IRSN
INSTITUT
DE RADIOPROTECTION
ET DE SÛRETÉ NUCLÉAIRE

EFECTIVE PHYSICAL PROTECTION SYSTEM IN FRANCE

Nuclear Defense Expertise Division

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Summary

- **Regulations**
- **Inspection**
- **Exercise**
- **Security culture**

Regulations

French national control system

Two actors :

- **the Competent authority** :

  Ministry of energy : High civil servant for defense and security

- **Its technical support :**

  Institut for radioprotection and nuclear safety

French national control system

A set of regulations: Code of defence (law) and related application texts

- to prevent loss, theft or diversion of nuclear materials
- in compliance with non proliferation rules set up by the IAEA

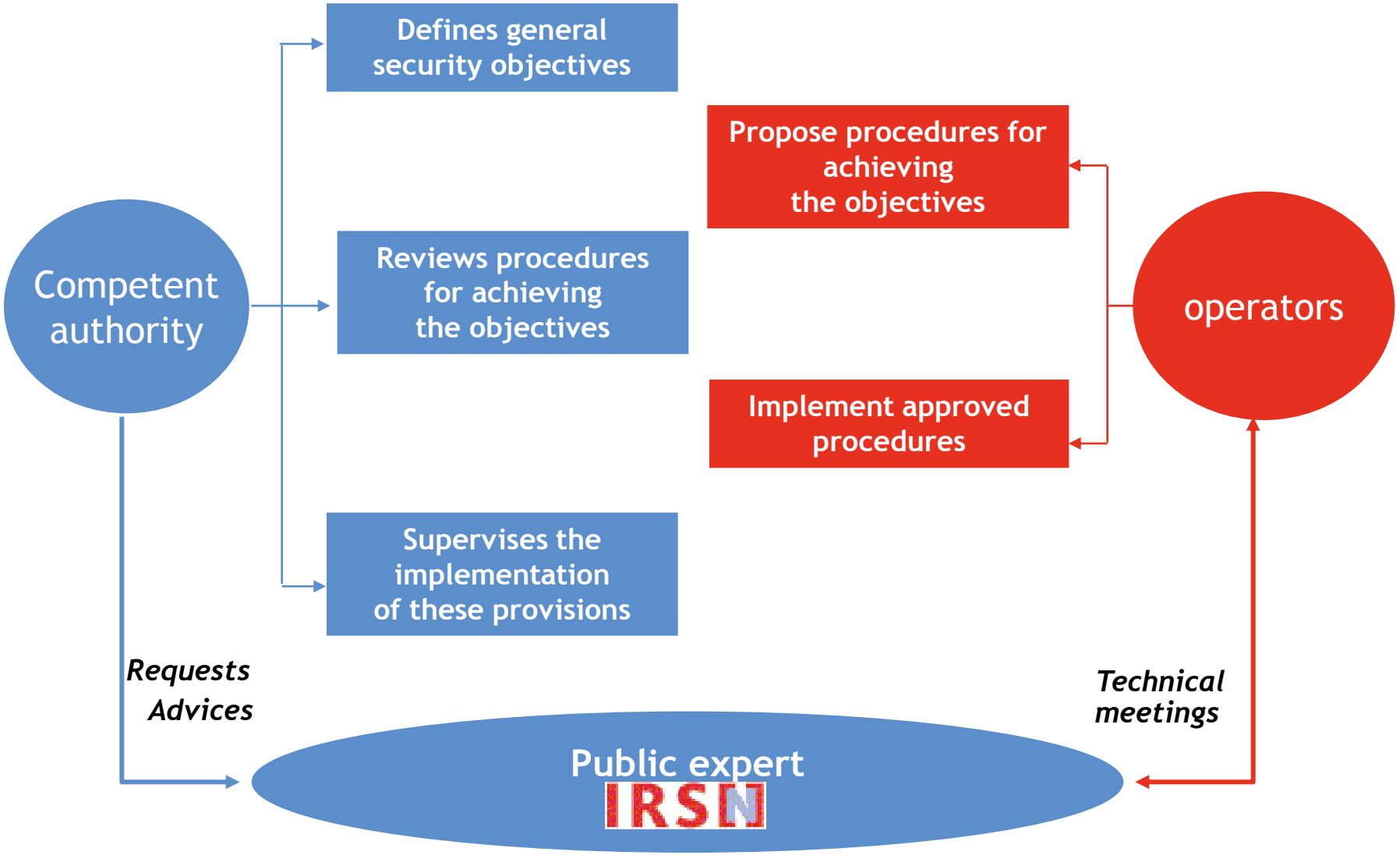
A set of complementary measures:

