IRSN
INSTITUT
DE RADIOPROTECTION
ET DE SÛRETÉ NUCLÉAIRE

Environmental radioactivity monitoring: the French experience within the European context

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What is the French “Institute for Radiation Protection and Nuclear safety” (IRSN)?

- A public body with industrial and commercial activities, under the joint supervision of several ministers (ecology and energy, economy and industry, research, defense and health).

- Research, expertise (in particular in support to Nuclear Safety Authority) and public service missions in the domain of risk assessment related to nuclear activities.

- 1700 employees, including more than 1000 specialists: researchers, Ph.D. students, post-docs and engineers.

- A budget of about €320 millions in 2014, with more than 45% committed to research

- 11 locations in France including 3 major sites: Cadarache, Fontenay-aux-Roses and Le Vésinet

EURATOM treaty (1957) : what it says about radioactivity monitoring in the environment?

- Article 35 : All Member States (MS) have to set up permanent installations for monitoring radioactivity in the atmosphere, water and soil, in order to guarantee compliance with the basic standards of health protection for the population and workers against IR.

- Article 36 : All MS have to regularly communicate the results of their monitoring.

- EC has developed tools to collect and exchange data and information between the MS :
  - REM : database to collect data reported to the Commission
  - ECURIE : system for the early notification and exchange of information in case of emergency
  - EURDEP : standard format for radiological data and a network for the exchange of data.

Gamma dose rate probe networks in Europe

A first conclusion at the European level

- Monitoring varies from one country to another. It doesn't imply that one monitoring strategy is better than the others.
- Density of nuclear power plants, public opinion, worry about neighbouring countries, governmental structures, regulation and history all come into play.
- At the moment, no complete scientific response is available to tell you how to conduct your monitoring (but some elements exist).

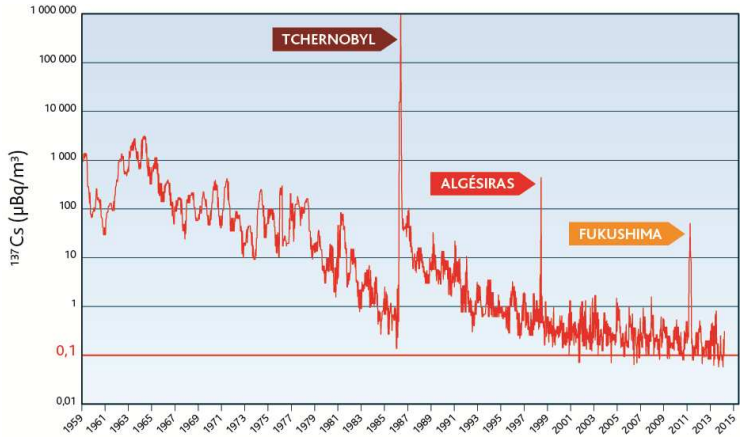
Generalities about radioactivity monitoring in the environment in France

- Need for implementing procedures for monitoring radioactivity in the environment appeared in the early 1950s with questions about the effects of fallout from atmospheric nuclear testing.
- Monitoring developed alongside the gradual expansion of French NPPs and was reinforced in 1986 after Chernobyl accident.
- The law of 2006 on nuclear transparency and safety reinforces legislative and regulatory protection of the environment. This law also established a high level of transparency and public access to environmental information and strengthened the role of stakeholders.

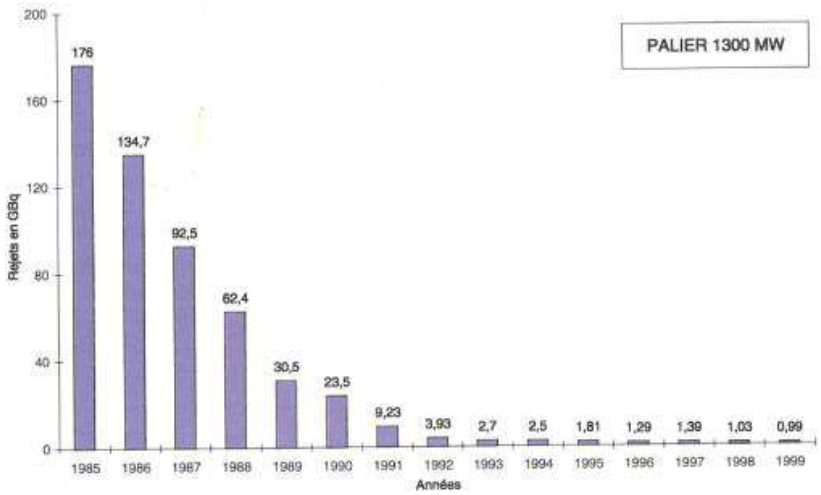
More than 40 nuclear installations are monitored in France

