Forum of Nuclear Regulatory Bodies in Africa

Technical Working Group on Regulatory Infrastructure for Nuclear Power Plants (TWG3-NPP)

Survey on the Status of Regulatory Standards relating to Siting on NPP's

TABLE OF CONTENTS

LIST OF TABLES

1 INTRODUCTION

The Terms of Reference of the TWG3-NPP calls for the convergence on regulatory standards and practices of participating countries. This is being achieved through comparison of regulatory standards and practices of the participating countries and comparing with other international standards and practices such as those prescribed by the IAEA, WENRA, MDEP, USNRC, etc. Surveys in the form of questionnaires are used primarily to solicit the required information from participating countries on various topics relating to the required regulatory infrastructure for Nuclear Power Plants.

2 PURPOSE

The purpose of the questionnaire was to ascertain the current status of the regulatory standards relating to Siting of NPPs in participating countries. This report therefore documents the outcome of the survey and makes recommendations on the way forward.

3 OBJECTIVES

The objectives of the exercise are to:

(i) Determine the status of the regulatory standards for siting NPPs in TWG3 participating countries,
(ii) Provide a guideline/benchmark of what issues should be covered by the legal framework, and
(iii) Provide a guideline/benchmark of what areas and topics should be covered by the respective regulatory requirements and guidance.

The outcome of the exercise will inform members of gaps in the legal and regulatory framework for siting NPPs and could be used as one of the inputs to develop an action plan to close the gaps.

The next set of questionnaires will focus on specific areas and could be used as a basis to develop or review regulatory requirements or fill gaps and to compare regulatory standards to identify areas for convergence.

4 FORMAT OF THE QUESTIONNAIRE

The questionnaire covered the following areas:

	Area	**Question/s**
a)	Regulatory Standards on sitting of NPPs	1 – 32
b)	Population & emergency planning	33-36
c)	External events	37-41
d)	Meteorological events	42-44

5 DEFINITIONS

The following describe the context in which the various terms have been used in the questionnaire:

- Regulatory Standards — This type of Regulatory documents is issued in the form of regulations or decrees considering the respective legal framework of country.
- Requirements — These are regulatory requirements that are developed and issued by Regulatory Bodies and are mandatory and becomes legally binding through the authorisation/licensing process.
- Guidance — Regulatory documents developed to assist authorization holders or/and applicant for authorisations in meeting the regulatory requirements. The Guides provide guidance on how to comply with the Requirements in terms of more detailed actions, conditions or processes. As guidance, the recommended course of action is advisory and hence expressed in the form of 'should' statements

6 RESPONSES TO THE QUESTIONNAIRE

The questionnaire was circulated and completed by Egypt, Niger, Nigeria, Tunisia and South Africa in 2012. The list of countries surveyed was determined using the outcome of the survey on Legal Framework and Safety Standards and Goals performed in 2010.

6.1 Evaluation of responses

The following colour key was used to evaluate the status of regulatory standards on siting of NPP of participating countries.

Criteria	**Colour**
Approved Standard, requirements and/or guidance	Yes
Draft Standard, requirements and/or guidance or being reviewed	Draft
Need identified	Identified
Nothing in place	Nothing

The following sections provide the analyses of the responses received. The responses have been categorised using the above criteria based on the input received. The criteria and colour as described above were used to categorise the responses to the individual questions for each of the responding countries. The outcome of the categorisation process on the status of the Regulatory Standards on Siting of NPP is provided in Table 1.