- physical protection measures
- nuclear management and accounting measures
- control measures (inspections)

The involvement of competent authorities and operators:

- performance based approach
- first responsibility of the operators
- control by competent authorities

Responsibilities



French national control system

3 key words in the law

- **Licensing:** prior authorization is required to exercise nuclear materials import, export, storage, transfer, use and transport activities
- **Control:** verification procedures concern administrative, technical and accounting aspects
  Control is carried out firstly by the operator and secondly by the Authority
- **Sanctions:** penal sanctions could punish improper possession of nuclear materials , unauthorized activities, obstruction of the performance of control, failure to declare the loss,…

French national control system

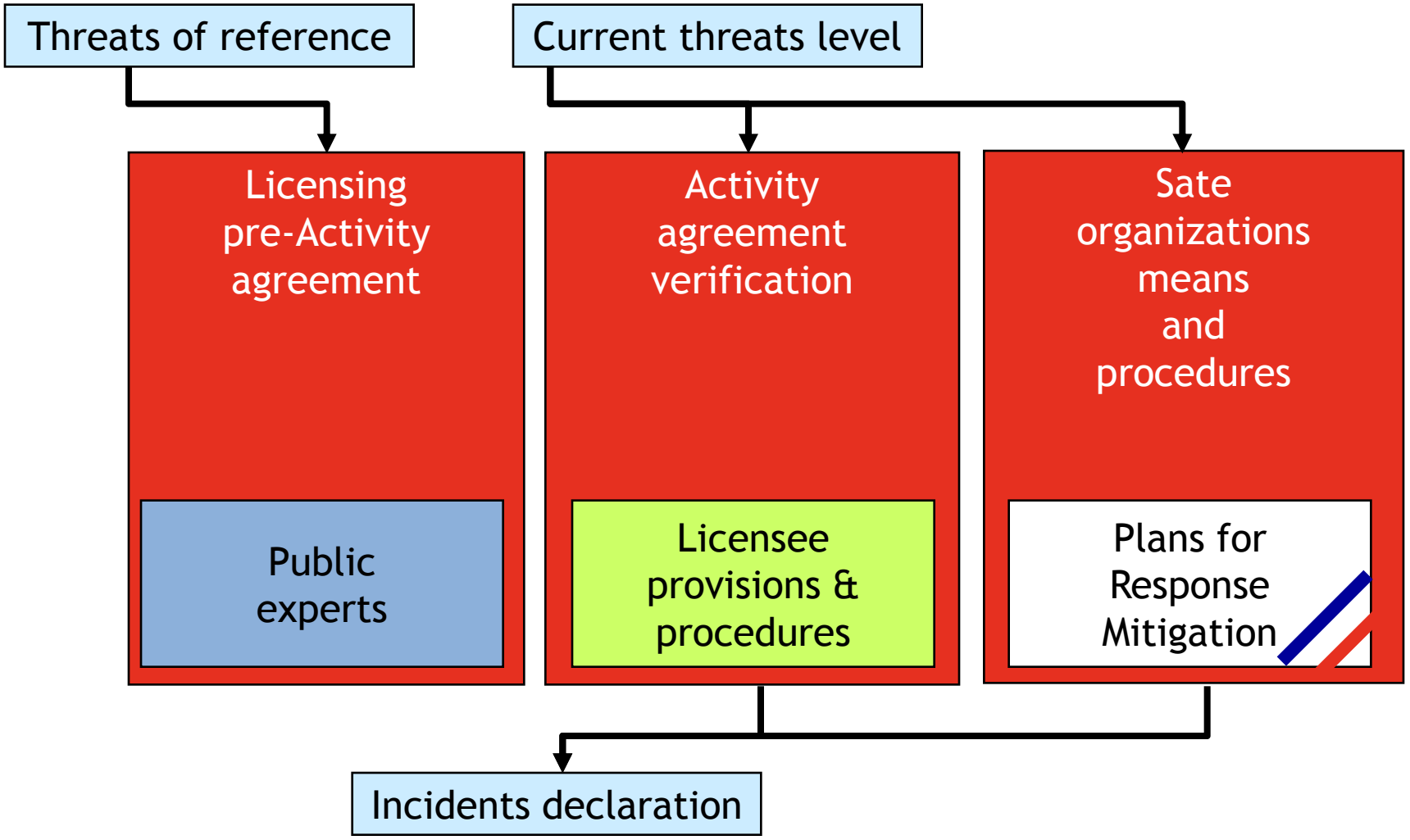
3 regimes

- **Licensing:** the requirement to obtain a prior authorization from the Authority, on the basis of a file
- **Declaration:** the obligation to declare the stock of NM to the Authority annually
- **Exemption:** No specific obligation, but the quantities of NM held must remain below the specified thresholds

