IAEA METHODOLOGY FOR REACTOR TECHNOLOGY ASSESSMENT (RTA)

CASE STUDY TRAINING BOOKLET

NUCLEAR POWER TECHNOLOGY DEVELOPMENT SECTION
DEPARTMENT OF NUCLEAR ENERGY

This document was prepared for training purposes. It contains descriptions relevant to the IAEA methodology for RTA.

The country RETASLAND does not exist.

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IAEA METHODOLOGY FOR RTA

The development or expansion of a nuclear programme requires successful execution of several important and interrelated tasks. Nuclear reactor technology assessment (RTA) is the evaluation and selection process, which enables Member States to accomplish some of these tasks. The RTA methodology is described in the IAEA Nuclear Energy Series document, IAEA NP-T-1.10 published in 2013:

https://www-pub.iaea.org/MTCD/Publications/PDF/Pub1597_web.pdf

The IAEA methodology for RTA supports the evaluation, selection, and deployment of the optimum technology to meet the objectives of the national nuclear power programme.

CASE STUDY

The country profile described in this Booklet provides information needed for RTA to enable decision for nuclear power programme planning and implementation.

The objective of this Booklet is to illustrate the breadth of needed information to apply the RTA methodology for small and medium modular reactors (SMRs) for near term deployment in Retasland.

This Booklet is used in national and interregional IAEA training courses and workshops.

RETASLAND

[Pronounced **Reeta's Land**]

is a fictitious country. There are two case studies and two Retasland: S/M Retasland and L Retasland.

The S/M Retasland case study considers the RTA of small modular reactors while the L Retasland case study considers the RTA for near term deployable large water cooled reactors.

IAEA supporting references:

- **Nuclear Reactor Technology Assessment for Near Term Deployment, NP-T-1.10, 2013**
- **ARIS data base**
- **Milestone approach, NG-G-3.1**

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Country nuclear power profile

This Chapter summarizes organizational and industrial infrastructure aspects relevant to a nuclear power programme and provides information about the relevant legislative, regulatory, and international frameworks in Retasland. According to the IAEA Milestones in the Development of a National Infrastructure for Nuclear Power (No. NG-G-3.1 (Rev. 1), 2015), Retasland is engaged in Phase 2 activities, aimed to achieve Milestone 2.

1. Country energy overview

1.1. Energy information

1.1.1. Energy policy

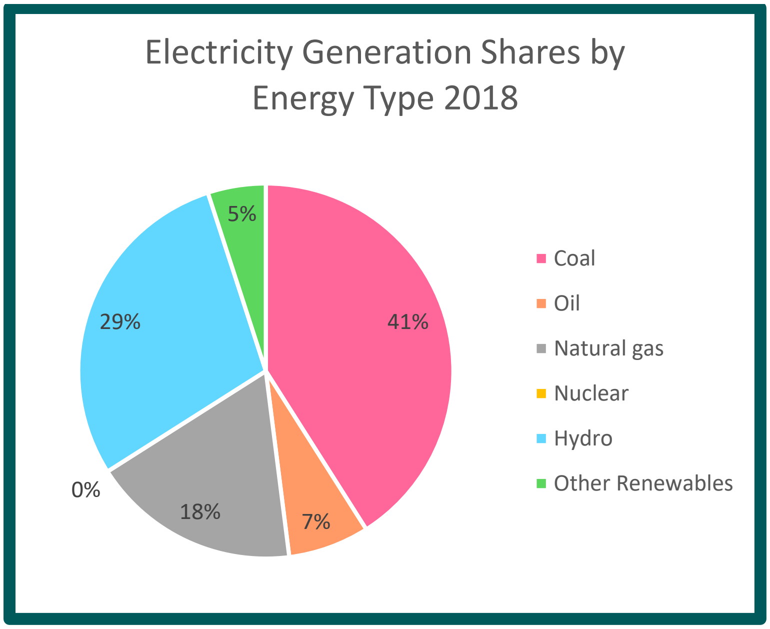
The energy sector of Retasland has had growing influence on the economy and environment in the past decade as the increasing population of Retasland has increased the energy demand. The Government of Retasland (GoR) has implemented a new national energy policy to meet the energy needs of the population — which is about 25 million people — in an environmentally sustainable manner that promotes energy efficiency and security. The national energy policy focuses on utilizing the primary natural resources of Retasland as well as new and advanced technology.

