizing radiation ;

"radioactive waste" means a material, whatever its physical form, remaining from practices or interventions and for which no further use is foreseen—

(i) that contains or is contaminated with radioactive substances and has an activity or activity concentration higher than the level from regulatory requirements, and

(ii) exposure to which is not excluded from these Regulations ;

"*region*" means a specific area to be studied ;

"*regulatory control*" means any form of control applied to facilities or activities by the Authority for reasons related to radiation protection, safety and security of radioactive sources ;

"*response spectrum*" means a plot of the maximum responses (acceleration, velocity or displacement) of a family of idealized single-degree-of-freedom damped oscillators against natural frequencies (or periods) of the oscillators to a specified vibratory motion input at their supports ;

"*risk*" means a multi-attribute quantity expressing hazard, danger or chance of harmful or injurious consequences associated with actual or potential exposures which relates to quantities such as the probability that specific deleterious consequences may arise and the magnitude and character of such consequences ;

"*safe shutdown earthquake*" means an earthquake which is based upon an evaluation of the maximum earthquake potential considering the regional and local geology and seismology and specific characteristics of local subsurface material. It is that earthquake which produces the maximum vibratory ground motion for which certain structures, systems and components are designed to remain functional ;

"*safety*" means any measures intended to minimize the likelihood of accidents with radiation sources and, where such an accident occur, to mitigate its consequences ;

"*screening distance value (SDV)*" means the distance from a facility beyond which, for screening purposes, potential sources of a particular external event can be ignored ;

"*screening probability level (SPL)*" means a value of the annual probability of occurrence of a particular type of event below which, for screening purposes, such an event can be ignored ;

"*seiche*" means the sloshing of a closed body of water from earthquake shaking ;

"*seismogenic structures*" means structures that display earthquake activity or manifest historical surface rupture or effects of palaeoseismicity, and they are considered likely to generate macro-earthquakes within a period of concern ;

"*seismometer*" means an instrument to detect and record earthquakes ;

"*site*" means the area within the exclusion zone where the NPP and all associated support structures and systems are located ;

"*site area*" means a geographical area that contains an authorized facility, and within which the management of the authorized facility may directly initiate emergency actions ;

"*site evaluation*" means the analysis of the sources of external events for a site that could give rise to hazards with potential consequences for the safety of a nuclear power plant constructed on that site ;

"site personnel" means all persons working in the site area of an authorized facility, either permanently or temporarily ;

"siting" means the process of selecting a suitable site for a facility, including appropriate assessment and definition of the related design bases ;

"supplier" means any legal person to whom a registrant or licensee delegates duties, totally or partially, in relation to the design, manufacture, production or construction of a source and an importer of a source is considered a supplier of the source ;

"surface faulting" means differential ground displacement at or near the surface caused directly by fault movement and is distinct from non-tectonic types of ground disruptions, such as landslides, fissures, and craters ;

"surges" means storm surge is the onshore gush of water associated with a low pressure weather system such as coastal rise in water level caused by wind ;

"stakeholders" means a person, group, organization, or system who affects or can be affected by Authority's actions pursuant to these Regulations ;

"tectonic structure" means a large scale dislocation or distortion within the earth's crust, which extent is measured in miles—

(i) the capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures,

(ii) the capability to shut down the reactor and maintain it in a safe shutdown condition, or

(iii) the integrity of the reactor coolant pressure boundary ;

"time history" means the sequence of values of any time-varying quantity (such as a ground motion measurement) measured at a set of fixed times, also known as time series ;

"tsunami" means a sea wave of local or distant origin that results from large-scale seafloor displacements associated with large earthquakes, major submarine slides, or exploding volcanic islands ;

"turbidites" means sea-bottom deposits formed by massive slope failures where rivers have deposited large deltas, these slopes fail in response to earthquake shaking or excessive sedimentation load ;

"whole body dose of 250 mSv" means the dose which corresponds numerically to the once in a lifetime accidental or emergency dose for radiation workers, and neither its use nor that of the 3000 mSv value for thyroid exposure as set forth in these Regulations are intended to imply that these numbers constitute acceptable limits for emergency doses to the public under accident conditions ; but this 250 mSv whole body value and the 3000 mSv thyroid value have been set forth as reference values, which can be used in the evaluation of nuclear power plant sites with respect to potential accidents of exceedingly low probability of occurrence, and low risk of public exposure to radiation ; and

"zone requiring detailed faulting investigation" means a zone within which a nuclear power reactor may not be located unless a detailed investigation of the regional and local geologic and seismic characteristics of the site demonstrates that the need to design for surface faulting has been properly determined.

Citation.

126. These Regulations may be cited as the Nigerian Safety Regulations for Licensing of Sites for Nuclear Power Plants, 2021.

