French Organizational Response Framework

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Forewords

- Who is the IRSN?

INSTITUT DE RADIOPROTECTION
ET DE SÛRETÉ NUCLÉAIRE

RÉPUBLIQUE
FRANÇAISE
Liberté
Égalité
Fraternité

IRSN IS THE PUBLIC EXPERT ON NUCLEAR AND RADIOLOGICAL RISKS

NUCLEAR SAFETY AND SECURITY

Reactors, fuel cycle, waste management, transport of radioactive materials, radioactive sources.

PROTECTION OF THE POPULATION AND THE ENVIRONMENT

Against the risks associated with ionizing radiation.

Research

Expertise

Forewords

- Main missions of the IRSN
  INSTITUT DE RADIOPROTECTION ET DE SÛRETÉ NUCLÉAIRE

Summary

1. French National Response Organization (in brief)
2. Protective Actions Strategies
3. Mission and Organization of the IRSN Response
4. A Few Words about Exercises

1 French National Response Organization

French national response plan to nuclear or radiological accidents

http://www.sgdsn.gouv.fr/files/files/Nos_missions/plan-national-nucleaire-fevrier2014-anglais.pdf

- The National Response Plan addresses the different aspects of crisis management:
  - **governance** at national level and its link with the territorial level
  - **coordination** at European and international levels
  - **assessment and anticipation** of the situation
  - **protecting populations** from exposure to radioactivity
  - **health care** for victims and care for people who may have been exposed to radioactivity
  - early implementation of the measures required for **post-accident management** and recovery
  - **informing and communicating** with the population
  - managing the flow of people and **maintaining law and order**
  - **socio-economic continuity**

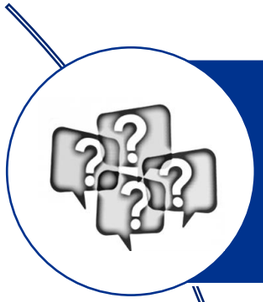
(published in 2014, now under revision)

French national response plan to nuclear or radiological accidents

1 RESPONSE STRATEGIES AND PRINCIPLES P. 06

2 DECISION-MAKING GUIDE P. 50

- **8 generic situations**
- **+40 factsheets** guiding how response is to be conducted



Situations of Uncertainty

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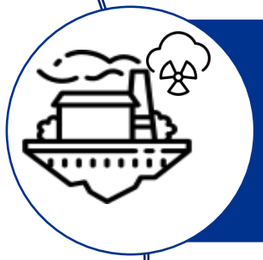
- Rumours
- Increase of measured radioactivity
- Suspicion of an accident
- …



Situations on a Fixed Installation

1-2-3

Distinction of situations following:
- kinetic of the release (early/delayed, short/long)
- order of magnitude of the potential consequences regarding planned distances

Situations on a Transport

4-7

- Accident during the Transport of radioactive materials on the french territory
- Distinction of accident occuring on the land or offshore

Situations Abroad

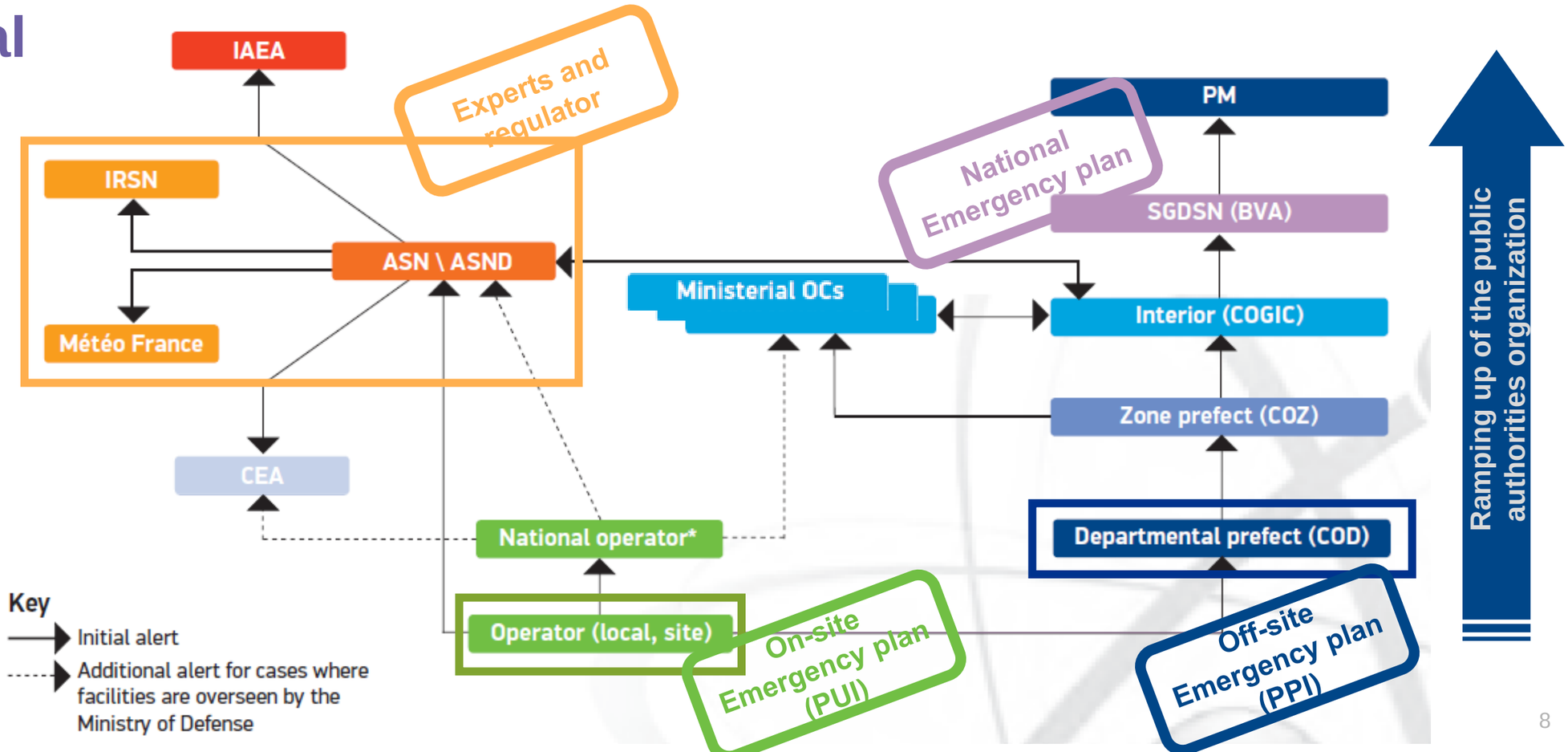
5-6

- Facility or transport accident abroad
- Distinction of situations following potential consequences on the french territory
- French residents abroad to be addressed