Figure 1 demonstrates the current and targeted shares of each primary energy type.

The target shares of each primary energy type reflect the major objectives of the national energy policy, which are as follows:

- Reduce greenhouse gas emissions;
- Allow market forces to reduce costs and increase efficiency;
- Develop advanced technologies across all energy types;
- Security of supply and complementarity in the energy mix;
- Provide electric power to remote locations within the country.

The national energy and environmental protection policies include commitments to CO_2 reduction targets of 10% by 2030 and 25% by 2050. Population is expected to grow by an average 1%/year and per-person electricity consumption by 1.2%/year (as a result of reaching 100% electrification across the country and 25% electrification of the transport sector) over the next 32 years. This will lead to an overall doubling in electricity demand.



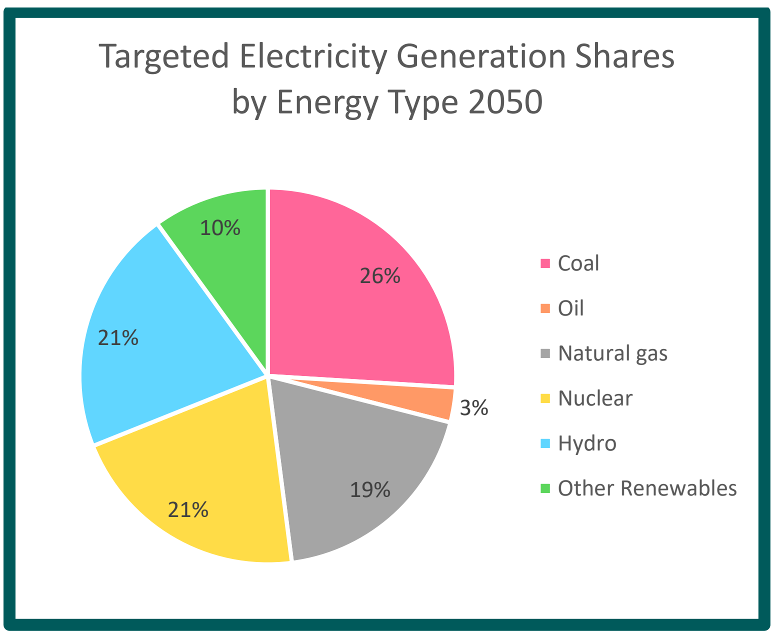


FIG. 1. Current (2018) and targeted (2050) shares of each primary energy type for electricity.

1.1.2. Estimated available energy resources

Retasland's main natural resources include coal, some crude oil, natural gas, and hydropower from the major rivers throughout the country. Table 1 provides the estimated available energy sources for Retasland.

TABLE 1. ESTIMATED AVAILABLE ENERGY SOURCES

	Fossil Fuels			Nuclear	Renewables
	Solid	Liquid	Gas	Uranium	Hydro
Total amount in specific units*	7621	162	35	0	5156
Total amount in exajoules (EJ)	223	24	761	0	90

**Specific units: Solid and Liquid: million tonnes; Gas: billion m^3; Hydro: MW*

1.1.3. Energy statistics

Table 2 provides the energy statistics (consumption and production) of Retasland from 1990 to 2018.

TABLE 2. ENERGY STATISTICS

Year	1990	2000	2005	2010	2015	2018
Energy consumption (EJ)						
Total	1.012	1.124	1.225	1.350	1.568	1.734
Solids	0.560	0.622	0.691	0.768	0.938	0.853
Liquids	0.127	0.142	0.157	0.175	0.214	0.194
Gases	0.328	0.364	0.405	0.449	0.549	0.499
Nuclear	0.000	0.000	0.000	0.000	0.000	0.000
Hydro	0.063	0.070	0.073	0.073	0.073	0.073
Other	0.000	0.000	0.000	0.057	0.091	0.114
Energy Production (EJ)						
Total	1.865	2.072	2.298	2.625	3.222	2.980
Solids	1.119	1.244	1.382	1.536	1.877	1.706
Liquids	0.191	0.212	0.236	0.262	0.320	0.291
Gases	0.491	0.546	0.607	0.674	0.824	0.749
Nuclear	0.000	0.000	0.000	0.000	0.000	0.000
Hydro	0.063	0.070	0.073	0.073	0.073	0.073
Other	0.000	0.000	0.000	0.080	0.128	0.160
Net Import (EJ)						
Total	-0.853	-0.947	-1.073	-1.275	-1.654	-1.246

1.2. Electricity system

1.2.1. Electricity system and decision making process

Decisions concerning the electric sector are primarily the responsibility of the Ministry of Energy (ME). The ME governs the policies and regulations of the energy sector to meet the electricity power demand in an economical, safe, and sustainable manner.

