

International Training Course on the IAEA Safety Standards at Tokai University, 11-14 March 2024

### Site Evaluation for Nuclear Installations SSR-1

Kazuyuki Nagasawa Senior Nuclear Safety Officer (Design Safety) External Events Safety Section (EESS), Division of Nuclear Installation Safety (NSNI) Department of Nuclear Safety and Security IAEA

## **Objectives of the presentation**



The objectives of this presentation is to explain the IAEA Specific Safety Requirements No. SSR-1 document, entitled "Site evaluation for nuclear installation".

After the introduction and some background information of site evaluation, the presentation discusses in detail the requirements listed in SSR-1.

Natural hazard and human induced hazard related requirements are described.





## **List of contents**



The structure of IAEA Safety Standards

- 1. Introduction
- 2. Safety principles and concepts
- 3. Application of the management system for site evaluation
- 4. General requirements for site evaluation
- 5. Evaluation of external hazards
- 6. Evaluation of the potential effects of the nuclear installation on the region
- 7. Monitoring and periodic review of the site References





## **1. Introduction** Objectives, Scope

Site Evaluation for Nuclear Installations (SSR-1), External Events Safety Section, NSNI/IAEA, 12 March 2024

## Environmental licensing vs. Site licensing





## **Objectives of site evaluation**



- 1. **Defining the information** to be used in the site evaluation process.
- 2. Evaluating a site such that the site specific hazards and the safety related site characteristics are adequately taken into account, in order to derive appropriate site specific design parameters.
- 3. Analysing the characteristics of the population and the region surrounding the site to determine whether there would be significant difficulties in implementing emergency response actions effectively.
- 4. Identifying the natural and human induced external hazards that could affect the safety of the nuclear installation.
- 5. Assessing the interactions between the site and nuclear installation for operational states and accident conditions, over the lifetime of the nuclear installation.



The Bohunice Nuclear Power Plant in western Slovakia. (Photo: JAVYS/Bohunice) Source: https://www.iaea.org/newscenter/pressreleases/new-iaea-energy-projections-see-possibleshrinking-role-for-nuclear-power

## **Scope of the requirements**

The requirements apply to the following nuclear installations:

- Nuclear power plants
- Research reactors (including subcritical and critical assemblies) and any adjoining radioisotope production facilities
- Storage facilities for spent fuel
- Facilities for the enrichment of uranium
- Nuclear fuel fabrication facilities
- Conversion facilities
- Facilities for the reprocessing of spent fuel
- Facilities for the predisposal management of radioactive waste arising from nuclear fuel cycle facilities
- Nuclear fuel cycle related research and development facilities









#### **The Requirements in SSR-1**



	Requirements
1. Introduction	
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# 2. Safety principles and concepts in SSR-1

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#### Fundamental safety objective and the safety principles



"The fundamental safety objective is to protect people and the environment from harmful effects of ionizing radiation." (IAEA Safety Standards Series No. SF-1) To ensure that facilities are operated and activities conducted so as to achieve the highest standards of safety that can reasonably be achieved, measures have to be taken: (para 2.1 / SF-1)

- To control the radiation exposure of people and the release of radioactive material to the environment
- To restrict the likelihood of events that might lead to a loss of control over a nuclear reactor core, nuclear chain reaction, radioactive source or any other source of radiation
- To mitigate the consequences of such events if they were to occur

#### Safety Standards Fundamental Safety Objective



Source: https://slidetodoc.com/iaea-safety-standards-regional-training-course-orphan-source/

## 2. Safety principles and concepts

The fundamental safety objective applies for all facilities and activities, and for all stages over the lifetime of a facility or radiation source, including planning, siting, design, manufacturing, construction, commissioning and operation, as well as decommissioning and closure. This includes the associated transport of radioactive material and management of radioactive waste. (para 2.2 / SF-1)

- People and the environment, present and future, must be protected against radiation risks. (Principle 7 of SF-1)
- All practical efforts must be made to prevent and mitigate nuclear or radiation accidents. (Principle 8 of SF-1)
- Arrangements must be made for emergency preparedness and response for nuclear or radiation incidents. (Principle 9 of SF-1)





# Requirement 1: Safety objective in site evaluation for nuclear installations



The safety objective in site evaluation for nuclear installations shall be to characterize the natural and human induced external hazards that might affect the safety of the nuclear installation, in order to provide adequate input for demonstration of protection of people and the environment from harmful effects of ionizing radiation.