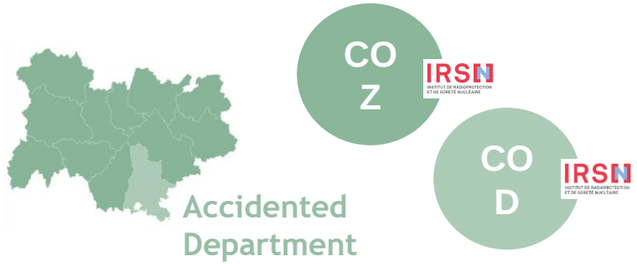
French national response plan to nuclear or radiological accidents

- Alert and mobilization

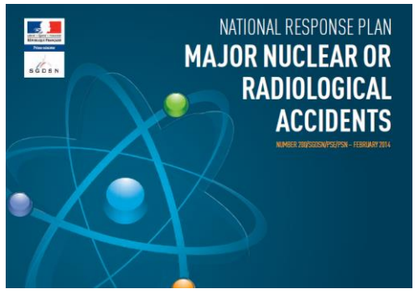
- **On-Site Plan (PUI)** activated → operator must notify and inform the **Prefect**, report to the **regulator** and the **IRSN** which serves as technical adviser
- The on-site plan activates the **Off-Site Plan (PPI)** but do not necessarily implies protective measures

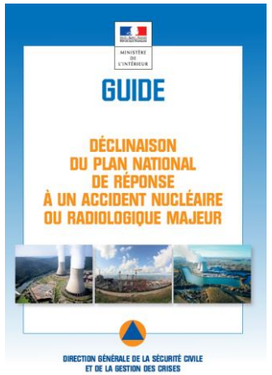


French national response plan to nuclear or radiological accidents – Local level



- The French general crisis-management relies primarily on departmental resources
- **At the local level, the COD conducts the crisis management**
  - The Prefect is the decision-maker, responsible for the protection of the public
- Off-site plan (**PPI**)



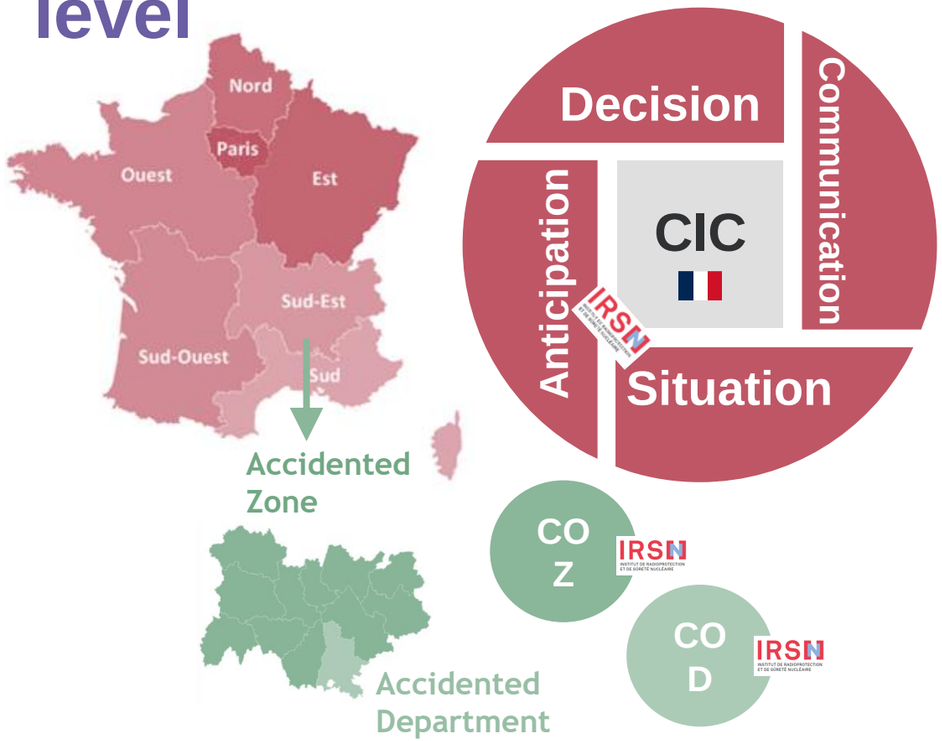


- Gather local governmental/ministerial representatives
  - Civil security, Police forces, industry/equipment/transport, health, agriculture/forest, education/school, justice,…
  - +Experts **IRSN/ASN(D)**, Operator

- COD can be supported by COZ and national OC's (escalade process)

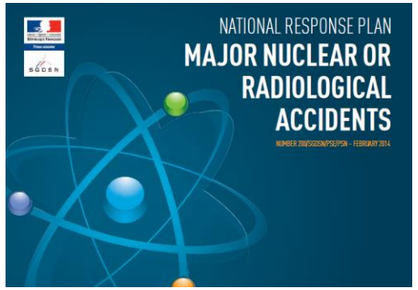
French national response plan to nuclear or radiological accidents – National level

- **At top national level, the Interministerial Crisis Unit (CIC) conducts the crisis management**
- Experts such as IRSN project representatives to the CIC



	National			International
POLITICAL STRATEGIC DECISION	**Prime minister** in liaison with the President of the Republic, political and strategic decisions			International representatives INFORMATION COORDINATION ASSISTANCE
COORDINATE	**Designated minister in charge of the emergency** management and cross-ministerial coordin Emergency cross-ministerial committee	Nuclear dedicated entities		AIEA Europe Safety Authorities State Nuclear experts
	Sector-specific plans and organisations ministries emergency centre and competent entities		Safety Authorities State IRSN experts Dedicated civil defence entities and means	
IMPLEMENT	**Territorial planning**			
	Regional and local actors plans			
	Nuclear operators plans			

2 Protective Actions Strategies



Overall strategy

- Protection is ensured by the ability to:
  - promptly alert the public in the areas of concerns
  - Effectively provide truthful information and clear orders

FR-Alert

- Management of the consequences of exposure to a release relies on a set of protective measures:

✓ Evacuation

✓ Shelter-in-place

✓ Stable-iodine prophylaxis (release of radioiodine)