- *20 CNPE (EDF),*
- *8 établissements liés au cycle du combustible (AREVA, EURODIF, FBFC),*
- *3 sites de stockage de l'ANDRA,*
- *7 centres d'études (CEA, CERN),*
- *4 sites de la Marine nationale (ports ...)*

Radioactivity in the environment in France : the context



Average concentration of Cs-137 in atmosphere in France from 1959 to 2014



Average liquid discharges of a NPP in France from 1985 to 1999 (except tritium)

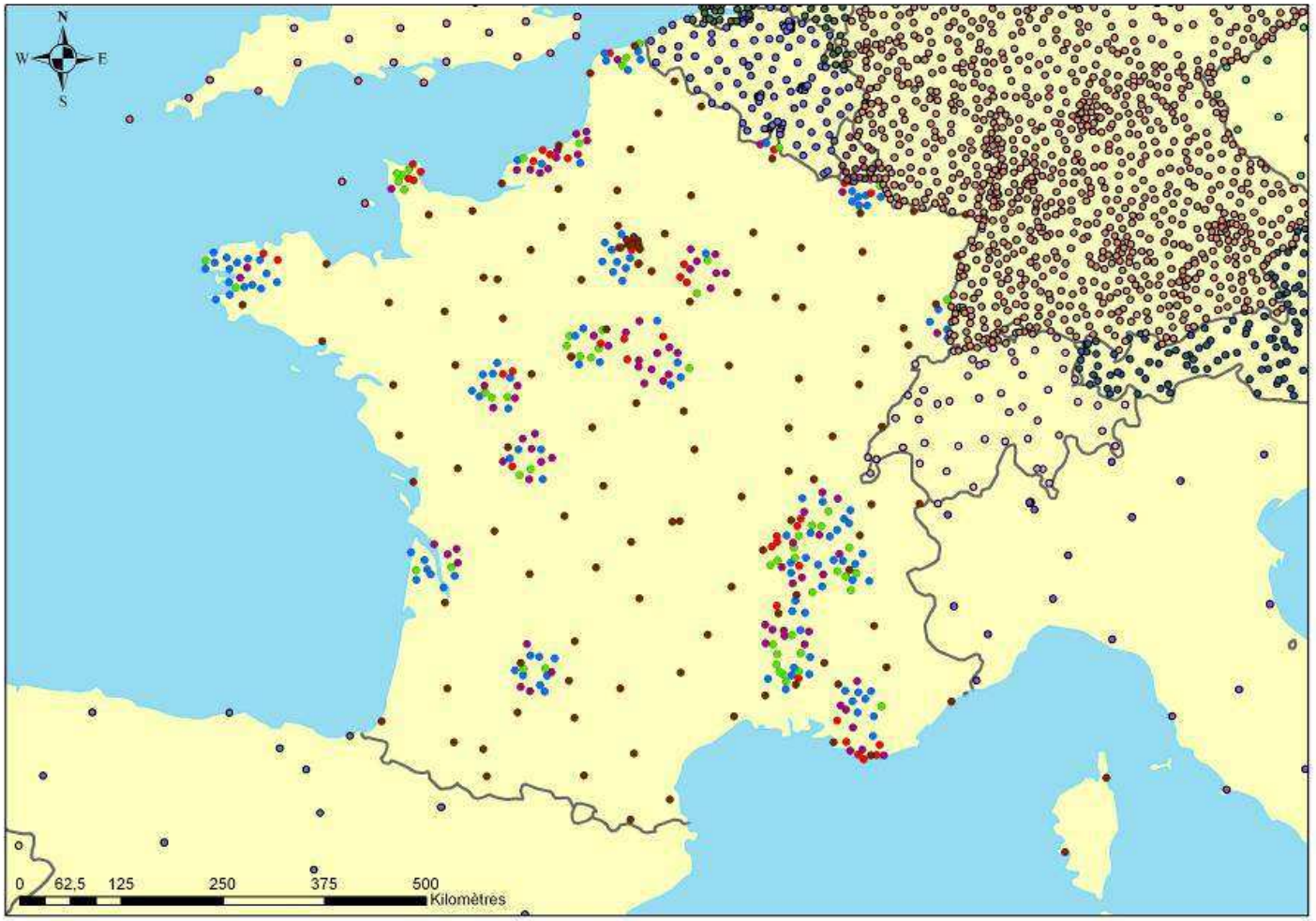
Principles and Regulatory framework of environmental monitoring in France

- Operator is responsible for the safety : in the perimeter and in the vicinity of nuclear installations, operator is in charge of environmental monitoring in connection with the discharge autorisation
- IRSN is in charge of environmental monitoring at the national level.
- Quality of measurements : laboratory approval system
- Transparency and communication to the public : measurements are publicly available on a web site (National network for radioactivity measurements) and IRSN publishes every 3 years a report on the radiological situation of the environment at the national scale.