Source: https://www.tehrantimes.com/news/465998/Natural-disasters-environment-s-fate-or-revenge



# 3. Application of the management system

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#### Requirement 2: Application of the management system for site evaluation



Site evaluation shall be conducted in a comprehensive, systematic, planned and documented manner in accordance with a management system.

3.1. An integrated management system that meets the requirements of IAEA Safety Standards Series **No. GSR Part 2, Leadership and Management for Safety** [12] shall be established.



Source: https://www.iaea.org

- The management system shall cover the organization, planning, work control, verification and documentation of activities and qualification and training of personnel to ensure that the required quality of the work is achieved at each stage of site evaluation.
- The management system shall be implemented at the earliest possible time in the conduct of site evaluation for the nuclear installation.



# 4. General requirements for site evaluation

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### Requirement 3: Scope of the site evaluation for nuclear installations



The scope of the site evaluation shall encompass factors relating to the site and factors relating to the interaction between the site and the installation, for all operational states and accident conditions, including accidents that could warrant emergency response actions.

- 4.3. The level of detailed needed in the evaluation of a site for a nuclear installation shall be **commensurate with the risk associated with the nuclear installation and the site** and will refer depending on the type of nuclear installation.
- 4.4. The scope and level of detail of the site evaluation process necessary to support the safety demonstration for the nuclear installation shall be determined in accordance with a graded approach.



#### **Requirement 4: Site suitability**



The suitability of the site shall be assessed at an early stage of the site evaluation and shall be confirmed for the lifetime of the planned nuclear installation.

4.6 In the assessment of the suitability of a site for a nuclear installation, the following aspects shall be addressed at an early stage of the site evaluation:

- (a) The effects of natural and human induced external events occurring in the region that might affect the site;
- (b) The characteristics of the site and its environment that could influence the transfer of radioactive material released from the nuclear installation to people and to the environment;
- (c) The population density, population distribution and other characteristics of the external zone, in so far as these could affect the feasibility of planning effective emergency response actions, and the need to evaluate the risk to individuals and to the population.



Source: https://www.researchgate.net/figure/Final-site-suitability-map\_fig1\_319634394



Source: https://www.weforum.org/agenda/2018/03/these-are-the-worlds-most-densely-populated-places/

#### **Requirement 4: Site suitability**



4.7. The site shall be deemed unsuitable for a nuclear installation if one or more of the three aspects listed in paragraph 4.6 indicates that the site is unacceptable and the deficiencies cannot be compensated for by means of a combination of measures for

- site protection,
- design features of the nuclear installation and
- administrative procedures.



NPP Mülheim-Kärlich, Germany Source: https://de.wikipedia.org/wiki/Kernkraftwerk\_Mülheim-Kärlich

#### **Requirement 5: Site and regional characteristics**



The site and the region shall be investigated with regard to the characteristics that could affect the safety of the nuclear installation and the potential radiological impact of the nuclear installation on people and the environment.



Three Mile Island Unit 2 near Harrisburg, Pennsylvania Source: https://www.britannica.com/technology/nuclear-reactor/Three-Mile-Island-and-Chernobyl

#### **Requirement 5: Site and regional characteristics**



4.14. **The size of the region** to be investigated shall be defined for each of the natural and human induced external hazards.

- For certain natural external events (e.g., tsunami), the size of the region that is investigated is sufficiently large to address the potential effects at the site.
- 4.15. The site and the region shall be studied to evaluate the **present and foreseeable future characteristics** that could have an impact on the safety of the nuclear installation.



The damages of the Great Tohoku Earthquake, 2011, Japan Source: https://timegoggles.com/archive-topics/photos-anniversary-of-greateast-japan-earthquake

- potential changes in the severity and/or the frequency of natural external events,
- changes in the population distribution in the region,
- the present and future use of land and water,
- the further development of existing nuclear installations or the construction of other facilities.

### **Requirement 6: Identification of site specific hazards**



Potential external hazards associated with natural phenomena, human induced events and human activities that could affect the region shall be identified through a screening process.



https://geodata.lib.ncsu.edu/fedgov/noaa/commvuln/htm/step1.htm

# Requirement 7: Evaluation of natural and human induced external hazards

The impact of natural and human induced external hazards on the safety of the nuclear installation shall be evaluated over the lifetime of the nuclear installation.