✓ Banning of food consumption

✓ Banning of food distribution, goods

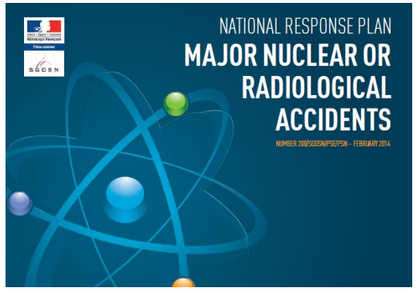
✓ Relocation

✓ Others

- Reference levels:

✓ Emergency phase: 100 mSv Effective dose

✓ Post-accident phase: 20 mSv Effective dose /year, re-evaluation each year, aiming to achieve 1 mSv



Overall strategy

- Protection is ensured by the ability to:
  - promptly alert the public in the areas of concerns
  - Effectively provide truthful information and clear orders

- Consequences of exposure to an atmospheric release are mitigated by orders of:
  - **Evacuation**

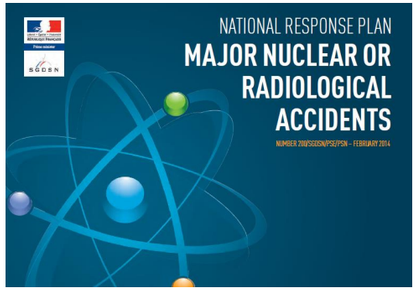
    - ✓ As far as possible before the release occurs or while it is still minor
    - ✓ Prevent disorganized auto-evacuations
    - ✓ Centres for evacuees are preidentified
    - ✓ Avoid any need for evacuees to move again or to be affected by other protective measure
    - ✓ Continuity of some activities/industries whilst reducing worker exposure

  - **Shelter-in-place**

    - ✓ Prompt to set up
    - ✓ Particularly adapted when the release occurs quickly and is of short duration - Sheltering can only be a ‘short term’ measure
    - ✓ Can be used prior to an evacuation
    - ✓ Avoiding cliff effect: shelter along the edges of evacuation area

  - **Stable-iodine prophylaxis** (release of radioiodine)

    - ✓ Efficiency sensitive to the time of intake compared to the time of exposure
    - ✓ Several successive intakes may be decided
    - ✓ ITB might be combined with Sheltering



Overall strategy

- Protection is ensured by the ability to:
  - promptly alert the public in the areas of concerns
  - Effectively provide truthful information and clear orders

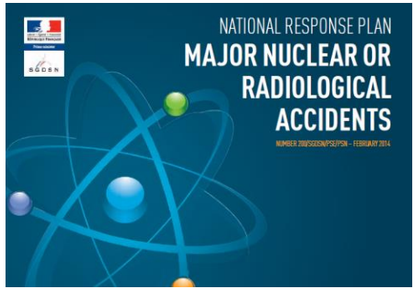
FR-Alert

[cont'd]

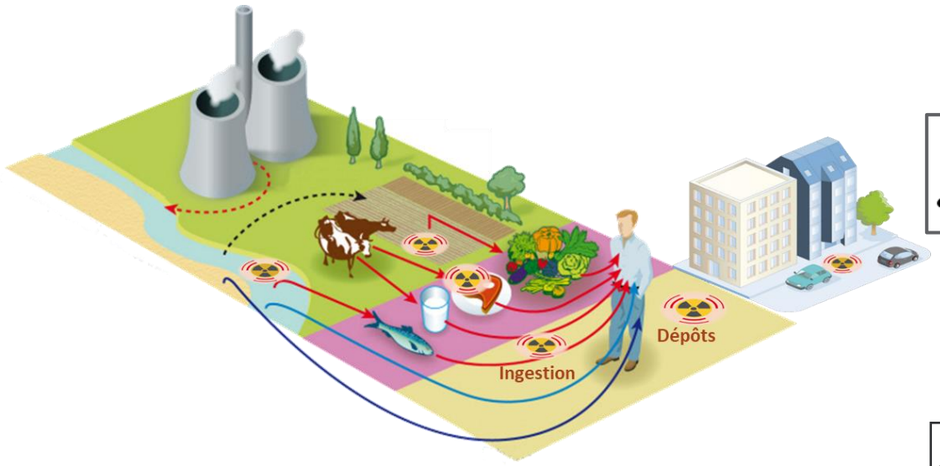
- Consequences of exposure to an atmospheric release are also mitigated by orders of:

  - **Banning of fresh food products consumption and distribution**
    - ✓ As soon as the release is ongoing or becomes unavoidable

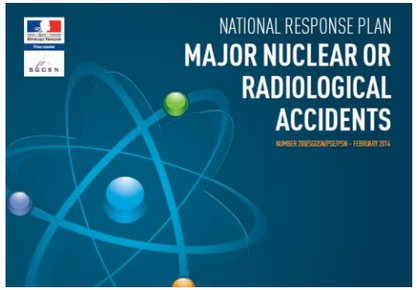
  - **Other actions**
    - ✓ Checkpoints along the protective measures areas are immediately set up
    - ✓ Avoiding cliff effect: next to areas concerned by protective measures, recommend to limit outdoor activities, to wash clothing, to clean communal areas…
    - ✓ Precautionary orders to cancel public events, to divert road/rail flows…
    - ✓ …



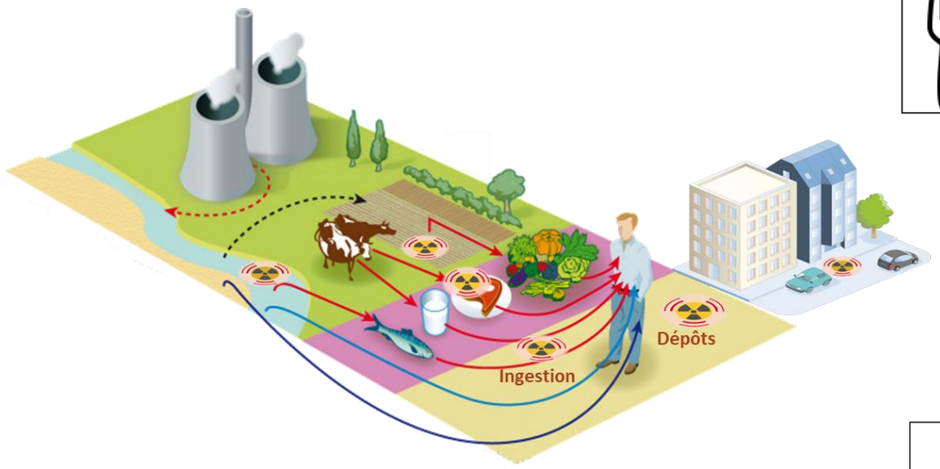
Overall strategy



- Protection of people faced to deposits related to prior releases is managed through a **post-accident zoning**
  - ✓ First post-accident zoning established based on reasonably conservative predictive modelling in order to pre-emptively manage the foreseeable consequences
  - ✓ Zones would be then reassessed over time based on the increased knowledge in actual contamination levels
- Public exposure related to existing deposits are mitigated by orders of:
  - **Relocation**
    - ✓ High socio-economic drawbacks
    - ✓ Continuity of some activities/industries whilst reducing worker exposure
  - **Banning the consumption of fresh foodstuffs**
    - ✓ Self-produced vegetables, hunting, fishing…
    - ✓ Consumption of tap water still authorized, except in the case of proven impacted water resources/facilities