Objectives of the radioactivity environmental monitoring

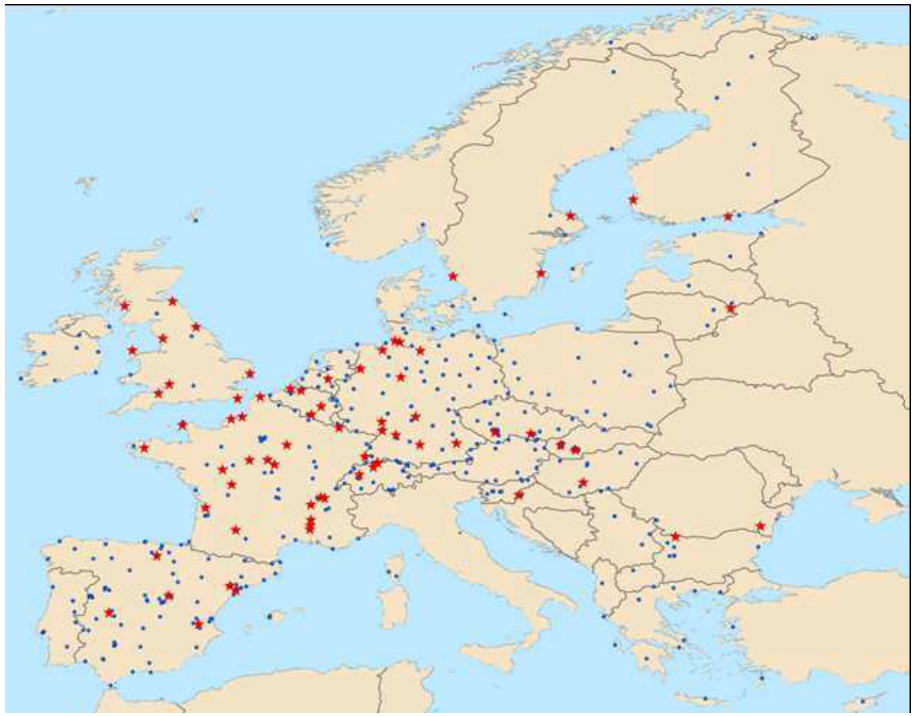
- Early detection of radiological events
- Protection of human health and environment
- Knowledge of the radiological status of the environment
- Public information

Early detection : IRSN TELERAY real time network



- Centralized Real time network of dose rate probes (420 stations)
- Connected to the IRSN crisis center

IRSN Aerosol network monitoring (delayed results)

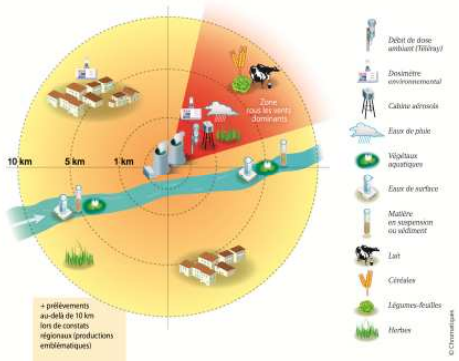


- In France : 50 permanent stations

3 SCALES

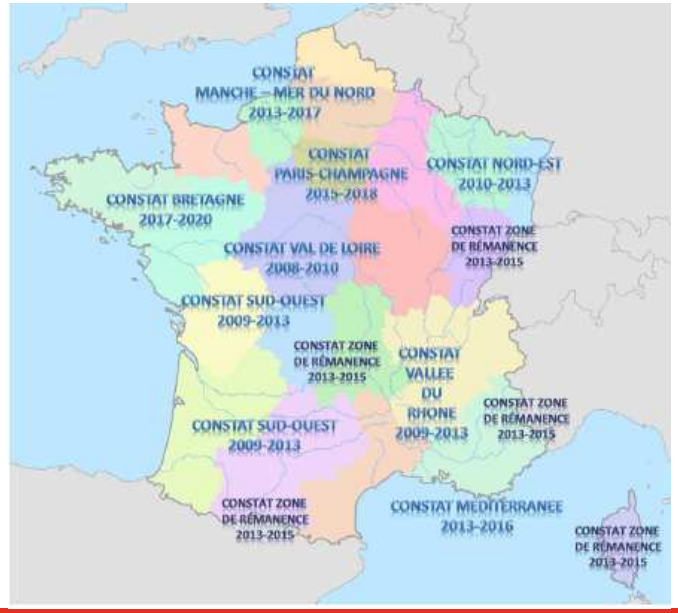
Local

Around Nuclear installations
periodic



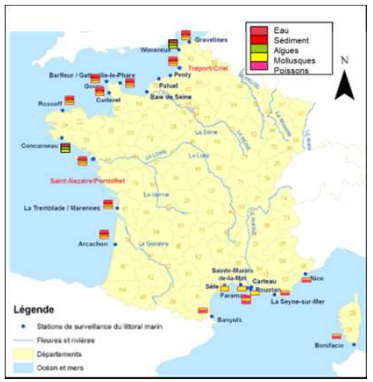
Regional

Surveys
Flexible monitoring



National

Monitoring networks
foodstuffs



3 compartments

Atmospheric


Ambient Gamma dose rate (Téléray)