4.20. The site evaluation for a nuclear installation shall consider the frequency and severity of natural and human induced external events, and potential combinations of such events, that could affect the safety of the nuclear installation.



Tsunami source frequency distribution in the Pacific Ocean near Japan

#### **Requirement 8: Measures for site protection**



If the projected design of the nuclear installation is not able to safely withstand the impact of natural and human induced external hazards, the need for site protection measures shall be evaluated.



Seawall at the Hamaoka NPS (Japan) https://www.at-s.com/news/article/shizuoka/992478.html

# Requirement 9: Site Evaluation for multiple nuclear installations on the same site or adjacent sites



The site evaluation shall consider the potential for natural and human induced external hazards to affect multiple nuclear installations on the same site as well as on adjacent sites.



Zaporizhzhia nuclear power plant (Ukraine)

https://apnews.com/article/russia-ukraine-science-climate-andenvironment-33d0f2520ef6c2b1d8f5390dbb2c6873

# Requirement 10: Changes of hazards and site characteristics with time



The external hazards and the site characteristics shall be assessed in terms of their **potential for changing over time** and the potential impact of these changes shall be evaluated.





Source: https://www.researchgate.net/figure/The-components-of-risk-along-with-exacerbatingfactors-from-global-change-1-Climate\_fig2\_331090455

# Requirement 11: Special considerations for the ultimate heat sink for nuclear installations that require an ultimate heat sink



The evaluation of site specific natural and human induced external hazards for nuclear installations that require an ultimate heat sink shall consider hazards that could affect the availability and reliability of the ultimate heat sink.



Source: https://www.iaea.org

# Requirement 12: Potential effects of the nuclear installation on people and the environment



In determining the potential radiological impact of the nuclear installation on the region for operational states and accident conditions, including accidents that could warrant emergency response actions, appropriate estimates shall be made of the potential releases of radioactive material, with account taken of the design of the nuclear installation and its safety features.

#### **Emergency Planning Zones**



Note: A 2-mile ring around the plant is identified for evacuation, along with a 5-mile zone downwind of the projected release path.

Source: https://www.nrc.gov/about-nrc/emerg-preparedness/about-emerg-preparedness/planning-zones.html

# Requirement 13: Feasibility of planning effective emergency response actions



The feasibility of planning effective emergency response actions on the site and in the external zone shall be evaluated, with account taken of the characteristics of the site and the external zone as well as any external events that could hinder the establishment of complete emergency arrangements prior to operation.

4.42. An assessment shall be made of the feasibility of planning effective emergency response actions in accordance with GSR Part 7.



Source: https://www.iaea.org/newscenter/news/emergencies-dont-sleep-iaea-and-sweden-test-responsearrangements-to-simulated-nuclear-accident

# Requirement 14: Data collection in site evaluation for nuclear installations



The data necessary to perform an assessment of natural and human induced external hazards and to assess both the impact of the environment on the safety of the nuclear installation and the impact of the nuclear installation on people and the environment shall be collected.



Drawn by J&A Aszódi, 2022, CC BY-SA 4.0



# 5. Evaluation of external hazards

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# Type of hazards

### Internal hazards

- Not discussed in this presentation
- External hazards



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## **Type of external hazards**



# Natural external hazards





### Human induced external hazards





## External hazards

#### Natural hazards

- Geological hazards
  - o Seismic hazards
  - Collapse, subsidence or uplift of the site surface
  - o Soil liquefaction
  - o Volcanic hazards
  - o Slope instability





## External hazards

#### > Natural hazards

- Meteorological hazards
  - o Extreme temperatures
  - Extreme precipitation
  - Extreme straight wind
  - o Lightning
  - Tornadoes and cyclones



## External hazards

#### Natural hazards

- Hydrological hazards
  - Floods due to precipitation and other natural causes
  - Water waves induced by earthquakes or other geological phenomena
  - Floods and waves caused by failure of water control structures





## External hazards

#### > Natural hazards

- **O Other natural hazards** 
  - $\circ$  Wildfires
  - o **Hail**
  - Frazil ice formation
  - o Diversion of a river
  - o Debris avalanche
  - o Biological hazards





# Type of human induced hazards



## External hazards

## > Human induced hazards

- o Fire
- o Explosions
- Releases of hazardous gases from ~
  a nearby facility
- Hazardous materials
- o Aircraft crashes



## **Evaluation of natural hazards**



- Natural hazards
  - Geological hazards
    Seismic hazards
  - Meteorological hazards
  - Hydrological hazards
  - o Other natural hazards
- Human induced hazards



#### Seismic hazards Requirement 15: Evaluation of fault capability



**Geological faults** larger than a certain size and within a certain distance of the site and that are significant to safety shall be evaluated to identify whether these faults are to be considered **capable faults**.