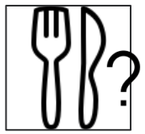


Overall strategy

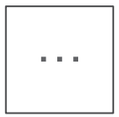


- Public exposure related to existing deposits are mitigated by orders of:

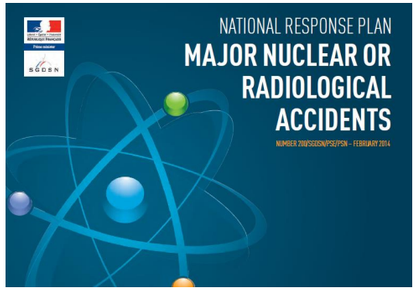
- **Banning the distribution of crops, foodstuffs, goods…**
  - ✓ Conformity with the regulatory maximum permitted levels
  - ✓ Sequestration of productions in an envelope zone where MPLs might be exceeded
  - ✓ Progressive Lift based on the results of clearance radioactivity measurements



- **Recommendations for dietary practices**
  - ✓ Precautionary and optimization purposes
  - ✓ Reminding of good dietary practices, based on a diversified diet that may include locally-produced foods
  - ✓ Measurement of radioactivity levels before consumption might be proposed



- **Other actions**
  - ✓ Decontamination actions and related waste management
  - ✓ Restrictions for accessing areas where radioactive substances tend to build-up (forests…)
  - ✓ …



Overall strategy

- Strategy for **health topics** consist of four objectives:

- **Treat the wounded and other medical emergencies**

- **Conduct a census and control of the people affected by the accident**
  - ✓ Checks/decontamination for external contamination,
  - ✓ Measurement of internal contamination, to be conducted as early as possible
  - ✓ Priorities may be set depending on the circumstances
  - ✓ Implementation of individual therapeutic measures
  - ✓ Retrospective assessment of individual doses required

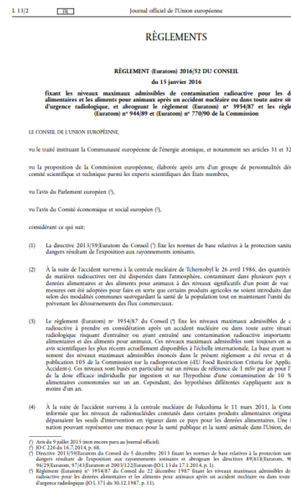
- **Set up short- and long-term psychological counselling**

- **Set up epidemiological monitoring of affected people**

Urgent protective actions indicators and guide-levels

- Projected effective dose
  - ✓ 50 mSv
- Projected effective dose
  - ✓ 10 mSv
- Projected Thyroïd eq. dose
  - ✓ 50 mSv
- Maximum permitted levels (MPLs)

EURATOM 2016/52



L 13/2 EN Journal officiel de l'Union européenne 20.1.2016

RÈGLEMENTS

RÈGLEMENT (Euratom) 2016/52 DU CONSEIL
du 15 janvier 2016

fixant les niveaux maximaux admissibles de contamination radioactive pour les denrées alimentaires et les aliments pour animaux après un accident nucléaire ou dans toute autre situation d'urgence radiologique, et abrogeant le règlement (Euratom) n° 3954/87 et les règlements (Euratom) n° 944/89 et (Euratom) n° 770/90 de la Commission

LE CONSEIL DE L'UNION EUROPÉENNE,

vu le traité instituant la Communauté européenne de l'énergie atomique, et notamment ses articles 31 et 32,

vu la proposition de la Commission européenne, élaborée après avis d'un groupe de personnalités désignées par le comité scientifique et technique parmi les experts scientifiques des États membres,

vu l'avis du Parlement européen (1),

vu l'avis du Comité économique et social européen (2),

considérant ce qui suit:

(1) La directive 2013/59/Euratom du Conseil (3) fixe les normes de base relatives à la protection sanitaire contre les dangers résultant de l'exposition aux rayonnements ionisants.

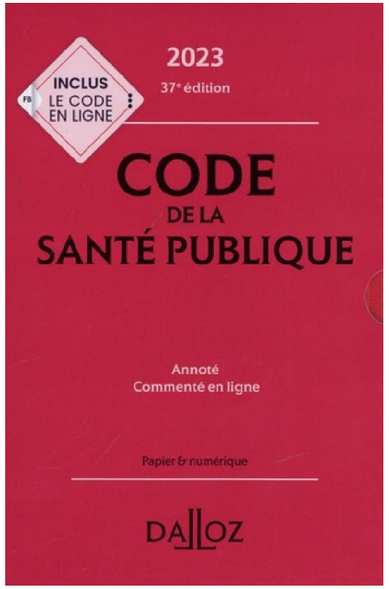
(2) À la suite de l'accident survenu à la centrale nucléaire de Tchernobyl le 26 avril 1986, des quantités considérables de matières radioactives ont été dispersées dans l'atmosphère, contaminant dans plusieurs pays européens des denrées alimentaires et des aliments pour animaux à des niveaux significatifs d'un point de vue sanitaire. Des mesures ont été adoptées pour faire en sorte que certains produits agricoles ne soient introduits dans l'Union que selon des modalités communes sauvegardant la santé de la population tout en maintenant l'unité du marché et en prévenant les détournements des flux commerciaux.