6.2 Regulatory Standards on Siting of NPP - Response Analysis

Table 1: Regulatory Standards on Siting of NPP - Responses

S/N	QUESTIONS	Country A	Country B	Country C	Country D
1	Do you, and/or another government department, regulate siting of NPPs? If so, please describe key elements of your regulatory framework.	Yes	Yes	*Yes*	Yes
2	Do you, and/or another government department, require any form of environmental assessment as part of site selection or before site preparation can begin?	Yes	Yes	*Yes*	Yes
3	Do you, and/or another government department, need to authorise siting activities? If yes, do plans and guides exist for the regulator to perform a review of the siting applications?	Yes	Yes	Yes	Yes No
4	Is there any requirement to consult the public in the siting process?	Yes	Yes	yes	Yes
5	Is transmission access or adequacy thereof taken into account in the siting process?	Yes	Yes	yes	Yes
6	Do you define, by a licence or otherwise, the activities that are permitted under a siting licence, as opposed to what would be permitted under construction?	NO	yes	Yes	Yes
7	What form of regulatory oversight is performed of site preparation?	NO			Yes
8	Do inspection plans or programmes exist to guide your inspectors? If yes, please describe the key features	NO	yes	No	No
9	To what extent is the impact of the site on the design considered.	NO			Yes
10	Is there regulations (draft or gazetted) on siting requirements for nuclear power plants in the country	DRAFT	Yes	Yes	Yes
11	Do the regulations require that the potential sites are identified and candidate sites are selected on the basis of a set of defined criteria, at a regional scale and with the use of available data	Yes	Yes	Yes	Yes
12	Do the regulations provide criteria for evaluating the acceptability of the sites?	Yes	Yes	Yes	Yes

13	What arrangement has the government made to ensure that potential sites are identified and candidate sites are selected on the basis of these set of defined criteria?	NO			
14	Do the regulations require that the criteria for acceptability of a site and the criteria for comparison of candidate sites cover all aspects relevant to safety, security, emergency preparedness, etc.	Yes	Yes	Yes	
15	Are the expected impacts of the plant on the public and the environment considered, including the consequences of discharges in normal operation and potential radioactive releases resulting from accidents, in the identification and selection of candidate sites?	NO	Yes	Yes	Yes
16	Do the regulations require that the Site characteristics that may affect the safety of the nuclear installation be investigated and assessed?	Yes	Yes	Yes	Yes
	Also is the characteristics of the natural environment in the region that may be affected by potential radiological impacts in operational states and accident conditions considered in this investigated?	Yes	Yes	Yes	Yes
	Do the regulations require that a programme be put in place for the observation and monitoring of these characteristics, (particularly population growth and population distribution) throughout the lifetime of the Installation?	Yes	Yes	Yes	Yes
17	Is the prospective licensee required to examine the proposed sites for nuclear installations with regard to the frequency and severity of external natural, human induced events and phenomena that could affect the safety of the installation	Yes	Yes	Yes	Yes
18	Are the hazards associated with external events required to be considered in the design of the nuclear installation?	Yes	Yes	Yes	Yes
	Do the regulations require that appropriate estimates be made of expected or potential releases of radioactive material, with account taken of the design of the installation and its safety features?	Yes	Yes	Yes	Yes
19	In the analysis to determine the suitability of the site, is it required that consideration be given to additional matters relating to safety such as the storage and transport of input and output materials (uranium ore, UF6, UO2, etc.), fresh and spent fuel and radioactive wastes?	NO	Yes	Yes	Yes
20	Do the regulations require that non-radiological impact of the installation (chemical or thermal releases, and the potential for explosion and the dispersion of chemical products) be taken into account in the site evaluation process	Yes	Yes	Yes	Yes
21	Do the regulations require that the potential for interactions between nuclear and non-nuclear effluents, such as the combination of heat or chemicals with radioactive material in liquid effluents be considered	Yes	Yes	Yes	Yes
22	Do the Regulations require that potential radiological impacts in operational states and in accident conditions on people in the region, including impacts that could lead to emergency measures, be evaluated for the proposed site	Yes	Yes	Yes	Yes
23	Would all the pathways by which radioactive material released from the nuclear installation that could potentially reach and affect people and the environment be identified and evaluated	Yes	Yes	Yes	Yes