1.2.2. Structure of electric power

Figure 2 shows the organizational structure of the electricity supply industry in Retasland. Retasland has good interconnection to three neighbouring countries and is currently a net electricity exporter.

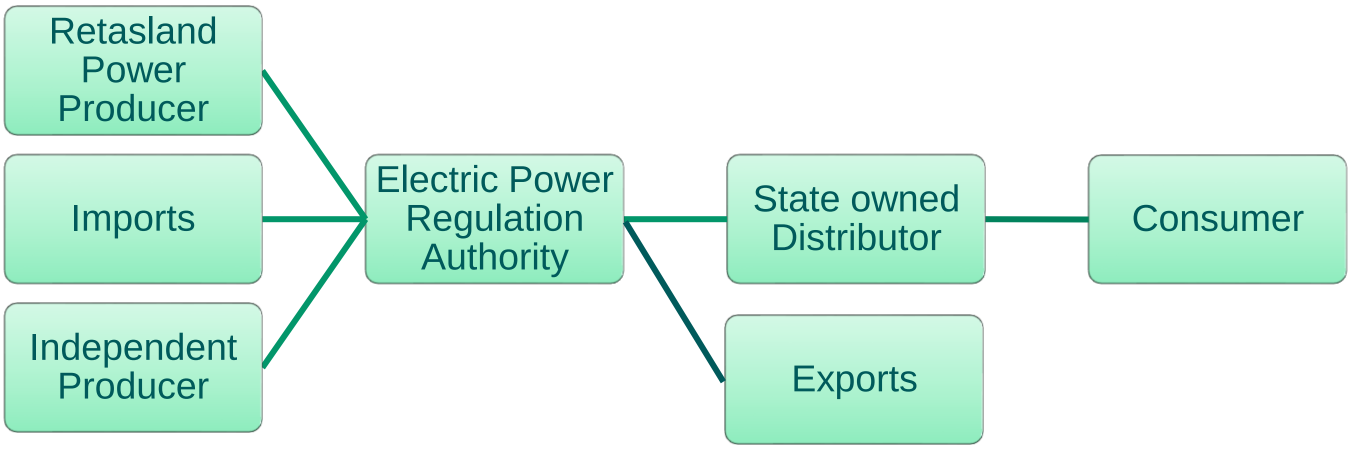


FIG. 2. Organizational structure of the electricity supply industry in Retasland.

Retasland is made up of three geographical regions: Northern, Central, and Southern regions. There are three major transmission lines of 300 MWe, 230 MWe, and 150 MWe that connect the geographical regions. The grid's average number of power supply interruption per year is 2, and the typical duration of an interruption is ½ to about 6 hours. The frequency of the electric system is 60 Hz.

The improvement plans have been prepared with the commitment to construct additional grid capacity of 300 MWe by 2050. The GoR has also engaged electric grid consultants to undertake a complete technical analysis of the current Retasland electric grid to take into consideration the requirements of introducing a variety of power plants into the national electric grid. The country has plans for high degree of network interconnection, sufficient spinning and operating reserve; regional interconnection is also being fast tracked.

1.2.3. Main indicators

Retasland has a diverse energy mix where coal is the dominant fuel for electricity generation; coal provides a daily average of 41% of the electricity production but can be up to 55% in extreme weather conditions. Hydropower also plays a crucial role in electricity generation with a daily average of 29% of the electricity production. Hydropower is expected to contribute a fairly regular amount of power over the next 30 years, which means as Retasland continues to increase its electric power capabilities, the overall percentage of electricity generation contributed by hydropower will decrease. Nuclear is targeted to provide at least 20% of electric generation by 2050. Table 3 provides the installed capacity, production, and consumption of electricity in Retasland from 1990 to 2018. The installed capacity represents maximum possible (potential) electrical output of a specific energy source; the electric generation is actual electrical output of a specific energy source, also called electricity production. Power plants do not operate at full capacity (i.e. installed capacity), and thus the electricity that is generated by a specific source is dependent on the capacity factor for the power plant of that specific source. Therefore, the percentage of installed capacity from a specific source does not match the percentage of electrical generation from that given source.

