



Integrated Regulatory Review Service (IRRS)

Nuclear Safety and Security Programme



Nuclear
Safety and
Security

Foreword



The use of nuclear technologies and applications in power generation, medicine, industry and research sectors bring considerable benefits to society worldwide. However, it also presents significant challenges to regulators of nuclear and radiation safety,

given the complex and evolving environment in which they discharge their responsibilities of protecting people and the environment from the harmful effects of ionizing radiation.

To support effective regulation worldwide, the IAEA establishes safety standards based on the IAEA's fundamental safety principles relating to the governmental, legal and regulatory framework for nuclear and radiation safety. The IAEA safety standards include requirements and guidance for the medical uses of radiation, the operation of nuclear facilities, the production, transport and use of radioactive material, and the management of radioactive waste.

Since its creation in 2006, the Integrated Regulatory Review Service (IRRS) has been one of the main mechanisms utilized by the IAEA to assist Member States in the application of these internationally recognized safety standards.

The IRRS supports Member States to develop strong and independent regulatory bodies that can effectively verify and assess compliance with regulatory safety requirements. This is done through a comprehensive peer review of national practices against the IAEA safety standards to

identify areas of improvement and to provide recommendations and suggestions, accordingly. The service also assists Member States to assess if they have the required capabilities to appropriately manage emerging challenges in nuclear and radiation safety. In addition, the IRRS fosters greater openness and transparency of the national framework for safety, which plays an essential role in building trust among all stakeholders.

At the international level, the IRRS provides an opportunity to share regulatory experiences and good practices between States fostering mutual learning opportunities among regulators.

As the regulatory environment evolves, the IRRS strives to improve the application of the IAEA safety standards in response to the latest regulatory challenges in Member States, such as innovative reactors or a phase out of nuclear power. Continuous improvement and building on lessons learned are key elements of the IRRS Programme Strategy.

This brochure provides a brief overview of the IRRS programme and highlights the recent trends and observations from IRRS missions. The IAEA is fully committed to provide Member States with the most effective IRRS to enhance nuclear and radiation safety worldwide.

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The IRRS is a peer review service established in 2006 to strengthen and enhance the effectiveness of national regulatory infrastructure for the safety of nuclear, radiation, radioactive waste, and transport activities, as well as emergency preparedness and response.

It does so by providing a cross-cutting review of the governmental, legal and regulatory framework for safety and the regulatory oversight of all facilities, activities and exposure situations in host countries against the relevant IAEA safety standards and the Code of Conduct on the Safety and Security of Radioactive Sources.

The IRRS considers technical and policy issues to provide an adequate and objective indicator of the effectiveness and efficiency of the national regulatory infrastructure on nuclear and radiation safety, and to identify opportunities for improvement through making recommendations and suggestions for the host country. Moreover, it fosters knowledge sharing and the exchange of experience among the international community whilst promoting the improvement and harmonization of regulatory approaches in Member States.



Discussing findings during the initial IRRS mission to Canada in 2019 (Photo/IAEA)

IRRS in numbers 2006–2021

70	host countries
120	missions conducted
467	active experts
180	IAEA trained experts
4191	observations

Who benefits from an IRRS?

- Governmental organizations and regulatory bodies in host countries, regardless of whether there is a national nuclear programme in place or the level of development of facilities and activities involving radiation sources;
- International regulatory experts through the exposure to different approaches on regulatory oversight as part of a mutual learning process;
- Global community of safety regulators by sharing of information, experience, and insights on current issues of relevance.

IRRS missions conducted 2006–2021

	Australia				Australia ^{Ext}		
	Cameroon	Botswana			Canada		
	Gabon	Côte d'Ivoire	Canada		Germany		
	Japan ^R	Germany ^R	France ^{Ext}		ROK		Belgium
	Kenya	Madagascar	Lebanon		Romania		Bulgaria
	Mauritius	Namibia	Peru	China	Slovenia	Finland	Czech Republic
France	Mexico	Sierra Leone	Russia	Iran ^R	Spain	Greece	Poland
Romania	Niger	Spain	UK ^{Ext}	Ukraine	Switzerland ^R	Slovakia ^R	Russia ^{Ext}
UK ^R	Uganda	Ukraine	Viet Nam	USA ^R	UAE	Sweden	UK ^{Ext}
2006	2007	2008	2009	2010	2011	2012	2013