24	Do the Regulations require that the site and the design for the nuclear installation be examined in conjunction so as to ensure that the radiological risk to the public and the environment associated with radioactive releases is acceptably low	Yes	Yes	Yes	Yes
25	Do the Regulations require that the total nuclear capacity (for nuclear installation) to be installed on the site be determined as far as possible at the first stages of the siting process	NO	Yes	Yes	Yes
26	Do the Regulations require that provision be made for foreseeable significant changes in land use such as the expansion of existing installations and human activities or the construction of high risk installations	NO	Yes	Yes	Yes
27	Does the Regulations require that possible natural phenomena and human induced situations and activities in the region of a proposed site be identified and evaluated according to their significance for the safe operation of the nuclear installation	Yes	Yes	Yes	Yes
28	Do the Regulations require that 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 been collected for the region and carefully analyzed for reliability, accuracy and completeness	Yes	Yes	Yes	Yes
29	Do the Regulations require that appropriate methods be adopted for establishing the hazards that are associated with major external phenomena	Yes	Yes	Yes	Yes
30	Do the Regulations require that the size of the region to which a method for establishing the hazards associated with major external phenomena be large enough to include all the features and areas that could be of significance in the determination of the natural and human induced phenomena under consideration and for the characteristics of the event?	Yes	Yes	Yes	Yes
31	Do the Regulations require that appropriate parameters be selected or developed and used in describing major natural and human induced phenomena associated with the nuclear installation	Yes	Yes	Yes	Yes
32	Do the Regulations require that site specific data be used in the determination of hazards and;	Yes	Yes	Yes	Yes
	Where such data are unobtainable, is it required that programme be put in place to use data from other regions that are sufficiently relevant to the region of interest	Yes	Yes	Yes	Yes
33	Do the Regulations require that proposed region be studied to evaluate the present and foreseeable future characteristics and the distribution of the population of the region taking into account the present and future uses of land and water in the region	Yes	Yes	Yes	Yes
34	Does the Regulations require that the combined effects of the site and the installation be evaluated for operational states and accident conditions of the installation such that the radiological exposure of the population remains acceptably low	Yes	Yes	Yes	Yes
35	Do the Regulations require that external zone for the proposed site be established with account taken of the potential for radiological consequences for people and the feasibility of implementing emergency plans	Yes	Yes	Yes	Yes

36	Do the regulations require that seismological and geological conditions in the region and the engineering geological aspects and geotechnical aspects of the proposed site area be evaluated?	Yes	Yes	Yes	Yes
37	Do the regulations require that information on pre-historical, historical and instrumentally recorded earthquakes in the region be collected and documented	Yes	Yes	Yes	Yes
38	Do the regulations require that hazards associated with earthquakes be determined by means of seismotectonic evaluation of the region	Yes	Yes	Yes	Yes
39	Do the regulations require that hazards due to earthquake induced ground motion be assessed for the site	Yes	Yes	Yes	Yes
40	Do the regulations require that the potential for surface faulting be assessed for the site	Yes	Yes	Yes	Yes
41	Do the regulations require that historical data concerning phenomena that have the potential to give rise to adverse effects on the safety of the nuclear installation, be collected and assessed and design bases for these events be derived	Yes	Yes	Yes	Yes
43	Do the regulations require that these meteorological phenomena be documented for an appropriate period of time	Yes	Yes	NO	Yes
44	Do the regulations require that the output of the site evaluation be described in a way that is suitable for design purposes for the plant	Yes	Yes	Yes	Yes
45	Do the regulations require that the region be assessed to determine the potential for flooding due to one or more natural causes that may affect the safety of the nuclear installation and; Would it be required that all pertinent data including historical data, both meteorological and hydrological, be collected and critically examined	Yes		Yes	Yes
46	Do the regulations require that suitable meteorological and hydrological model be developed with account taken of the limits on the accuracy and quantity of the data, the length of the historical period over which the data were accumulated, and all known past changes in relevant characteristics of the region and; Would the possible combinations of the effects of several causes be examined and considered in the hazard model	Yes	Yes	Yes	Yes
47	Do the regulations require that the hazards for the site due to flooding be derived from the model and;	Yes	Yes	Yes	Yes
	Is it a requirement that the parameters used to characterize the hazards due to flooding include the height of the water, the height and period of the waves (if relevant), the warning time for the flood, the duration of the flood and the flow conditions	Yes	Yes	Yes	Yes
48	Do the regulations require that potential for instability of the coastal area or river channel due to erosion or sedimentation be investigated	Yes	Yes	Yes	Yes
49	Do the regulations require that the region be evaluated to determine the potential for tsunamis or seiches that could affect the safety of a nuclear installation on the site	Yes	Yes	Yes	Yes
50	Do the regulations require that the frequency of occurrence, magnitude and height of regional tsunamis or	Yes	Yes	Yes	Yes