6 materials

- Plutonium, Uranium, Thorium, Deuterium, Tritium, Lithium 6

A system addressing all stages



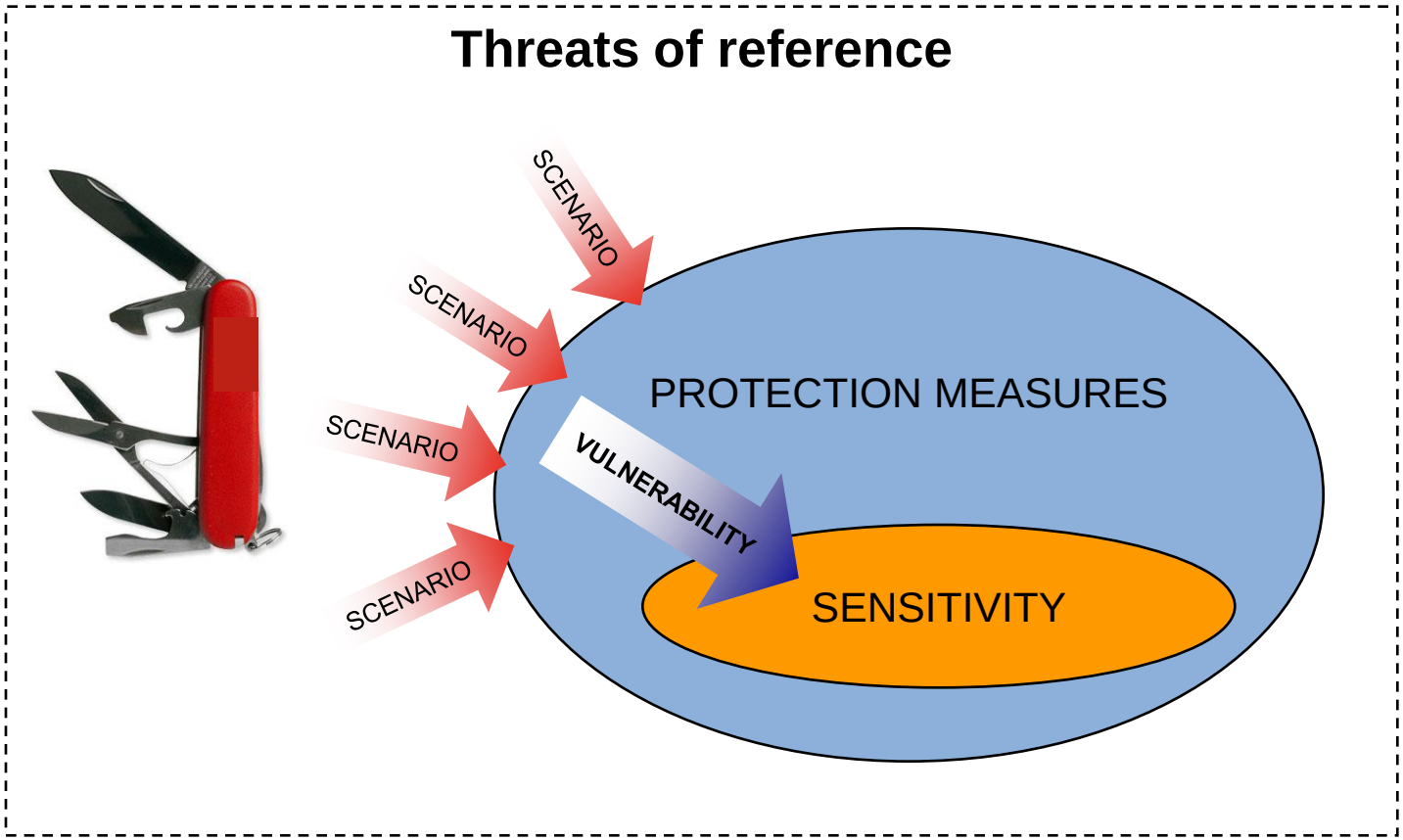
3 Categories of physical protection

MATERIAL	CATEGORIE I	CATEGORIE II	CATEGORIE III
Plutonium (All isotopes)	Pu ≥ 2 kg	2 kg > Pu > 400 g	400 g ≥ Pu > 3 g
Uranium $U_5 \geq 20\%$	$U_5 \geq 5$ kg	5 kg > U_5 > 1 kg	1 kg ≥ U_5 > 15g
Uranium $20\% > U_5 \geq 10\%$		$U_5 \geq 5$ kg	5 kg > $U_5 \geq 1$ kg
Uranium $10\% > U_5$			$U_5 \geq 5$ kg
Natural Uranium Depleted Uranium Thorium			U ≥ 500 kg Th ≥ 500 kg
Uranium 233	$U_3 \geq 2$kg	2 kg > $U_3 \geq 400$ g	400 g > $U_3 \geq 3$ g
Deutérium	Material control and accounting measures		
Tritium	$H_3 \geq 5$ g	5 g > $H_3 \geq 2$ g	
Lithium			$Li_6 \geq 1$ kg
Spent fuel		All spent fuels	

Physical protection system

- Deter
- Detect
- Alert
- Delay
- Respond
- Recover
- Mitigate

protection : equation with threat, sensitivity and vulnerability



Security studies

Area concerned:

- Installations holding category 1 nuclear material

Assessment of the efficiency and the reliability of the measures implemented to prevent the theft of plutonium or enriched uranium

Two complementary aspects:

- Physical Protection: analysis of events allowing access to nuclear material and their removal from their storage location and out of the facility

  Estimation of detection, delay and response times

- Management and Accountancy: analysis of the ability of management and accounting systems to detect loss or theft of nuclear material (in terms of quantity and time needed) as well as possible falsification

  Estimation of quantities upon detection time

Security studies (continue)

Main threats:

Regular and undetected theft of small quantities of nuclear material by an official with regular access to nuclear material

Theft of a significant amount of nuclear material in a single operation by an official with regular or irregular access to nuclear material

Theft of a significant amount of nuclear material by a group of outside attackers

Principles behind the measures

The study should show that the objectives fixed by the authorities have been achieved.

The conclusions should identify and quantify any possible weaknesses in current arrangements.

The study should look at the various operating period of the facility (such as working hours, maintenance periods and dealing with accidents).

The study governs the licensing for operating category 1 storage.