Table 4 presents the targeted installed capacity of each primary energy type from now until 2050 to achieve the objectives of the national energy policy.

TABLE 3. INSTALLED CAPACITY, PRODUCTION, AND CONSUMPTION OF ELECTRICITY

Year	1990	2000	2005	2010	2015	2018
Capacity of electrical plants (GWe)						
Thermal	8.604	9.561	10.623	11.803	14.426	13.115
Hydro	4.408	4.898	5.156	5.156	5.156	5.156
Nuclear	0.000	0.000	0.000	0.000	0.000	0.000
Other Renewables	0.000	0.000	0.000	0.800	1.280	1.600
Total	13.012	14.458	15.778	17.759	20.862	19.870
Electricity production (TWh)						
Thermal	30.035	33.372	37.080	41.200	50.355	45.778
Hydro	17.376	19.307	20.323	20.323	20.323	20.323
Nuclear	0.000	0.000	0.000	0.000	0.000	0.000
Other Renewables	0.000	0.000	0.000	1.752	2.803	3.504
Total	47.411	52.679	57.403	63.275	73.482	69.605
Total electricity consumption (TWh)						
Total	39.351	43.723	47.645	52.518	60.990	57.772

Table 4. INSTALLED CAPACITY PLAN

Installed Capacity (MWe)									
	2018	2020	2025	2030	2035	2040	2045	2050	% Installed Capacity of 2050
Coal	6189	6125	6059	6025	5917	5785	5609	5396	23%
Oil	4308	4206	4005	3808	3563	3269	2928	2538	11%
Natural gas	2618	2660	2816	3007	3201	3398	3597	3800	16%
Nuclear*	0	0	0	217	543	1087	1630	2511	11%
Hydro	5156	5156	5156	5156	5156	5156	5156	5156	22%
Other Renewables	1600	1721	2072	2475	2909	3375	3872	4400	18%
Total	19870	19868	20107	20687	21289	22069	22792	23801	100%

**The numbers presented in this table represent the minimum capacity required to achieve the targeted share of nuclear energy for electric generation and are not meant to be an exact capacity requirement.*

2. Nuclear power situation

2.1. Historical development and current organizational structure

2.1.1. Overview

The Government of Retasland (GoR) conducted an extensive study to determine the viability of various energy sources to create an energy plan in response to the expected population growth and increasing demand for energy. The study concluded that nuclear power would need to play a crucial role to meet the goals of the national energy policy and the energy demand in a sustainable manner.

Currently, Retasland does not have any nuclear power plants or research reactors, but with high safety and environmental standards, nuclear power has a substantial targeted energy share. The GoR established the Retasland Atomic Energy Authority (RAEA) to oversee the newly launched National

Nuclear Power Programme (NNPP). The RAEA was first charged with identifying a site location for a nuclear power plant, and a summary is provided in Annex A.

Under the National Nuclear Power Programme, the RAEA already carried out a Pre-Feasibility Study of the reactor designs available for near-term deployment and reduced the number of possible SMR designs for their assessment to three final deployable design options; deployment of the first nuclear power plant is targeted for 2030. The nuclear programme's medium-term objective is to implement a total capacity of at least 200 MWe.

2.1.2. Current organizational chart

An organizational chart of the most important government agencies involved in the National Nuclear Power Programme (NNPP) is shown in Figure 3.