	seiches be estimated and used in determining the hazards associated with tsunamis or seiches, with account taken of any amplification due to the coastal configuration at the site.				
51	Do the regulations require that the potential for tsunamis or seiches to be generated by regional offshore seismic events be evaluated on the basis of known seismic records and seismo-tectonic characteristics	Yes	Yes	Yes	Yes
52	Do the regulations require that hazards associated with tsunamis or seiches be derived from known seismic records and seismo-tectonic characteristics as well as from physical and/or analytical modelling	Yes	Yes	Yes	Yes
53	Do the regulations require that information relating to upstream water control structures (if any) be analysed to determine whether the nuclear installation would be able to withstand the effects resulting from the failure of one or more of the upstream structures	Yes	Yes	Yes	Yes
54	Do the regulations require that the possibility of storage of water as a result of the temporary blockage of rivers; upstream or downstream at the proposed site be examined	Yes	Yes	Yes	Yes
55	Does the Regulations require that the site and its vicinity be evaluated to determine the potential for slope instability that could affect the safety of the nuclear installation If the potential for slope instability exists, do the Regulations require that the hazard be evaluated by using parameters and values for the site specific ground motion?	Yes	Yes	Yes Yes	Yes
56	Would geological maps and other appropriate information for the region be examined for the existence of natural features and human made features? Is it required that the potential for collapse, subsidence or uplift of the site surface be evaluated?	Yes	Yes yes	Yes Yes	Yes
57	Is the potential for liquefaction of the subsurface materials of the proposed site required to be evaluated by using parameters and values for the site specific ground motion?	Yes	yes	Yes	Yes
58	Is the geotechnical characteristics of the subsurface materials required to be investigated? Is it a requirement that the stability of the foundation material under static and seismic loading be assessed?	Yes	Yes yes	Yes yes	Yes
59	Is the groundwater regime and the chemical properties of the groundwater required to be studied?	Yes	yes	Yes	Yes
60	Do the regulations require that the potential for aircraft crashes on the site be assessed taking into account the characteristics of future air traffic and aircraft would impact, fire and explosions hazards associated with an aircraft crash be considered also	YES	Yes	Yes	Yes
61	Do the regulations require that all activities in the region that involve the handling, processing, transport and storage of chemicals having a potential for explosions or for the production of gas clouds capable of deflagration or detonation be identified and hazards associated with these activities evaluated	Yes	Yes	Yes	Yes
62	Do the regulations require that the region be investigated for installations (including installations within the	Yes	Yes	Yes	Yes

	site boundary) in which flammable, explosive, asphyxiant, toxic, corrosive or radioactive materials are stored, processed or transported				
63	Do the regulations require that site related parameters be considered in the design of systems for long term heat removal from the core	Yes	Yes	Yes	Yes
64	Do the regulations require that the potential natural and human induced events that could cause a loss of function of systems required for the long term removal of heat from the core be identified	Yes	Yes	Yes	Yes
65	Is programme for meteorological description of the region captured in your regulations	Yes	Yes	Yes	Yes
66	Is the use of appropriate model in the assessment of the atmospheric dispersion of radioactive material released contained the regulations	Yes	Yes	Yes	Yes
67	Do the regulations require that programme of investigation and measurements of the surface hydrology be carried out to determine to the extent necessary the dilution and dispersion characteristics for water bodies, the re-concentration ability of sediments and biota, and the determination of transfer mechanisms of radionuclide in the hydrosphere and of exposure pathways	Yes	Yes	Yes	Yes
68	Do the regulations require that an assessment of the potential impact of the contamination of groundwater on the population be performed by using the data and information collected in a suitable model	Yes	Yes	Yes	Yes
69	In your regulations, does the process for identification and selection of candidate sites take account of factors such as legal aspects, archaeological and historical aspects	Yes	Yes	Yes	Yes
70	Is economics and social developments considered in your regulations	Yes	Yes	Yes	Yes
71	Are land use, energy distribution networks, accessibility and availability of local infrastructure considered in your regulations	Yes	Yes	Yes	Yes
72	Are the issues of public acceptability and proximity to industrial and military installations, considered in your regulations	Yes	Yes	Yes	Yes
73	Has the regulatory body established specific safety requirements for site evaluation, including requirements for the process for authorizing the site selected, in compliance with the relevant IAEA safety standards?	Yes	Yes	Yes	Yes
74	Has the regulatory body developed licensing processes for the siting stage and programme for informing the operating organization about the processes and safety documentations required in support of the licensing process	Yes	Yes	Yes	Yes
75	Do the regulations require a particular site to have a certain number of power reactors and certain capacity	No	Yes	Yes	Yes
76	Do the regulations require the site related design basis parameters be identified by the operating organization on the basis of the characterization of the selected site	Yes	Yes	Yes	Yes
77	Do the regulations require the operating organization continues to implement environmental programme and the site monitoring programme, even after siting process	Yes	Yes	Yes	Yes
78	Do the regulations require that the hydrology of the region be adequately described including the descriptions of the water bearing formations, their interaction with surface waters and data on the uses of	Yes	Yes	Yes	Yes