Inspections / exercises

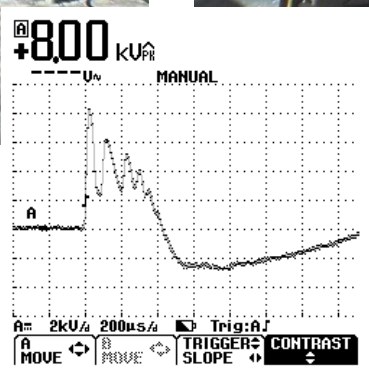
Inspections

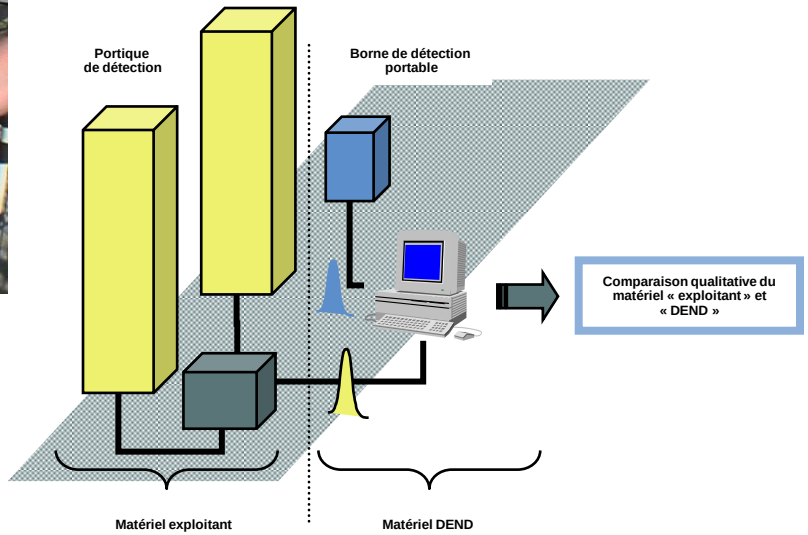
Inspections :

- **field inspections**
- **scheduled or unannounced**
- **standard or worksite inspections**
- **compliance with the reference framework by the nuclear licensees**

Inspection with measuring operations

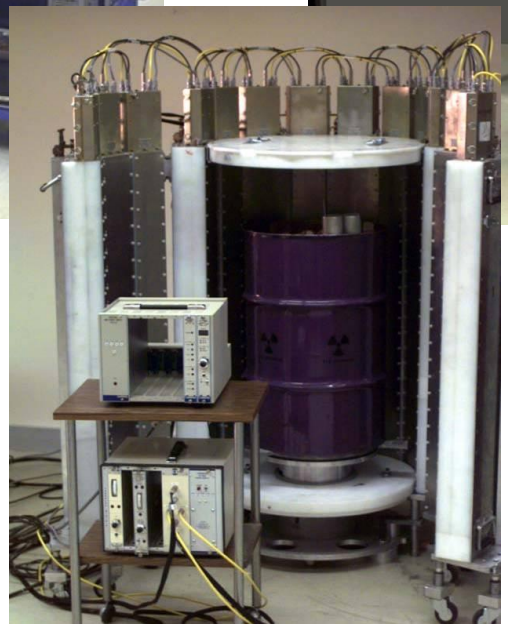
physical protection

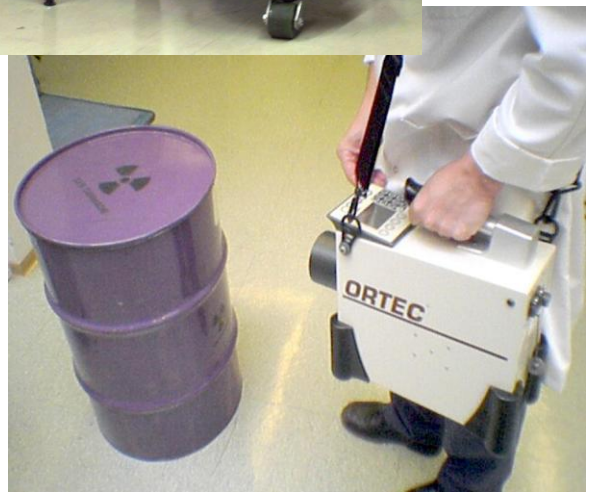




Inspection with measuring operations

Nuclear material





Exercises

Exercise at local level

Frequency : 4 to 6 per site and per year

Involved entities : on site response forces and personnel implied in security matters

Scope :

- Test of intervention procedures
- Simulation of an internal threat
- Detection of an explosive device
- …