2014	2015	2016	2017	2018	2019	2020	2021
Cameroon	Armenia	Belarus	Belgium	Australia	Armenia	Japan ^{Ext}	Belarus
France	Croatia	Bulgaria	Botswana	Austria	Canada	Lithuania	Cameroon
Jordan	Finland	China ^{Ext}	Cyprus	Chile	Croatia	Malta	Denmark
ROK ^{Ext}	Hungary	Estonia	Czech Republic	Georgia	Estonia		Switzerland ^R
Netherlands	India ^R	Italy	Ethiopia	Hungary	Germany		
Pakistan	Indonesia	Japan	France	Luxembourg	Indonesia		
Slovenia	Ireland	Kenya	Greece	Moldova	Latvia		
USA	Malta	Lithuania	Guatemala	Netherlands ^{Ext}	Norway		
Viet Nam ^R	Slovakia	South Africa	Jordan	Spain ^{ART}	UK		
Zimbabwe	Switzerland ^R	Sweden	North Macedonia				
	Tanzania		Nigeria				
	UAE		Poland				
			Romania				

LEGEND

Initial mission (1st cycle)
Follow-up mission (1st cycle)
Initial mission (2nd cycle)
Follow-up mission (2nd cycle)

ACRONYMS

ART	IRRS – ARTEMIS combined mission
R	Reduced scope mission
Ext	Extended follow-up mission

Considering that the governmental, legal and regulatory framework for safety varies significantly from country to country, the IRRS has been designed in a modular form to adequately address both generic issues and country-specific topics. The [General Safety Requirement \(GSR\) Part 1 \(Rev. 1\)](#) constitutes the backbone of the IRRS; though, all other IAEA Safety Requirements and the Code of Conduct on the Safety and Security of Radioactive Sources are used to cover the detailed scope of regulatory oversight, as appropriate.

Regarding policy issues, they range across legal, technical and organizational areas and are intended to promote a constructive exchange between the host country and the IRRS Team on regulatory policy and strategic matters. Policy issues may stem from diverse sources including IAEA publications on regulatory and safety conferences, reports on safety issues and trends, results from other IAEA missions, and International Nuclear Safety Group (INSAG) reports, among others.

As for technical issues, a full scope IRRS mission covers all the core modules (Module 1–10). The Member State should include all competent authorities with responsibility for regulating nuclear and radiation safety within the IRRS review. If a State requests to exclude specific authorities, facilities, activities or exposure situations from the review, there should be a justification provided on their exclusion. In such a case, a limited-scope IRRS mission is conducted. Module 11 – Interfaces with Nuclear Security and Module 12 – Tailored Module for Countries Embarking in Nuclear Power Programmes are optional and added upon request.



Report writing during the follow-up IRRS mission to Hungary in 2018 (Photo/IAEA)

Regarding Module 12, IRRS has been widely recognized to provide valuable safety-related inputs, based on [Specific Safety Guide \(SSG\)-16 \(Rev. 1\)](#), to embarking countries, which are establishing the safety infrastructure of their prospective nuclear power programme. Depending upon the level of development of the national safety infrastructure, the phase¹ to be reviewed is discussed and agreed with the host country.

For Phase 1, it is suggested to include a policy discussion regarding the regulatory framework and nuclear safety infrastructure for the prospective nuclear power programme. During Phase 2 when the regulatory body must develop strong capabilities and a comprehensive regulatory framework to perform the required regulatory activities, particularly to authorize and oversee the construction of the nuclear power plant, it is suggested to conduct a Preliminary Regulatory Review Mission (PRRM)², as an alternative to a full scope IRRS mission which includes Module 12. Finally for Phase 3, it is suggested to host a full scope IRRS that includes the review of the regulatory oversight of the nuclear power plants.

¹ As defined in SSG-16, the three phases in developing the infrastructure necessary to support a nuclear power programme are:

- Phase 1: Considerations before a decision to launch a nuclear power programme is taken;
- Phase 2: Preparatory work for the contracting and construction of a nuclear power plant after a policy decision has been taken;
- Phase 3: Activities to implement the first nuclear power plant.