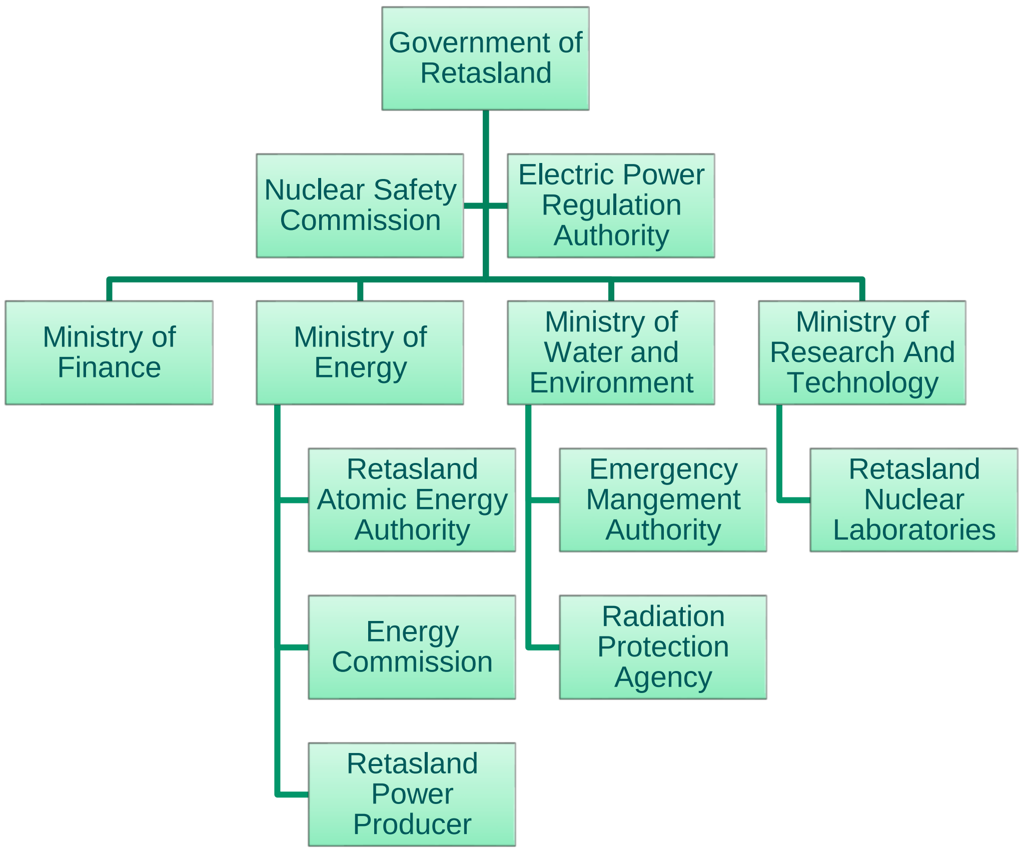


FIG. 3. Government agencies involved in the National Nuclear Power Programme.

2.2. Future development of nuclear power sector

2.2.1. Nuclear power development strategy

The NNPP outlines activities involved in the implementation of nuclear power, including siting and grid evaluation, financing, technological aspect assessment (including fuel type), safety, human resources, and legal requirements. The target commission date for the first nuclear power plant is 2030, and the siting and grid evaluation has been completed (see Annex A for site information).

2.2.2. Project management

The Retasland Atomic Energy Authority (RAEA) is to oversee the NNPP. A state owned company will oversee the construction, operation, and decommissioning of the first nuclear power plant working with the Nuclear Safety Commission (NSC) for licensing approval. The Ministry of Research and Technology (MRT) is the primary energy-policymaking body of the GoR.

The Ministry of Energy (ME) oversees the activities of the RAEA and management of the national electricity grid by the Electric Power Regulation Authority (EPRA). EPRA is working alongside the RAEA for grid infrastructure planning and development.

The Ministry of Water and Environment (MWE) is performing the Environmental Impact Assessment for the power plant and will offer continued support in environmental monitoring to the state owned company that will be overseeing the operation of the NPP.

2.2.3. Project funding

The GoR is overseeing the funding for the NNPP, including the funding of the first nuclear power plant. A financial strategy is one of the activities outlined by the NNPP and will be carried out by the Ministry of Finance (MF).

2.2.4. Electric grid development

As an activity outlined in the NNPP, a grid evaluation has been completed. Retasland has an integrated electrical grid system with transmission lines as described in Section 1.2.2. The transmission lines in all three geographical regions of Retasland are interconnected, and the EPRA is coordinating several projects to stabilize and strengthen the national electricity grid to maximize export of electricity and to accommodate the shifting national energy mix. Grid reliability analyses are continually being performed.