For capable faults, potential challenges to the safety of the nuclear installation in terms of **ground motion** and/or **fault displacement** hazards shall be evaluated.



![](_page_38_Picture_5.jpeg)

Drawn by J&A Aszódi, 2022, CC BY-SA 4.0 (Drawn with inspiration from Zhenming Wang et al, 2017)

![](_page_38_Picture_7.jpeg)

The 2016 Kumamoto Earthquake (Japan) Photo: K.NAGASAWA

#### Seismic hazards Requirement 16: Evaluation of ground motion hazards

![](_page_39_Picture_1.jpeg)

An evaluation of ground motion hazards shall be conducted **to provide the input needed for the seismic design** or safety upgrading of the structures, systems and components of the nuclear installation, as well as the input for performing the deterministic and/or probabilistic safety analyses necessary during the lifetime of the nuclear installation.

5.5. Hazards due to earthquake induced ground motion shall be assessed by means of appropriate methods.

- The effect of the vibratory ground motion in combination with other seismically induced events, if any, shall be considered.
- The potential for **seismicity due to human activities** (such as construction of dams, mining, and operation of oil wells and gas wells) shall also be considered.

# Geological hazards Volcanic hazards

- Meteorological hazards
- Hydrological hazards
- Other natural hazards
- Human induced hazards

Natural hazards

## **Evaluation of natural hazards**

![](_page_40_Picture_7.jpeg)

![](_page_40_Picture_8.jpeg)

#### Volcanic hazards Requirement 17: Evaluation of volcanic hazards

![](_page_41_Picture_1.jpeg)

Hazards due to **volcanic activity** that have the potential to affect the safety of the nuclear installation shall be evaluated

5.7. The hazards of **capable volcanoes** shall be evaluated to provide the input needed for determining **the site specific design parameters** or for re-evaluating the site, as well as for deterministic and/or probabilistic safety analyses performed during the lifetime of the nuclear installation.

![](_page_41_Picture_4.jpeg)

http://www.qsr.mlit.go.jp/unzen/gallery/index.html

## **Evaluation of natural hazards**

![](_page_42_Picture_1.jpeg)

Human induced hazards

#### Natural hazards

- Geological hazards
- Meteorological hazards
- Hydrological hazards
- Other natural hazards

![](_page_42_Figure_8.jpeg)

#### Meteorological hazards Requirement 18: Evaluation of extreme meteorological hazards

![](_page_43_Picture_1.jpeg)

Extreme meteorological hazards and their possible combinations that have the potential to affect the safety of the nuclear installation shall be evaluated.

5.11. Meteorological phenomena\*, as well as their credible combinations, shall be evaluated for their <u>extreme values</u> based on available records.

If necessary, efforts shall be made to extend the database on meteorological hazards (e.g., by incorporating historical climate data, numerical models and simulations).

 wind, precipitation, snow and ice, air and water temperature, humidity, storm surges and sand or dust storms, etc.

5.12. Appropriate methods shall be applied for the evaluation of meteorological hazards, taking into account the amount of data available (both measured data and historical data) and known past changes in relevant characteristics of the region.

![](_page_43_Picture_7.jpeg)

https://newsjar.net/windstorm-kills-1-displaces-575-in-imo-community/

**Extreme values** of meteorological parameters are identified by means of statistical analysis of measurement data for different meteorological parameters.

#### Meteorological hazards Requirement 19: Evaluation of rare meteorological events

![](_page_44_Picture_1.jpeg)

The potential for the occurrence of rare meteorological events such as **lightning**, **tornadoes** and **cyclones**, including information on their severity and frequency, shall be evaluated.

5.13. The potential for the occurrence and the frequency and severity of **lightning** shall be evaluated for the site vicinity.

5.14. The potential for the occurrence and the frequency and severity of **tornadoes**, **cyclones and associated missiles** shall be evaluated for the site. The hazards associated with tornadoes and cyclones shall be derived and expressed in terms of parameters such as **rotational wind speed**, **translational wind speed**, **radius of maximum rotational wind speed**, **pressure differentials** and **rate of change of pressure**.