FIRST SCHEDULE

(Regulation 5 (2))

Content of Application

The application shall contain all the following information—

(1) Site Safety Analysis Report (SAR), which shall include—

(a) specific number, type, and thermal power level of the facilities, or range of possible facilities, for which the site may be used ;

(b) anticipated maximum levels of radiological and thermal effluents from each facility ;

(c) type of cooling systems, intakes, and outflows that may be associated with each facility ;

(d) boundaries of the site ;

(e) proposed general location of each facility on the site ;

(f) seismic, meteorological, hydrologic, and geologic characteristics of the proposed site with proper consideration of the most severe of the natural phenomena that have been historically reported for the site and surrounding area and with sufficient margin for the limited accuracy, quantity, and period of time of gathering the historical data ;

(g) location and description of nearby industrial, military, or transportation facilities and routes ;

(h) existing and projected future population profile of the area surrounding the site ;

(i) description and safety assessment of the site on which a facility is to be located, the assessment shall contain an analysis and evaluation of the major structures, systems, and components of the facility that bear significantly on the acceptability of the site under the radiological consequence evaluation factors ;

(j) information demonstrating that site characteristics are such that adequate security plans and measures can be developed ;

(k) the quality assurance or quality control programme for the nuclear power plant ;

(l) complete environmental impact assessment report, environmental management system and land use pattern duly approved by the competent regulatory body or bodies ; and

(m) detailed description of the physical characteristics of the proposed site that could pose a significant barrier to the development of emergency preparedness and response plans.

(2) The SAR shall also include—

(a) emergency preparedness and response plans stating its proposed major features for review and approval by the Authority in consultation with the Nuclear Security Committee (NSC) and the Nuclear Emergency Committee (NEC) ;

(b) emergency preparedness and response plans submitted under sub paragraph (a) of this paragraph shall include the proposed inspections, tests, and analyses that the applicant shall perform, and the acceptance criteria that are necessary and sufficient to provide reasonable assurance that, if the inspections, tests, and analyses are performed and the acceptance criteria met, the facility when constructed shall be operated in conformity with the emergency preparedness and response plans, the provisions of the Act, and the Authority's regulations ;

(c) description of contacts and arrangements made with Federal, State, and Local governmental agencies with emergency planning responsibilities ;

(d) any certifications that have been obtained ;

(e) where these certifications cannot be obtained, the site SAR shall contain information, including a utility plan, sufficient to show that the proposed plans provide reasonable assurance that adequate protective measures can and will be taken in the event of a radiological emergency at the site ; and

(f) under the option provided in this sub paragraph, the applicant shall submit a written commitment to the Authority from the governmental agencies that—

(i) the proposed emergency preparedness and response plans are practicable,

(ii) these agencies are committed to participating in any further development of the plans, including any required field drills, and

(iii) that these agencies are committed to executing their responsibilities under the plans in the event of an emergency.

SECOND SCHEDULE

(Regulation 43)

SCALE OF INVESTIGATION

1. Regional investigations

Regional investigations which shall provide general knowledge on the geodynamic setting of the region which identifies and characterizes those geological features that may influence or relate to the seismic hazard at the site and this investigation shall cover a radial extent not less than 300km.

2. Near Regional investigations

These shall be used to determine the latest movements of faults and for the faults of importance for seismic hazard assessment, the amount and nature of displacements, rates of activity and evidence of segmentation. The investigation shall cover a geographical area with radial extent of not less than 25km.

3. Site Vicinity investigations

These investigations shall be employed to define in greater detail the neotectonic history of faults, especially in determining the potential for surface faulting at the site and to identify conditions of potential geological instability of the site area. It shall cover a geographical area of not less than 5km in radius.

4. Site area investigations

These investigations shall be employed to obtain detailed knowledge of the potential for permanent ground displacement and to provide information on the dynamical properties of foundation materials to be used in site response analysis. This investigation shall include the entire area covered by the plant, which shall not be less than a square kilometre.

THIRD SCHEDULE

(Regulation 45 (a))

INVESTIGATION ON VIBRATORY GROUND MOTION

The investigations shall include—

(1) determination of the lithologic, stratigraphic, hydrologic, and structural geologic conditions, including the geologic history of the site and the region surrounding it ;

(2) identification and evaluation of tectonic structures underlying the site and the region surrounding the site, whether buried or exposed ;

(3) evaluation of physical evidence concerning the behaviour during prior earthquakes of the surficial geologic materials and the substrata underlying the site from the lithologic, stratigraphic, and structural geologic studies ;

(4) determination of static and dynamic engineering properties of the materials underlying the site ; and

(5) establishment of the Safe Shutdown Earthquake for capable faults within 300 square kilometres of the site which may be of significance as prescribed in the Fourth Schedule to these Regulations.