(3) Le règlement (Euratom) n° 3954/87 du Conseil (4) fixe les niveaux maximaux admissibles de contamination radioactive à prendre en considération après un accident nucléaire ou dans toute autre situation d'urgence radiologique risquant d'entraîner ou ayant entraîné une contamination radioactive importante des denrées alimentaires et des aliments pour animaux. Ces niveaux maximaux admissibles sont toujours en accord avec les avis scientifiques les plus récents actuellement disponibles à l'échelle internationale. La base ayant servi à l'établissement des niveaux maximaux admissibles énoncés dans le présent règlement a été revue et décrite dans la publication 105 de la Commission sur la radioprotection (45): Food Restriction Criteria for Application after an Accident». Ces niveaux sont basés en particulier sur un niveau de référence de 1 mSv par an pour l'augmentation de la dose efficace individuelle par ingestion et sur l'hypothèse d'une contamination de 10 % des denrées alimentaires consommées sur un an. Cependant, des hypothèses différentes s'appliquent aux nourrissons de moins d'un an.

(4) À la suite de l'accident survenu à la centrale nucléaire de Fukushima le 11 mars 2011, la Commission a été informée que les niveaux de radionucléides contenus dans certains produits alimentaires originaires du Japon dépassaient les seuils d'intervention en vigueur dans ce pays pour les denrées alimentaires. Une telle contamination pouvant représenter une menace pour la santé publique et la santé animale dans l'Union, des mesures ont

(1) Avis du 9 juillet 2015 (non encore paru au Journal officiel).
(2) JO C 226 du 16.7.2014, p. 68.
(3) Directive 2013/59/Euratom du Conseil du 5 décembre 2013 fixant les normes de base relatives à la protection sanitaire contre les dangers résultant de l'exposition aux rayonnements ionisants, et abrogeant les directives 89/618/Euratom, 90/641/Euratom, 96/29/Euratom, 97/43/Euratom et 2003/122/Euratom (JO L 13 du 17.1.2014, p. 1).
(4) Règlement (Euratom) n° 3954/87 du Conseil du 22 décembre 1987 fixant les niveaux maximaux admissibles de contamination radioactive pour les denrées alimentaires et les aliments pour animaux après un accident nucléaire ou dans toute autre situation d'urgence radiologique (JO L 371 du 30.12.1987, p. 11).

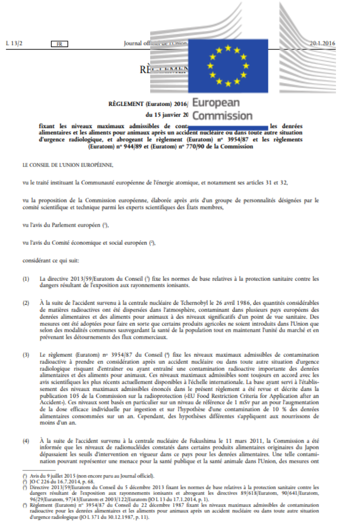
RADIONUCLIDES	BABY FOODS(*)	DAIRY PRODUCE(**)	LIQUIDS INTENDED FOR HUMAN CONSUMPTION(**)	OTHER FOODSTUFFS(**)
Alpha-emitting isotopes of plutonium and transplutonium elements, (notably ^{239}Pu and ^{241}Am)	1	20	20	80
Isotopes of strontium (notably ^{90}Sr)	75	125	125	750
Isotopes of iodine (notably ^{131}I)	150	500	500	2000
All other nuclides of half-life greater than 10 days (notably ^{134}Cs and ^{137}Cs)	400	1000	1000	1250



Post-accident protective actions indicators and guide-levels

- Projected effective dose (except ingestion)
  - ✓ 20 mSv 1st year
- Projected dose (including ingestion)
  - Enveloppe zone between:
  - ✓ Effective: 20 mSv 1st year
  - ✓ or Thyroid: 50 mSv 1st year

- Leafy vegetables contamination
  - ✓ Enveloppe zone for leafy veg. MPLs
- Food and crops contamination
  - ✓ Enveloppe zone for EURATOM 2016/52 MPLs
  - ✓ And management by agricultural sector



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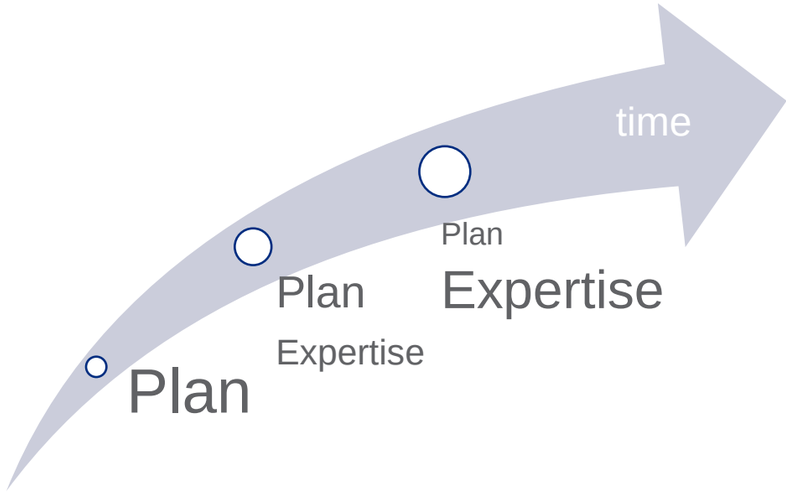
Off-site plans (PPI) - content

- Information on:
  - ✓ The plant & associated hazards,…
  - ✓ Environment and population aspects…
- Operational guidelines to manage the crisis, to decide protective measures, to communicate:
  - ✓ Set of protective measures to consider
  - ✓ Responding bodies related to the COD and respective missions
  - ✓ Coordination for implementation
- Principle of **graded approach** from planned actions to consultation with experts



Off-site plans (PPI) - Measures to consider

- **Reflex Sheltering**
  - ✓ For some sites, a reflex sheltering is planned and ready to implement for some early/ongoing releases situations. Criteria (EALs, OILs)
  - ✓ The plant director can launch the alert to the populations
  - ✓ Possible complementary actions based on experts recommendations

NPP 2 km

- **Precautionary Evacuation**
  - ✓ For some sites, a precautionary evacuation zone is planned and ready to implement in case of early and a priori long-lasting release
  - ✓ Would be recommended by experts when major/long release might occur <10 h

NPP 5 km

- **Predistribution of stable iodine tablets**
  - ✓ Stable iodine tablets are predistributed
  - ✓ Beyond planification area, complementary strategic stock can be provided by national means

NPP 20 km

- **Precautionary food bans**
  - ✓ While awaiting expert appraisal, initial directive prohibiting the consumption/distribution of local fresh foodstuffs, within the largest emergency protective measure perimeter