The EPRA has made Power Purchasing Agreements (PPAs) with a few of the neighbouring countries and is enhancing the international transmission capabilities. The RAEA is working alongside the EPRA to develop necessary local infrastructure and transmission line upgrades to accommodate construction of nuclear power plants. A detailed plan will be developed once technology selection is complete and requirements are firmly established; however, there is no anticipated issue in meeting the needs of the project.

2.2.5. Sites

A site evaluation was carried out along with the grid evaluation mentioned in Section 2.3.4. The site evaluation identified a location in the Northern region of Retasland as the location for the first nuclear power plant. A detailed description of the site can be found in Annex A.

2.2.6. Public awareness

Biennial polls have been conducted for the past 10 years to assess the public approval and perception of nuclear power. The public of Retasland generally favours the idea of nuclear power with the latest poll showing 73% of the public accepting the implementation of nuclear power plants. The driving factors for public approval are lower costs of electricity and reduced greenhouse gas emissions.

2.3. Fuel cycle, including waste management

The nuclear fuel cycle (NFC) consists of three stages: the front end, reactor service period, and the back end. The uranium fuel will be imported because Retasland does not have significant uranium deposits and has no plans for any enrichment of fuel fabrication capabilities. Currently, the low level and intermediate level radioactive waste from industrial and medical facilities are managed by the GoR-appointed Radiation Protection Agency (RPA).

For the back end of the NFC, there will be a need for consideration of storage of spent fuel for the whole lifetime of a nuclear power plant on-site. This should be incorporated in the design architecture of a nuclear power plant. Thus, such a storage facility should be included as part of the plant.

2.4. Research and development

The Retasland Nuclear Laboratories (RNL) is the primary nuclear research centre in Retasland, funded by the Ministry of Research and Technology (MRT). With progress toward the construction of nuclear power plants in the country, the scope of RNL has expanded to include human capacity building to support the project. RNL has recently established, in cooperation with national universities, the Retasland Nuclear Training Centre (RNTC).

2.5. Emergency preparedness

The use of nuclear materials, radioisotopes, and radioactive materials in nuclear applications has been recently increased in Retasland's industry, medicine, and education. All forms of radiation uses are regulated and controlled under the Retasland RPA. Monitoring and preparedness for radiological emergency and response for nuclear/radiological accidents has been recognized and appreciated as evident in the Prefeasibility Study report, which identifies the initial steps of emergency classification based on the severity of the events (notification of unusual event; alert; site area emergency; and general area emergency) and emergency planning zones (precautionary action zones and urgent protective action planning zones), which informs the emergency planning measures to be activated in case of an event warranting response. The Emergency Management Authority (EMA) is the coordinator assigned for national emergency response to disasters and emergencies, including nuclear and radiological emergencies.

The licensee, the state owned company overseeing the operation of the NPP, will be responsible for developing the on-site emergency plan to establish mitigatory actions of any accidents related to the nuclear power plant. Local government, supported by EMA and the Nuclear Safety Commission (NSC), will establish actions for protection of the public off-site. The on-site emergency plan will be submitted to and approved by the NSC, once ensuring compatibility between on-site and off-site response.

2.6. Stakeholder communication

The NSC has developed and implemented a stakeholder involvement plan and rolled out some of the activities. The NSC has identified, mapped, and prioritized Retasland's nuclear power programme stakeholders as follows: internal, local, industrial, national, and international. The stakeholders are classified under the categories of international organizations, academia and research institutions, media and trade unions, Ministry of Energy and its agencies, standards bodies, regulatory bodies, parliament, judiciary, public, government ministries, and NPP site host community.

Each of Retasland's identified stakeholder groups, the public, and other relevant interested parties have been informed about nuclear technology and, in particular, nuclear power and its benefits and risks, including the 'non-zero' potential for severe accidents. This ongoing process is carried out through open, timely, and transparent communication such as forums, conferences, meetings, advertisements, and media. The NSC has participated in the development of the Least Cost Power Development Plan energy planning with other stakeholders and justified the need for inclusion of nuclear electricity in the energy mix.