² PRRM will mainly assist the host country and its regulatory body to identify areas for improvement and associated priorities and to ensure a better coordination in the development of the regulatory framework. Moreover, it will assess with accrued confidence the level of readiness of the regulatory body to oversee nuclear power plant construction. The PRRM covers only the relevant SSG-16 actions from Phase 1 and 2.

Modules and standards

Module 1 – Responsibilities and functions of the government:

GSR Part 1 (Rev. 1) – requirements 1–13; GSR Part 5; GSR Part 6; SSR-5

Module 2 – Global nuclear safety regime:

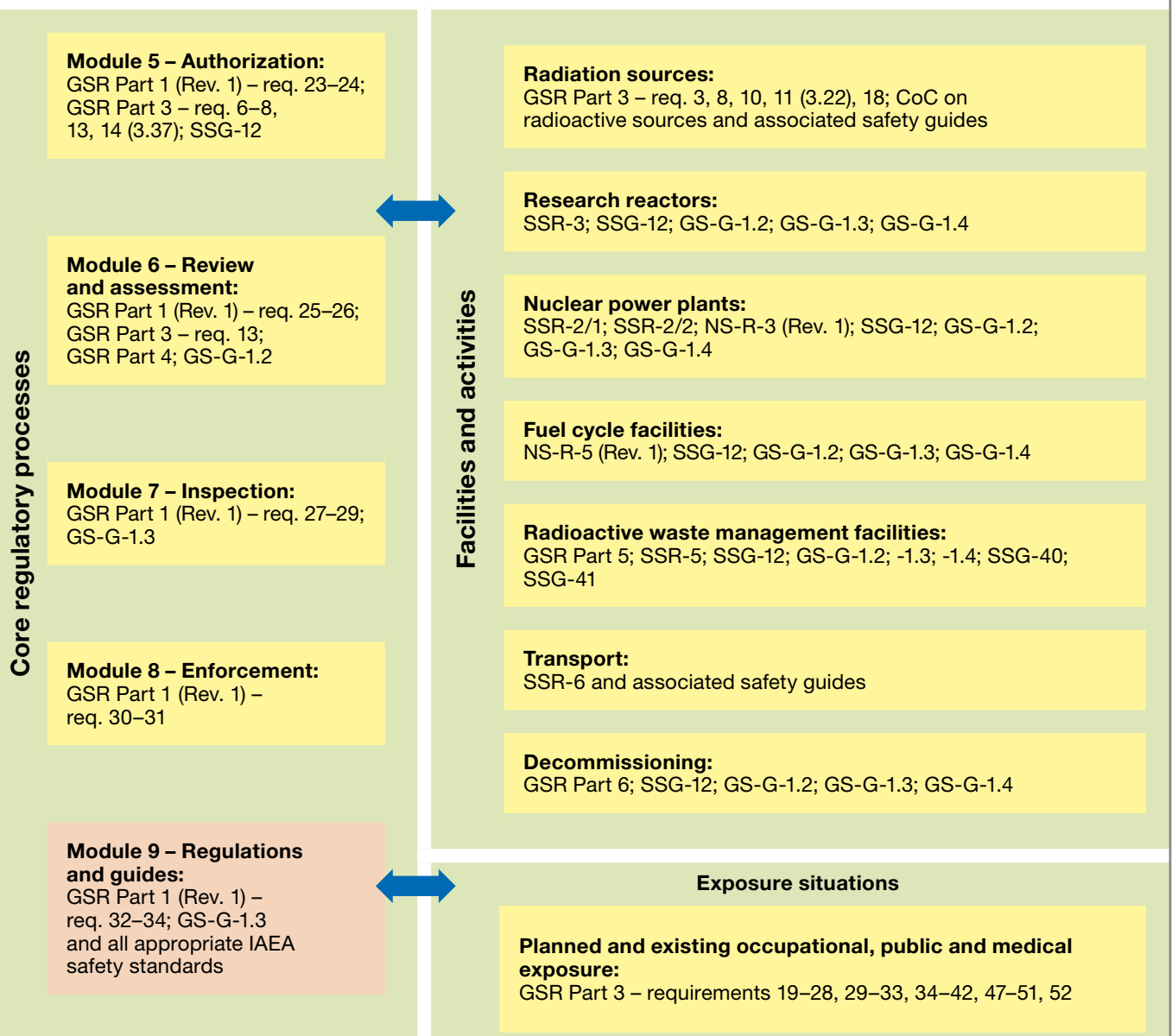
GSR Part 1 (Rev. 1) – requirements 14–15

