

# Introduction

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During the second half of the twentieth century, France actively pursued the development of a large-scale nuclear program. This civil and military program now encompasses the entire nuclear fuel cycle, the majority share of electricity production (Figure 1), and numerous test and research facilities. Alongside this nuclear program, we should also mention the widespread use of radioactive sources in a very broad range of activities, including industry, medicine, research, the agri-food industry and education. All these facilities and activities have one thing in common: they involve the use of fissile or fertile materials. The risks associated with such activities are managed within the framework of the French State's responsibility toward its citizens and also toward the international community.

Nuclear facilities and activities carry specific risks since, by definition, they all involve the use of various quantities of radioactive products. Moreover, these products can cause exposure to ionizing radiation and its consequences to workers, the public and the environment.

In the nuclear energy sector, protecting workers, members of the public and the environment is primarily based on safety and radiological protection measures. These measures are designed to prevent events within facilities resulting from human error or equipment failure and events occurring outside facilities, and to mitigate the consequences of any event that does occur in spite of the preventive measures implemented. In addition to prevention and mitigation measures, there are security provisions designed to prevent any action by terrorists or malicious persons and, if necessary, to reduce the consequences. Implementation of all these security provisions is based on the public authorities and the nuclear operators sharing responsibilities.

The international community now considers terrorism to be a major concern. Managing nuclear and radiological security in view of the risk of terrorism or malicious



Figure 1. Tricastin nuclear site and the surrounding area, France. © Geneviève Baumont/IRSN.

acts, together with ensuring the non-proliferation of weapons of mass destruction, are subjects of prime concern for our society. Given the changing nature of the threat at international level, the multiplication of international instruments designed to protect against these risks, and the revision of France's security regulations in 2011, these are sensitive issues, which are subject to change and must be tackled. In this context, it is essential to note that nuclear security concerns should be seen in relation to nuclear safety concerns since the risk to the public and to the environment is the same regardless of whether the initiating event leading to a radiological release is due to natural causes, equipment failure or a malicious act.

There are in fact two aspects to protection against terrorism and malicious acts: first, the measures taken to ensure nuclear security, and second, the measures taken to prevent the proliferation of weapons of mass destruction. Bearing this in mind, when we speak of nuclear security, we mean protecting nuclear and radioactive material, nuclear facilities and the transportation of nuclear material, against malicious acts, a concept that encompasses the theft and diversion of nuclear materials and acts of sabotage. Preventing the proliferation of weapons of mass destruction implies security in the nuclear and chemical fields.

Rather than merely describing current approaches to security and non-proliferation, this work gives a partly historical account which emphasizes how these approaches have changed and the dynamics involved. It contains four chapters dealing, in order, with:

- security of nuclear material, nuclear facilities and the transportation of nuclear material,

- security of radioactive sources,
- non-proliferation in the nuclear field,
- non-proliferation in the chemical field.

Each chapter is structured as follows:

- context and historical background,
- the international framework,
- organization in France,
- the specific role played by IRSN, the French Institute for Radiological Protection and Nuclear Safety.

Definitions needed to understand the different subjects are given, together with the principles and rationale underlying the approaches to security and non-proliferation. Particular emphasis is laid on risk management. Details of the national and international regulatory organizations are also given, together with information on the bodies and entities involved in these areas. Diagrams and photographs are included to illustrate the different chapters, together with some specific developments intended to clarify certain technical points. IRSN's input in these areas is presented in a "Focus" section.