3. National laws and regulations

3.1. Regulatory framework

3.1.1. Regulatory authority(ies)

The Nuclear Safety Commission (NSC) is the authority created to regulate safety (nuclear and radioactive), security, and safeguards for all nuclear activities and materials within the country. The NSC is responsible for the safe deployment, regulation, licensing, and control of nuclear activities and future power plants. Furthermore, the NSC is has the legal authority to conduct inspections of surveillance and controls of nuclear materials as well as to ensure the compliance to safety regulations and perform enforcement. The NSC is a government institution completely independent from all organizations involved in the promotion of nuclear energy.

3.1.2. Licensing process

The NSC can issue licenses to any legal persons whom are involved (e.g. purchasing, use, manufacturing) with any sort of radioactive material or irradiation activities and devices. The NSC staff will review license applications, along with safety reports, for completeness and adequacy. The NSC will then make a recommendation to the NSC board of governors, which issue licenses. The NSC has adopted basic safety rules based on the IAEA Nuclear Safety Standards with the additional condition that proposed plants be licensable in the vendor's country. The following licenses shall be issued for the development of a nuclear reactor: plant design license, site license, commissioning license, construction license, operation license, modification license (if needed), and decommissioning license.

3.2. National laws and regulations

3.2.1. Radiation protection

Retasland's Radiation Protection Act defines country's radiation protection programme and authorizes the use of radioactive materials to labs, medical centres and for industrial applications. The programme is designed to protect the public and radiation workers from exposure to ionizing radiation and therefore reduce radiation doses wherever and whenever reasonably achievable by adopting the ALARA policy, thereby reducing the health risk.

Both, public and occupational, regulatory dose limits1 are defined as follows:

Annual Radiation Dose Limits	Agency
Radiation Worker – 50 mSv	(NRC, “occupationally” exposed)
General Public – 1 mSv	(NRC, member of the public)
General Public – 0.25 mSv	(NRC, decommissioning and decontamination all pathways)
General Public – 0.10 mSv	(EPA, air pathway)
General Public – 0.04 mSv	(EPA, drinking water pathway)

3.2.2. Safeguards

Retasland has demonstrated a political commitment by signing and ratifying several relevant treaties and conventions. In particular, the signing of the Comprehensive Safeguards Agreement (CSA), Additional Protocol, and the Regional Nuclear-Weapon Free Zone Treaty demonstrates Retasland’s transparency and confidence building measures at regional and international community levels. The country will strengthen its non-proliferation credentials as it introduces the NPP by adhering/committing to the Treaty on Non-Proliferation of Nuclear Weapons regime obligations and putting in place all the necessary measures. Retasland has established State System of Accounting for and Control of Nuclear Materials under the Small Quantities Protocol. It also accounts for and reports on all the nuclear materials and installations in the country to the IAEA on quarterly and annually basis.

[1] https://hps.org/publicinformation/ate/faqs/regdoselimits.html

References

INTERNATIONAL ATOMIC ENERGY AGENCY, Nuclear Reactor Technology Assessment for Near Term Deployment, IAEA Nuclear Energy Series No. NP-T-1.10, IAEA, Vienna (2013).

IAEA Country Nuclear Power Profiles: https://cnpp.iaea.org/pages/index.htm

Annex A. Site description

The Retasland Atomic Energy Authority (RAEA) together with the Ministry of Water and Environment (MWE) and the Ministry of Energy (ME) conducted the site survey. Originally, four potential sites were selected based on engineering, economics and environmental aspects.

The factors in the environmental impact assessment of nuclear power plant operation have been identified:

- Sources of impact, for example power plant operation and waste management;
- Environmental Stressors such as radioactivity, heat, noise, and habitat change;
- Pathways for environmental stressors such as air, surface water, groundwater, and terrestrial or aquatic habitat;
- Ecological and human receptors of the stressors;
- Resulting ecological and human effects.

The information gathered established an environmental site characteristics baseline providing the site characteristics on its ecosystem, ecological value and sensitivity, and conservation status and presence of protected biodiversity. Socioeconomic factors of the study included human activities, the significant cultural heritage of the site, scenic value, and land ownership. The seismic and volcanic hazard assessments reports were completed based on the latest IAEA guidance.