![](_page_44_Picture_5.jpeg)

Tornado protection net installed around the cooling tower of the Rokkasho Reprocessing Plant (JNFL / Japan)

https://www.jnfl.co.jp/ja/special/construction-status/

## **Evaluation of natural hazards**

![](_page_45_Picture_1.jpeg)

#### Human induced hazards

#### Natural hazards

- Geological hazards
- Meteorological hazards
- Hydrological hazards
  Flooding hazards
- o Other natural hazards

![](_page_45_Figure_8.jpeg)

#### Flooding hazards Requirement 20: Evaluation of flooding hazards

![](_page_46_Picture_1.jpeg)

Hazards due to **flooding**, considering **natural and human induced events** including their possible combinations, shall be evaluated.

- Floods due to precipitation and other natural causes
- Water waves induced by earthquakes or other geological phenomena
- Floods and waves caused by failure of water control structures

![](_page_46_Picture_6.jpeg)

Fort Calhoun plant on June 16, 2011 during the 2011 Missouri River Floods; vital buildings were protected using water-filled perimeter "flood berms" https://energynews.us/2020/08/31/report-climate-risks-compound-financial-challenges-for-midwestnuclear-plants/

# Geological hazards Meteorological hazards

- Hydrological hazards
- Other natural hazards
- Human induced hazards

Natural hazards

## **Evaluation of natural hazards**

![](_page_47_Picture_6.jpeg)

![](_page_47_Picture_7.jpeg)

Geotechnical hazards and geological hazards Requirement 21: Geotechnical characteristics and geological features of subsurface materials

![](_page_48_Picture_1.jpeg)

The geotechnical characteristics and geological features of subsurface materials shall be investigated, and a soil and rock profile for the site that considers the variability and uncertainty in subsurface materials shall be derived.

![](_page_48_Picture_3.jpeg)

Overturning due to soil liquefaction at the 2023 Kahramanmaraş-Pazarcık (Mw=7.7) and Elbistan (Mw=7.6) Earthquakes

https://eerc.metu.edu.tr/en/system/files/documents/DMAM\_Report\_2023\_Kahramanmar as-Pazarcik\_and\_Elbistan\_Earthquakes\_Report\_final\_ENG.pdf/

#### Geotechnical hazards and geological hazards Requirement 22: Evaluation of geotechnical hazards and geological hazards

![](_page_49_Picture_1.jpeg)

Geotechnical hazards and geological hazards, including **slope instability**, **collapse**, **subsidence** or **uplift**, and **soil liquefaction**, and their effect on the safety of the nuclear installation, shall be evaluated.

![](_page_49_Picture_3.jpeg)

Landslide as the 2016 Kumamoto Earthquake (Japan) Photo: K.NAGASAWA

## Geological hazards Meteorological bezerda

- Meteorological hazards
- Hydrological hazards
- Other natural hazards
- Human induced hazards

Natural hazards

## **Evaluation of natural hazards**

![](_page_50_Picture_7.jpeg)

![](_page_50_Picture_8.jpeg)

#### Other natural hazards Requirement 23: Evaluation of other natural hazards

![](_page_51_Picture_1.jpeg)

**Other natural phenomena** that are specific to the region and which have the potential to affect the safety of the nuclear installation shall be investigated.

5.32. Other natural external hazards, such as wildfires, drought, hail, frazil ice formation, diversion of a river, debris avalanche and biological hazards (e.g. jellyfish, small animals and barnacles) shall be identified and assessed so that the site specific design parameters for these hazards can be derived.

![](_page_51_Picture_4.jpeg)

#### Meteorological hazards $\bigcirc$

• Hydrological hazards

#### Human induced hazards

## **Evaluation of Human induced hazards**

#### Natural hazards

Geological hazards  $\bigcirc$ 

![](_page_52_Picture_7.jpeg)

![](_page_52_Picture_8.jpeg)

![](_page_52_Picture_9.jpeg)

# Requirement 24: Evaluation of hazards associated with human induced events

![](_page_53_Picture_1.jpeg)

The hazards associated with human induced events on the site or in the region shall be evaluated.

5.33. Human induced events to be addressed shall include, but shall not be limited to:

- Events associated with nearby land, river, sea or air transport (e.g., collisions and explosions);
- Fire, explosions, missile generation and releases of hazardous gases from industrial facilities near the site;
- Electromagnetic interference.