Module 3 – Responsibilities and functions of the regulatory body:

GSR Part 1 (Rev. 1) – requirements 16–36; GSR Part 2; GS-G-1.1; RS-G-1.4

Module 4 – Management system of the regulatory body:

GSR Part 1 (Rev. 1) – requirement 19; GSR Part 2; GSR Part 3 – requirement 3 (2.38)



Module 10 – Emergency preparedness and response including emergency exposure:

GSR Part 7; GSR Part 1 (Rev. 1); GS-G-2.1; GSG-2; GSG-11

Module 11 – Interfaces with nuclear security:

GSR Part 1 (Rev. 1) – requirement 12

Module 12 – Tailored module for countries embarking on nuclear power programmes:

SSG-16 (Rev. 1)

What is the outcome of an IRRS mission?

The outcome of an IRRS mission is a comprehensive report which includes recommendations and suggestions for the host country to strengthen and enhance the effectiveness of the national regulatory framework. It also includes good practices to be shared with the international community.

Even though the decision to implement the IRRS recommendations and suggestions lies entirely with the relevant authorities of the host country concerned, 85 per cent of all recommendations and suggestions were successfully resolved according to the data collected from all follow-up missions conducted so far (2009–2021).

What are the latest IRRS conclusions?

The latest analysis from missions implemented from 2015 to 2019 highlighted the most challenging areas for Member States. To improve their regulatory infrastructure, Member States should pay special attention to:

- Develop, maintain or enhance a long term human resources plan to ensure the availability and competence of staff;
- Establish, implement and/or update an integrated management system including health, safety, security, quality, environmental, human and organizational factors, societal and economic elements;
- Develop or modify an inspection programme which includes a planning process that allows all regulated facilities and activities to be inspected using a graded approach;
- Establish or update the process for the authorization of facilities and activities using a graded approach;
- Establish arrangements for effective coordination and cooperation between authorities having regulatory responsibilities for nuclear and radiation safety with those responsible for nuclear security, transport

safety, emergency preparedness and response and the medical application of radiation;

- Establish and implement a national policy and strategy for the safe decommissioning of facilities, the safe management and disposal of radioactive waste, and the safe management of spent fuel;
- Establish or strengthen the formal process for reporting and reviewing events and identifying lessons learned;
- Bring public exposure and discharge limits from facilities in line with [GSR Part 3: Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards](#);
- Make arrangements for the regulatory body to fulfil its responsibilities during nuclear and radiological emergencies.

How does the IRRS continue to evolve and add value to the international regulatory community?

Considering the feedback collected from IRRS missions and related activities as well as from the periodic analysis of missions' observations, the IRRS team regularly reviews and updates the IRRS scope,



Fukushima Daiichi Nuclear Power Plant site visit during the preparatory meeting for the follow-up IRRS mission to Japan in 2019 (Photo/TEPCO)



Presentation of findings during the follow-up IRRS mission to Belarus in 2021 (Photo/Gosatomnadzor)

processes, implementation modalities and materials to make sure the service remains relevant, effective and aligned with the Member States' needs and expectations.

Continuous efforts are in place to improve the delivery of IRRS by fostering complementarities and synergies with other peer review services. For instance, the IRRS Module 10 which focuses on Emergency Preparedness & Response is closely coordinated with the IAEA Incident and Emergency Centre (IEC) to avoid any unnecessary duplication between the IRRS and the Emergency Preparedness Review (EPREV). Likewise, Module 11, which focuses on the Interfaces with Nuclear Security, is closely coordinated with the IAEA Division of Nuclear Security to avoid overlaps between the IRRS and the International Physical Protection Advisory Service (IPPAS).