	groundwater in the region				
79	Do the regulations require that programme for the investigation of the hydro-geological characteristics of the region be developed	Yes	Yes	Yes	Yes
80	Do the regulations require that the assessment of the potential impact of the contamination of groundwater on the population be performed	YES	Yes	Yes	Yes
81	Does the Regulations require that programme for the determination of population distribution within the region be developed	Yes	Yes	Yes	Yes
82	Does the Regulations require that programme be developed for the evaluation of the potential radiological impacts of normal discharges and accidental releases of radioactive material	Yes	Yes	Yes	Yes
83	Does the regulations require that programme for the assessment of the land and water uses be developed	Yes	Yes	Yes	Yes
84	Do the regulations require that the ambient radioactivity of the atmosphere ,hydrosphere, lithosphere and biota in the region be assessed	Yes	Yes	Yes	Yes
85	Do the regulations require that programme for the monitoring of the natural and human induced hazards as well as the demographic, meteorological and hydrological conditions over the lifetime of the installation be developed	Yes	Yes	Yes	Yes
86	Do the Regulatory body ensure that a quality assurance programme for all activities performed in the different stages of the site evaluation be developed	Yes	Yes	Yes	Yes
87	Are results of the activities for site investigation compiled in a report that documents the results of all in situ work, laboratory tests and geotechnical analyses and evaluations? Is this required as part of Quality assurance programme	Yes	Yes	Yes	Yes
88	Are results of studies and investigations expected to be documented in sufficient detail to permit an independent review	Yes	Yes	Yes	Yes
89	Do the regulations require that programme be developed for all activities that may influence safety or the derivation of parameters for the design basis for the site	Yes	Yes	Yes	Yes
90	Do the regulations require that programme be in place for the verification by individuals or groups of site related parameters and analysis which may not lend themselves to direct verification by inspections, tests or other techniques that can be precisely defined and controlled	Yes	Yes	Yes	Yes
91	Do the Regulatory body ensure that a quality assurance programme for all activities performed in the different stages of the site evaluation be developed	Yes	Yes	Yes	Yes
92	Do the regulations require programme for dose assessment for workers, local population (different ages) be developed.		Yes		
93	Do the regulations require off site monitoring regime for radiation levels and alarm system.		Yes		
94	Do the regulations require defining the extent of exclusion area, low population zone, and population centre in relation to population density in each area?		Yes		
95	Do the regulations require method and program for store and retain records of radioactive release routinely in the site.		Yes		

7 CONCLUSION

The survey provided valuable insights on the status of the Siting Standards in the countries that participated in the survey and has identified gaps in the area of siting NPPs. It must be mentioned that the survey only provides an overall picture and do not consider the depth and effectiveness of the established frameworks.

From the survey it is apparent that South Africa, Nigeria and Egypt have, at the time of the survey, relevant standards relating to siting of NPPs either in place or it is in an advance stage of development.

The countries with little to no standards in place should use the outcome of this exercise to put in place an action plan to develop the respective standards. The TWG3 should focus on standards development and include initiatives in this regard in its work programme. The assistance of the IAEA and international partners should be sought to provide training in this regard.