The site evaluation considered the historical site data and potential effects of river water consumption and power plant impact on aquatic life. For comparison, from the 2011 study[2] conducted by the National Renewable Energy Laboratory, it was found that nuclear plants with cooling towers consumed 672 gal/MWhr. The water consumption intensity for nuclear was like that for coal electricity (687 gal/MWhr); lower than the consumption rates for concentrating solar power (865 gal/MWhr for CSP trough, 786 gal/MWhr for CSP tower); and higher than that of electricity generated by natural gas (198 gal/MWhr).

The characteristics of the final selected site are summarized as follows:

A.1. Ambient site environmental conditions and demographics

The site is a 5 km x 5 km plot of land located in a remote area of the Northern region of Retasland (one of three geographical regions). The site is in the flattest area in the country with mountains located east and west at a distance of approximately 50–80 km from the site and a desert on the north side of the country at a distance of 140 km from the site. The closest city (distanced 10 km away) has a population of 100 000 inhabitants. Site climate is characterized with a strong wind blowing north-south 6 months in a year; the winter is characterized with heavy snow and ice; summers are hot and humid. Frequent sandstorms occur in the summer, carrying sand from the north desert to the Northern region of the country. The sandstorms can reach heights of approximately 20 m with speeds of at least 45 km/hour.

[2] https://en.wikipedia.org/wiki/Environmental_impact_of_nuclear_power

A.2. Transportation routes/facilities and access to required infrastructure for construction and operation

A few developed transportation routes connect the site to Retasland's major cities; these routes are 7–10 meters wide and cross bridges with vehicle load limits of 400 tonnes and maximum height clearance of 5 meters. The nearest major transmission line is 3 km away and has a 300 MWe capacity; this transmission line is interconnected to both the Central region and the country along the Northern border. There are no archaeological sites nearby and no need to relocate populated areas. There are no recreational centres or tourist sites nearby.

A.3. Water source and usage

The natural habitat of several creatures protected by a national ecology programme is found 50 km away from the site. The site is 8 km from the Reta River, which floods an average of 0.02 km (0.05 km highest in recorded history). The Reta River is the only source of water available for the site.

There are some fish species that show sensitivity to high water temperature; refer to Section B.2. for legal requirements.

A.4. Frequency of external events

Site parameter limiting value of a peak ground acceleration is 0.12 g. This value was obtained by calculations based on historical data over the last 200 years.

No public airlines fly overhead the site, nor is there any other form of public trespassing on the site.

Sand storms are often present (refer to Section A.1).

A.5. Grid integration

The electric grid for the entire country is described in Section 1.2.2. The existing electric grid in this region is stable with a capacity of 500 MW.

Annex B. Technical characteristics of the nuclear power plant

B.1. Desired characteristics of the nuclear power plant

The NPP to be selected will have the following main technical characteristics:

- Initial total electrical output: at least 200 MWe
- Minimum plant efficiency: 30%
- Minimum availability: 90% (based on operating experience (OPEX) of similar units by 2030)
- Maximum planned (refuelling) outage: 15 days (only in spring)
- Design life: 60 years with no major refurbishment requiring > 6 mo. outage
- Ability to tolerate power interruptions up to 12 hrs long without shutdown
- State-of-the-art human–machine interface and operator training simulator
- Cogeneration of process heat and hydrogen production

B.2. Legal requirements for the nuclear power plant

The Reta River is home to several fish species, some of which show sensitivity to abnormally high water temperatures. The average water temperature of the Reta River is between 23°C and 30°C, with a record high of 35°C and record low of 15°C. The river water can be used as a heat sink so long as the temperature at the plant's exhaust does not exceed 27°C.

Annex C. Organizations involved in nuclear power activities

GoR	Government of Retasland
IAEA	International Atomic Energy Agency
RAEA	Retasland Atomic Energy Authority (project implementation)
EMA	Emergency Management Authority (emergency response)
EPRA	Electric Power Regulation Authority (grid regulator)
ME	Ministry of Energy (policy)
MF	Ministry of Finance (policy and economics)
MRT	Ministry of Research and Technology (policy)
MWE	Ministry of Water and Environment (environmental impact and monitoring)
RNL	Retasland Nuclear Laboratories (scientific support and capacity building)
NSC	Nuclear Safety Commission (nuclear regulator)
RPA	Radiation Protection Agency (waste management)
RPP	Retasland Power Producer