In addition, at the request of some Member States, extensive work was carried out to optimize the delivery of IRRS and the Integrated Review Service for Radioactive Waste and Spent Fuel Management, Decommissioning and Remediation (ARTEMIS). Considering

the lessons learned from a [combined IRRS-ARTEMIS mission in 2018](#), the IAEA is currently working in cooperation with Member State representatives on 'back-to-back' IRRS-ARTEMIS missions which are organized and conducted in a coordinated manner and separated by only few months. This implementation modality is designed to avoid overlaps and promote consistency through the effective exchange of relevant information as well as selecting the same peer review team expert for the review topics common to both missions.

This continuous improvement process would not be possible without the generous extrabudgetary contributions of our donors, particularly the European Commission (EC) and the US Department of State.

How can an IRRS be requested?

A formal governmental request is made by the host country to the IAEA Deputy Director General and Head of the Department of Nuclear Safety and Security, usually 2–3 years before the proposed date of the IRRS mission.



International experts conducting interviews during the follow-up IRRS mission to Switzerland in 2021 (Photo/IAEA)

What does the IRRS process entail?

The IRRS process consists of the following phases:



- **Preparatory Phase, including Self-Assessment** – An open dialogue between the IAEA Coordinator and the host country Liaison Officer is established to discuss the scope, expectations and logistics of the IRRS mission. The IAEA encourages hosts countries to include all regulated facilities and activities in the mission's scope.

In preparation for the mission, the host country is requested to conduct a comprehensive self-assessment using the [Self-Assessment of Regulatory Infrastructure for Safety \(SARIS\) methodology](#) and associated software. When the scope of the mission also covers Module 12, the tailored module for countries embarking in a nuclear power programme, the host country is requested to conduct a self-assessment using the [Integrated Review of the Infrastructure for Safety \(IRIS\)](#). The outputs of the self-assessment(s) form the basis for the Advance Reference Material (ARM), which is provided to IRRS reviewers prior to the mission to get them well acquainted with the national governmental, legal and regulatory framework. This phase can take several months to complete but the actual duration will depend on the scope of the mission and the availability of information and resources.

- **IRRS Mission** – During the IRRS missions, which usually last between 9 to 15 days depending on the scope of the mission, the IRRS team will extensively collect and verify key information on the national regulatory responsibilities, functions and activities through (1) the review of written material, (2) interviews with personnel and other officials and (3) direct observation of activities at the regulatory body office and during site visits to regulated facilities. Through this process,



Team discussions during the follow-up IRRS mission to Armenia in 2019 (Photo/IAEA)

opportunities for improvement are explored and potential enhancement strategies identified. The main insights and observations on technical and policy issues are included in the Preliminary IRRS Report and presented to the host country before the end of the mission.

- **Post Mission Activities** – The host country will start the implementation of the recommendations and suggestions included in the final IRRS mission report. In the interest of openness, host countries are encouraged to make their IRRS mission reports public.
- **Follow-up Mission** – An IRRS follow-up mission is aimed at reviewing the national progress achieved through the implementation of the recommendations and suggestions included in the IRRS Report. A formal government request should be made nine months before the proposed date of the follow-up mission. It is suggested that it takes place two to four years after the initial mission.

Who participates in IRRS missions?

The IRRS team is composed of an IAEA coordinator, a senior regulator assigned as Team Leader and an international team of senior regulatory experts assigned as reviewers (typically 10 to 20 depending on the scope and complexity of the mission). The reviewers are selected and recruited, in consultation with the host country, considering their broad knowledge on the regulation of nuclear and radiation safety and their extensive related experience, often in specialized areas. The IAEA periodically conducts training activities for IRRS reviewers to help maintain a consistent approach to missions and to refresh their overall knowledge on the IRRS process before participating in a mission.

How often should an IRRS be hosted?

It is suggested that Member States host an IRRS initial mission every 10 years and a follow-up mission no later than 4 years after the initial mission.

Are there any prerequisites to host an IRRS?

Member States that have invited an IRRS mission must prepare thoroughly following the SARIS methodology which includes conducting a comprehensive self-assessment using [eSARIS](#) and, when appropriate, IRIS, and developing a national action plan based on the self-assessment results.