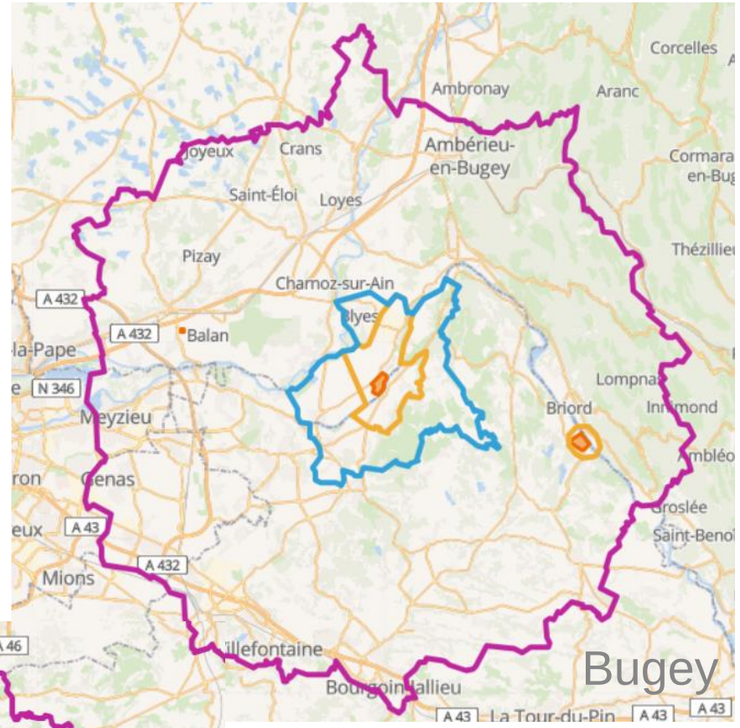
Off-site plans (PPI) - Zones

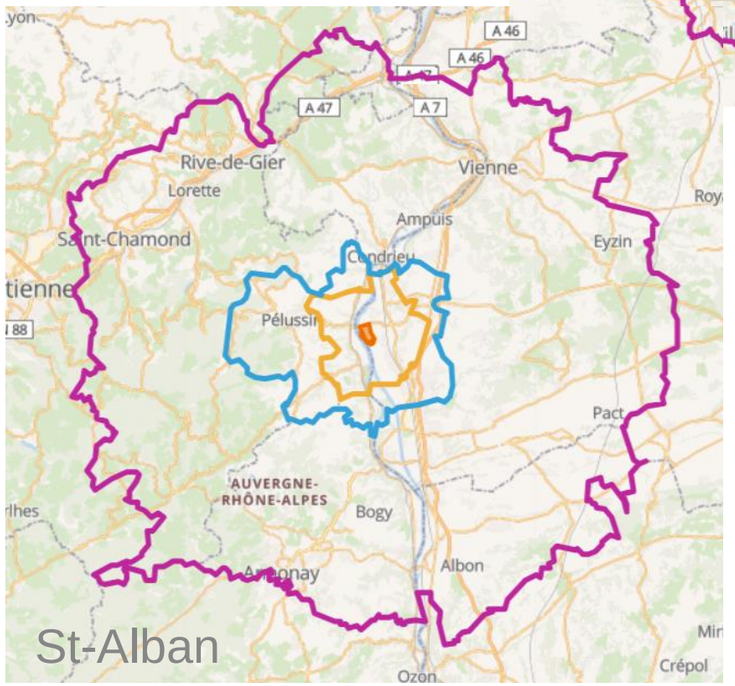
- Examples of PPI zoning (NPPs)

20 km Stable Iodine Predistribution

5 km Precautionary Evacuation

2 km Reflex Sheltering





3 Mission and Organization of the IRSN Response

Mission of the IRSN in Emergency Response Situations

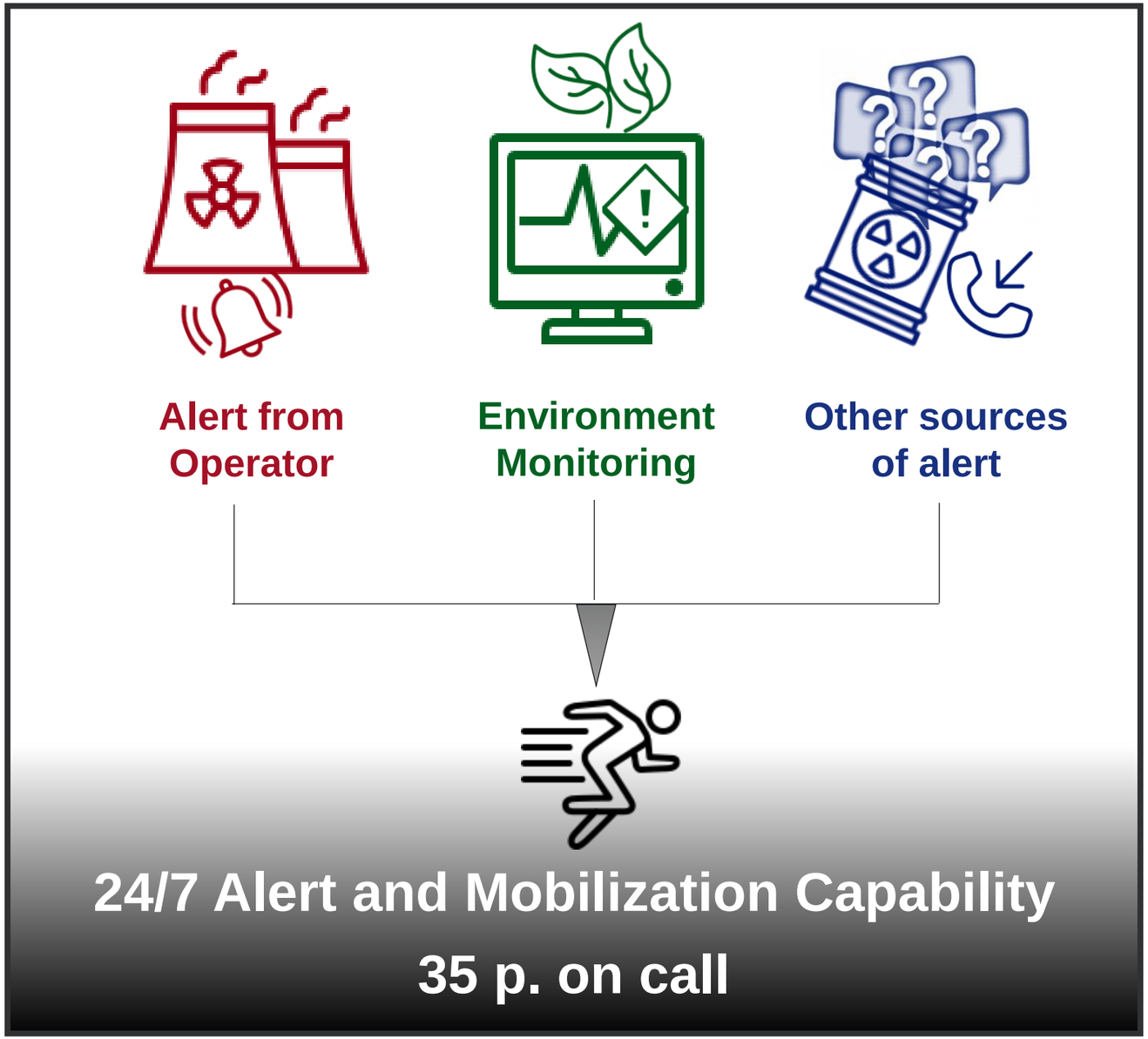
- **Supporting authorities** in radiological risks, providing a decision-aiding expertise to protect the population, workers and the environment
  - **Accidental and post-accidental** situations related to nuclear installations or transports, civil or defense
  - **Malicious acts** on installations or in the public domain