Frequency : 1 per site and per year

Involved entities : on site and off site response forces

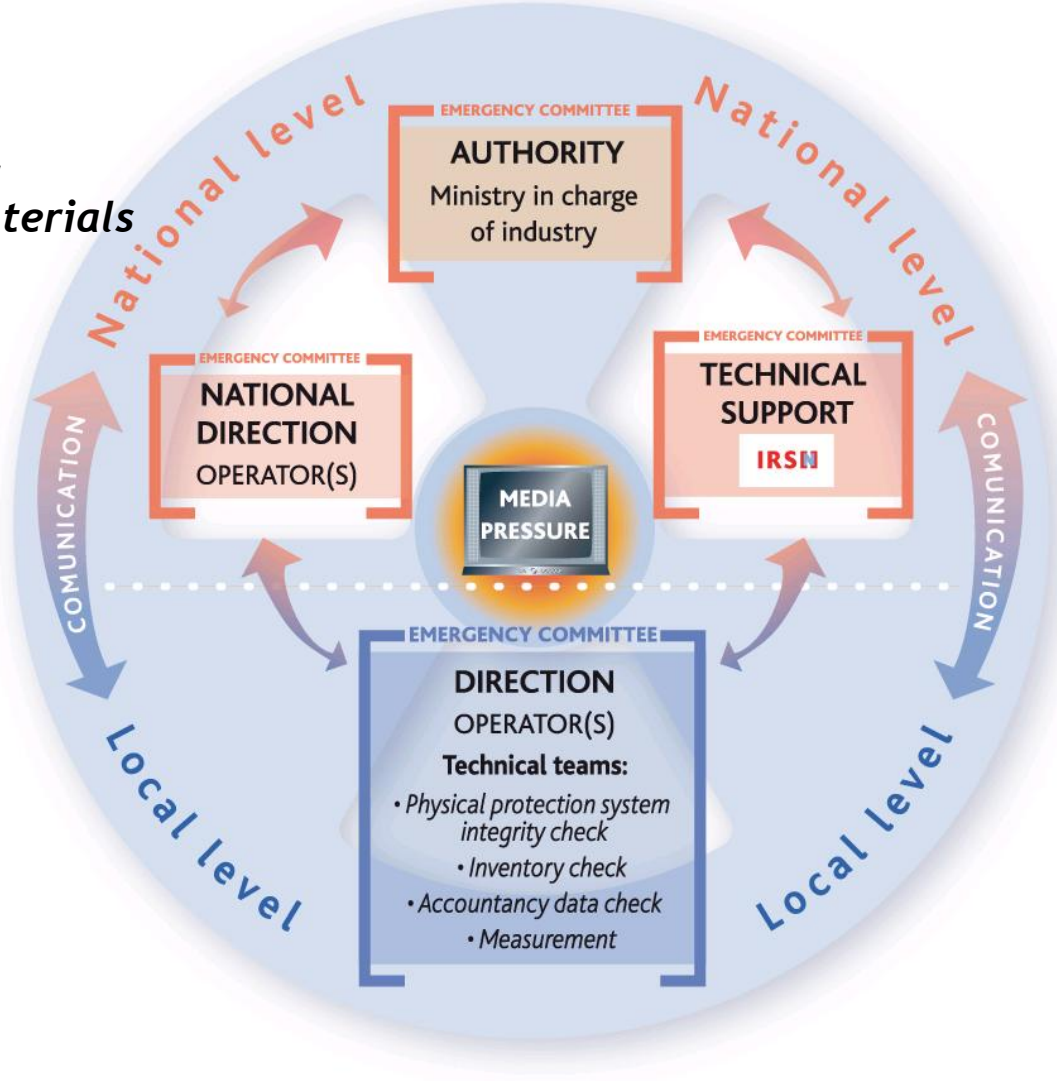
Scope :

- Test of intervention procedures
- Response to counter outsiders
- Management of interfaces between on site and off site response forces
- …

Exercise at national level

Scope :

"the Ministry of Industry can order a physical inventory of nuclear materials and compare it with audited records under all circumstances".



Frequency :
1 per year for all sites

Exercise at national level

Physical protection

Frequency : 1 per year for all sites

Involved entities :

- The operator
- Local and special law enforcement agencies
- Local and national authorities

Planning (about 1 year of preparation)

Working groups :

- Scenario
- Logistics
- Experience data

Security Culture

Security culture

State commitment

Define protection objectives
Define responsibilities
Information protection system

Define a security policy
Management organization
Provide adequate resources
Vigilance

Organization commitment

Management commitment

Define responsibilities
Define and verification of measures
Qualification and formation
Reward / Sanction
Audit, assessment, comparison
Exemplar attitude

Cautious and strict approach
Vigilance et questioning mind
Quick reaction time

Individual commitment of involved people

Individual commitment of non directly involved people

Principle
Procedure awareness and respect
Curious mind