Environmental Dosimetry


Aérosols


Rainwater


Water vapor And gases

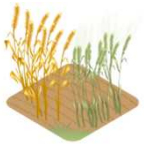
Terrestrial


In Situ Gamma

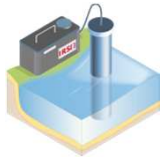

Soil


Grass and salad


Milk


Cereals and other foodstuffs

Aquatic


In situ gamma


surface water


sediment


Aquatic vegetation


Algae


Fish, seashell

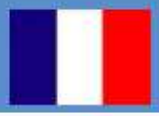
Quality of the measurements : A key issue for credibility

- All laboratories performing radioactivity measurements in the environment needs a formal approval from ASN
- It exists 45 kinds of approval relating to all the environmental compartments and various radionuclides measurements (alpha, beta, or gamma emitters)
- The approval includes the conformity of the practices of laboratory to the requirements of standard ISO/CEI 17025 and the regular participation to intercomparison tests organised by IRSN.

Transparency and information to the public : an absolute necessity (1/2)

Requests from society can be different

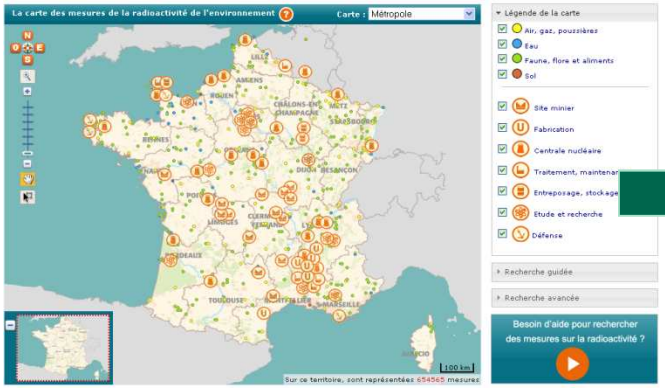
France (IRSN) and USA (EPA-Environmental Protection Agency) both put on line in real time gamma dose rate results of their network during Fukushima

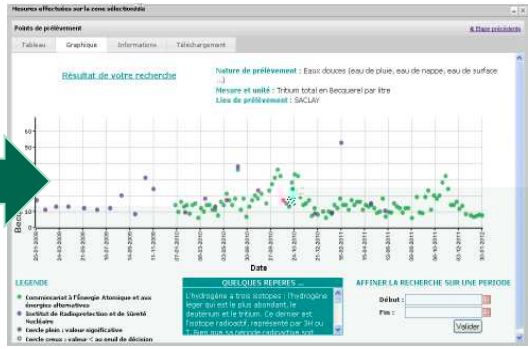
		
Vistors peak	50 000	600 000
Distance from Fukushima (eatward)	6 000 km (Hawaii)	26 000 km

Source:U.S. EPA Response to the Fukushima Daiichi Nuclear Power Plant Accident
Tupin, Edward A.; Boyd, Michael A.; Mosser, Jennifer E.; Wieder, Jessica S.
Health Physics. 102(5):563-569, May 2012

Transparency and information to the public : an absolute necessity (2/2)

- National IT network for environmental monitoring that gathers measurements performed by all actors in France (operators, IRSN, associations,…)





- Regular publication of reports on the status of the environment with regard to radioactivity

Conclusions

- Protection of people and the environment from radiation is primarly based on monitoring radioactivity in the environment. It is therefore an important component of nuclear safety.
- There is a growing attention of society to environmental issues that increases interest in such monitoring and give rise to question regarding its implementation.
- Radioactivity environmental monitoring is a scientific and technical challenge due to the decrease of radioactivity in the environment. The most detected radionuclides are H-3 and C-14 (due to discharges from NPP). Cs-137 is still detected and originates from nuclear testing and Chernobyl accident.
- Quality of measurements and information to the public are two key issues that needs to be properly adressed.

THANK YOU FOR YOUR ATTENTION

- For more information :
  - www.irsn.fr
  - www.mesure-radioactivite.fr