- Major contribution to **radiological masurements**
  - Coordination of the sampling and measurement program
  - Centralization and interpretation of the measurements
  - ✓ Environmental & Human body measurements

- Contribution to institutional **communication to the public**
  - Educational information on the situation, putting risks into perspective
  - Communication of measurements results

Assets of the Emergency Response of IRSN

- **Key pillars** of our operational response system



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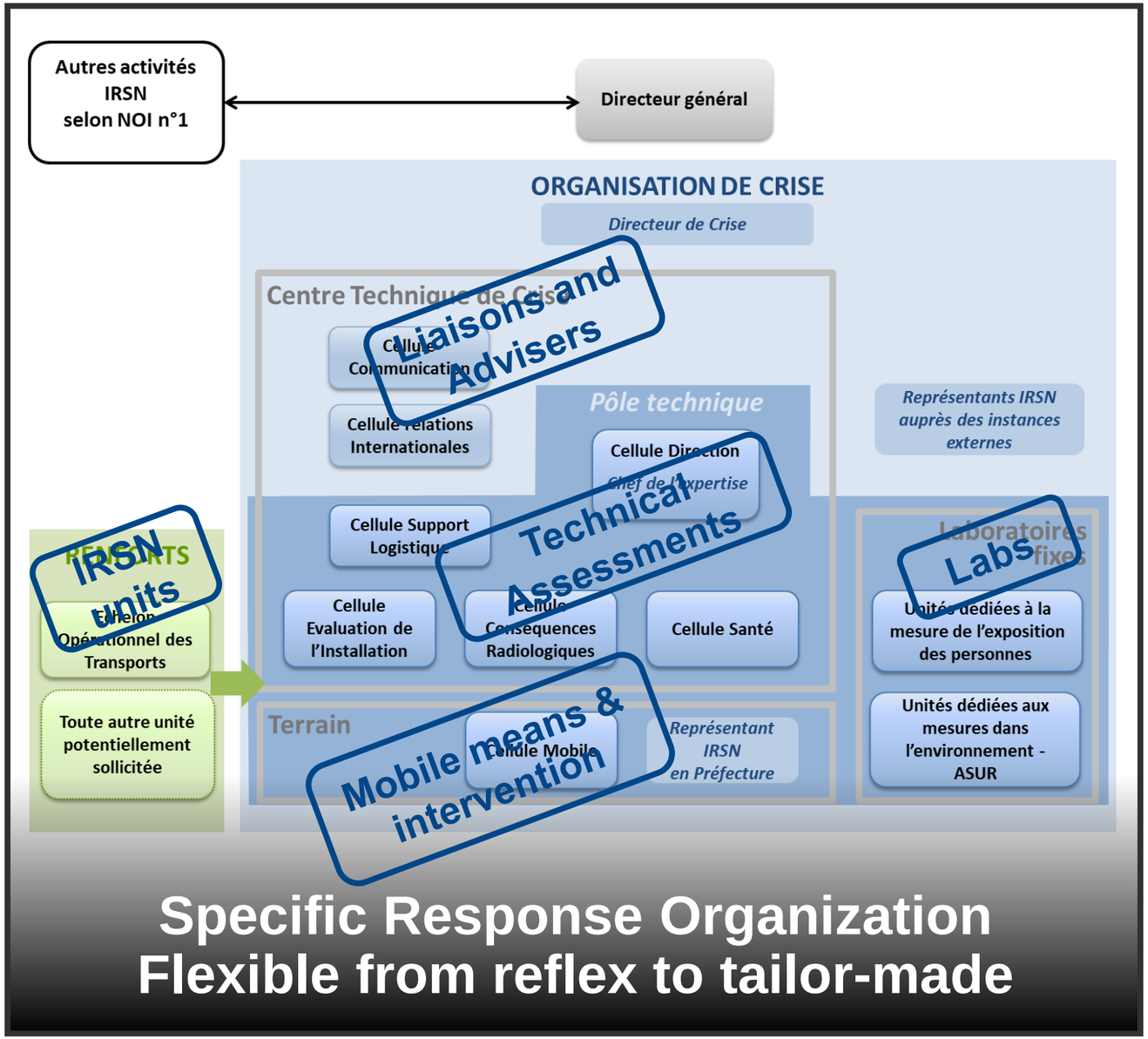


Assets of the Emergency Response of IRSN

- **Key pillars** of our operational response system

350+ Experts

National exercises (~10 /y)
Other exercises (~15 /y)

Trained and Exercised Expert Pools

Assets of the Emergency Response of IRSN

- **Key pillars** of our operational response system

Assets of the Emergency Response of IRSN

- **Expertise** capability relies on two complementary assets

- **A&P conduct on state of facilities and source terms**
- **A&P conduct on consequences for the environment and exposure of people**

✓ Data retrieving from the facility, met data, measurements…

✓ Iterative assessments combining modelling and measurements, specific operational assessment methods and tools

✓ Decision-aiding products

Technical Emergency Center

- **Sampling and measurement program conduct (local + French territory)**
- **Execution of measurements in the environment & on the people**

✓ Remote monitoring of environment networks (470+ stations)