![](_page_53_Picture_8.jpeg)

![](_page_54_Picture_0.jpeg)

# 6. Evaluation of the potential effects of the nuclear installation on the region

![](_page_54_Picture_2.jpeg)

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#### Requirement 25: Dispersion of radioactive material

![](_page_55_Picture_1.jpeg)

The dispersion in air and water of radioactive material released from the nuclear installation in operational states and in accident conditions shall be assessed.

- Atmospheric dispersion of radioactive material
- Dispersion of radioactive material through surface water and groundwater

![](_page_55_Figure_5.jpeg)

Drawn by J&A Aszódi, 2022, CC BY-SA 4.0 using inspirations from Maria del Rosario Perez et.al., WHO, 2013

#### Requirement 26: Population distribution and public exposure

![](_page_56_Picture_1.jpeg)

The existing and projected population distribution within the region over the lifetime of the nuclear installation shall be determined and the potential impact of radioactive releases on the public, in both operational states and accident conditions, shall be evaluated and periodically updated.

![](_page_56_Figure_3.jpeg)

https://www.thegeographeronline.net/1-population-and-economic-development-patterns.html

#### **Requirement 27: Uses of land and water in the region**

![](_page_57_Picture_1.jpeg)

The uses of land and water shall be characterized in order to assess the potential effects of the nuclear installation on the region.

![](_page_57_Picture_3.jpeg)

https://www.pref.gifu.lg.jp/soshiki/26124/

![](_page_58_Picture_0.jpeg)

# 7. Monitoring and periodic review of the site

Site Evaluation for Nuclear Installations (SSR-1), External Events Safety Section, NSNI/IAEA, 12 March 2024

#### Requirement 28: Monitoring of external hazards and site conditions

![](_page_59_Picture_1.jpeg)

All natural and human induced external hazards and site conditions that are relevant to the licensing and safe operation of the nuclear installation shall be **monitored over the lifetime** of the nuclear installation.

7.1. The monitoring of external hazards and site conditions shall be commenced no later than the start of construction and shall be continued until decommissioning. The monitoring plan shall be developed as part of the objectives and scope of the site evaluation.

![](_page_59_Picture_4.jpeg)

Source: https://www.onr.org.uk

![](_page_59_Figure_6.jpeg)

SSG-35 Site Survey and Site Selection for Nuclear Installations

#### Requirement 29: Review of external hazards and site conditions

![](_page_60_Picture_1.jpeg)

All natural and human induced external hazards and site conditions shall be **periodically reviewed by the operating organization** as part of the **periodic safety review** and as appropriate throughout the lifetime of the nuclear installation, with due account taken of operating experience and new safety related information.

![](_page_60_Picture_3.jpeg)

Source: https://www.powermag.com/

#### Requirement 29: Review of external hazards and site conditions

![](_page_61_Picture_1.jpeg)

7.5. The site specific external hazards and the site conditions shall be re-evaluated, as necessary, based on the outcome of the periodic review of site-specific hazards or because of new data relevant to the radiological environmental impact assessment or to the safe operation of the nuclear installation.

Drawn by J&A Aszódi, 2022, CC BY-SA 4.0

![](_page_62_Picture_0.jpeg)

![](_page_62_Picture_1.jpeg)

- 1. Site Evaluation for Nuclear Installations, Specific Safety Requirements, IAEA No. SSR-1, https://www.iaea.org/publications/13413/site-evaluation-for-nuclear-installations
- 2. Milestones in the Development of a National Infrastructure for Nuclear Power, IAEA Nuclear Energy Series No. NG-G-3.1 (Rev. 1), <u>https://www.iaea.org/publications/10873/milestones-in-the-development-of-a-national-infrastructure-for-nuclear-power</u>
- 3. IAEA Milestones Approach, Developing the National, Infrastructure for Nuclear Power https://www.iaea.org/topics/infrastructure-development/milestones-approach
- 4. <u>https://www.iaea.org/sites/default/files/18/01/developing-the-national-nuclear-infrastructure-for-nuclear-power.pdf</u>
- 5. Fundamental Safety Principles, IAEA Safety Standards Series No. SF-1 https://www.iaea.org/publications/7592/fundamental-safety-principles

![](_page_63_Picture_0.jpeg)

#### How to contact us

#### Safety.Standards@iaea.org

![](_page_64_Picture_0.jpeg)

## Thank you!

![](_page_64_Picture_2.jpeg)