It is important to note that the [IAEA peer reviews and advisory services](#), such as IRRS, do not constitute a design certification, licensing or supervisory activity, nor do they constitute a regulatory inspection or an audit against national codes and standards. The review process focuses only on the specific area requested by the Member State. These services support the strengthening of national safety and security infrastructure whilst recognizing that the responsibility for nuclear safety and security rests entirely with the Member State.



Entrance meeting during the initial IRRS mission to Norway in 2019 (Photo/IAEA)



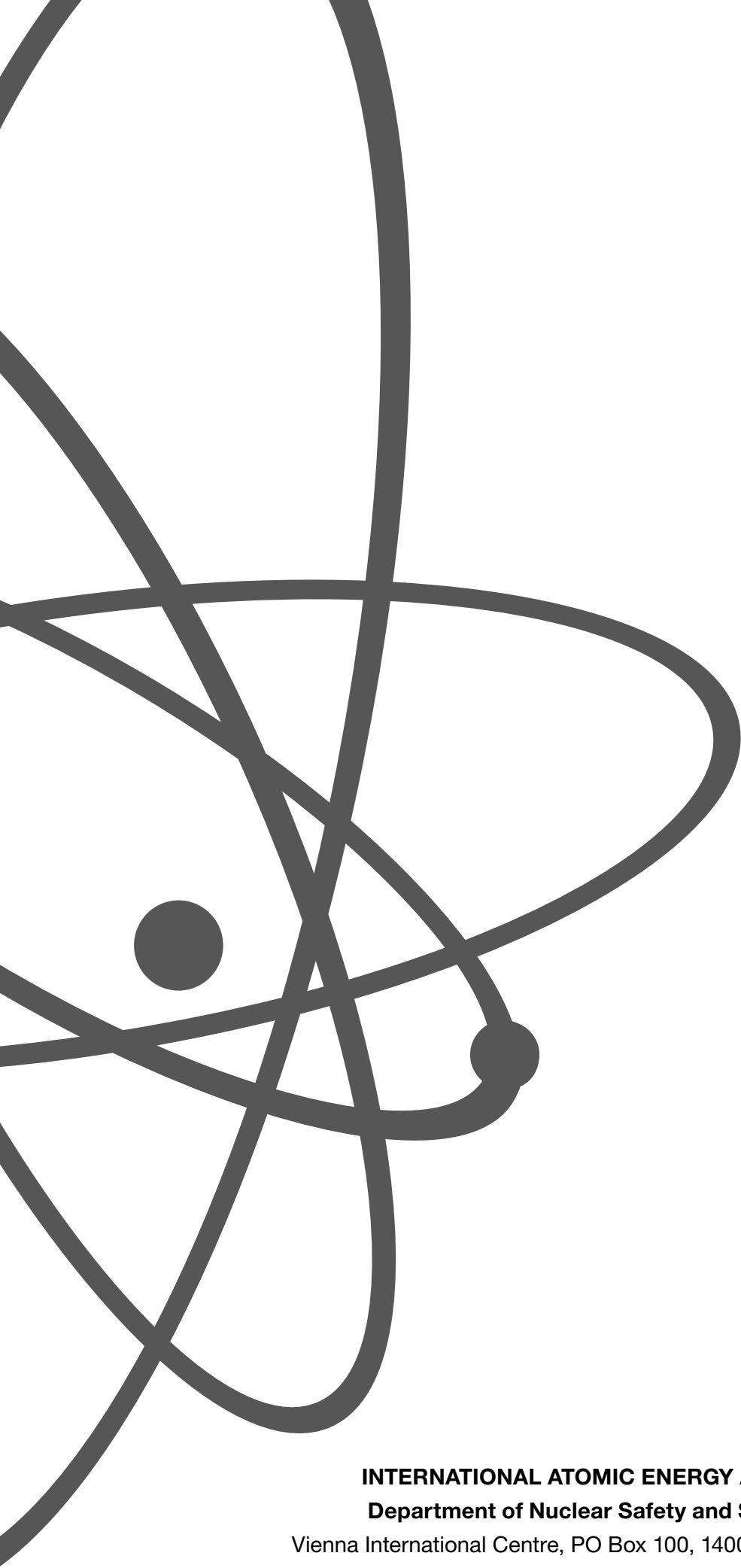
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More information and point of contact

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