✓ Mobile means projected on field

✓ Fixed Laboratories network

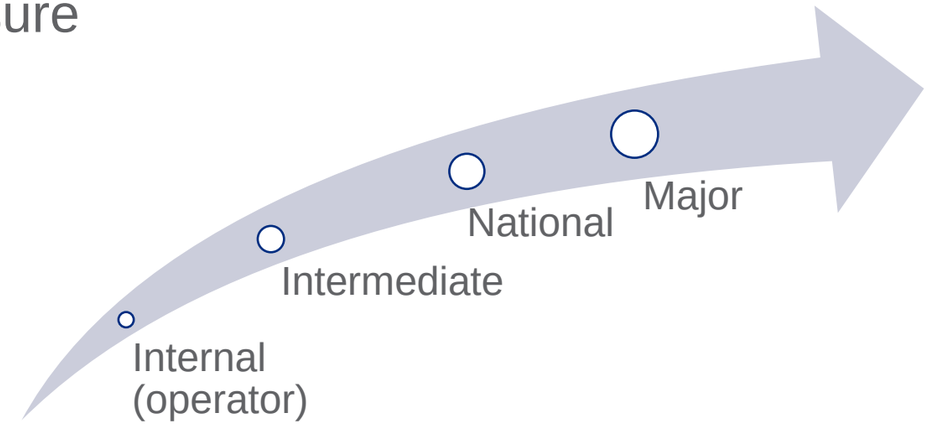
✓ Results centralized in specific databases

Measurements means

4 A Few Words about Exercises

General framework of Exercises and drills

- National Exercices
  - ✓ Loc. & Nat. Operator, COD (COZ), ASN(D) IRSN, MeteoFrance,…
  - ✓ Every 3-5 years for each nuclear site
  - ✓ 1 or 2 days - D2 emphasizes either post-accident, measurements, civil security operations…
- Major Exercises
  - ✓ Additionally implies full inter-ministerial level
  - ✓ Every 3-4 years (pre-empted National Exercice)
  - ✓ 2+ days
- Main objective to test responding bodies organizations, methods and coordination
- Exercises generally consider real meteorological conditions
- ~1/3 of exercises benefit from a simulated medatic pressure

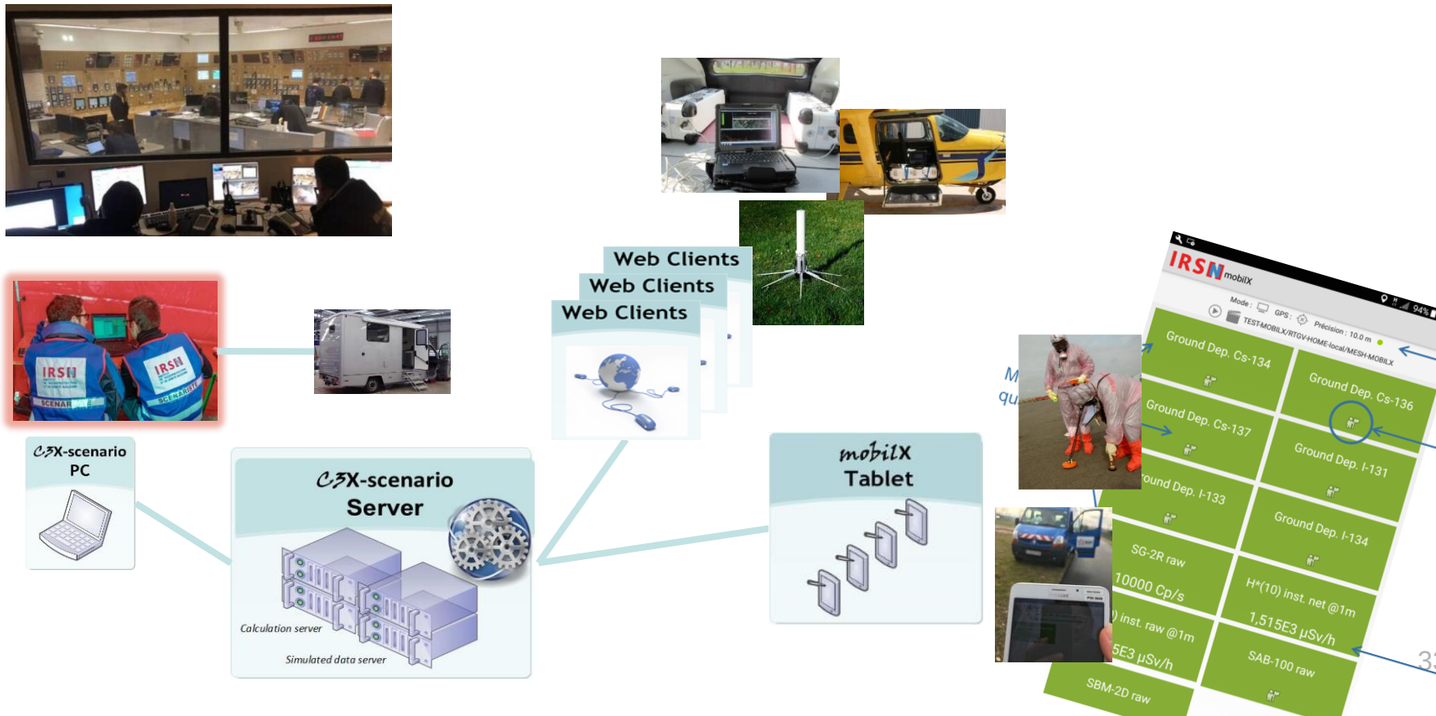


Preparation of National Exercises

- Preparation of a National Exercise = a project
  - The Prefecture as customer
    - ✓ The Exercise as deliverable
    - ✓ Additional targeted workshops may be held in-margin of the ‘main’ exercise
  - Kickoff meeting at Dday -6months
  - A steering commitee
  - Dedicated working groups
    - ✓ Organization and Communication
    - ✓ Scenario (technical & other aspects)
    - ✓ Measurements
    - ✓ Law and order
    - ✓ Protective measures
    - ✓ …

National Exercises scenarios preparation and execution

- Preparation of the scenario
  - Scenario WG retrieves requirements and other inputs
  - Technical scenario development by IRSN or Operator alternatively
  - Installation scenario prepared on full-scope simulator (NPP)
  - Scenario kept secret from the players
- Execution of the scenario
  - Put the different players in a situation as realistic as possible
  - Scenario data controllers remain stuck to the responders' actions
    - ✓ Fictitious radiological measurements results provided as measurement operations are achieved



Thank you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RADIATION PROTECTION COMPUTER CODE
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