NATIONAL ACTION PLAN 2016-2019

FOR MANAGEMENT OF THE RADON RISK

This report was drafted by the French nuclear safety regulator (ASN) in collaboration with the members of the national action plan oversight committee:

The Minister responsible for the environment
The Minister responsible for health
The Minister responsible for housing
The Minister responsible for labour
The regional health agencies
The Regional Directorates for the Environment, Planning and Housing
National Public Health Agency, Santé publique France
The scientific and technical centre for the building trades
The study and assessment centres for risks, the environment, mobility and development
Associations involved in the "radon" topic
The national union of measurement professionals.

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AUTORITÉ DE SÛRETÉ NUCLÉAIRE

FOREWORD

Management of the radon risk is a major health issue, given its proven carcinogenic nature, recognised since 1987 by the International Agency for Research on Cancer (IARC).

In the 1980s, France initiated steps to characterise this risk through a national campaign of measurement in the home and manage it through an appropriate body of regulations.
Since 2005, these technical and regulatory measures have been accompanied by two consecutive national action plans, identifying the objectives for mitigating the health impact of radon.

If the momentum achieved by these two plans is to be continued, the new context for the drafting of this third plan, more specifically linked to the transposition of Council directive 2013/59/Euratom of 5th December 2013[1], now gives it a regulatory dimension.

In conjunction with the 2015-2019 National Health and Environment Plan (PNSE 3) and drafted jointly by ASN, the Ministries responsible for health, the environment, construction and labour, national experts (IRSN, ANSP, CSTB), regional stakeholders (ARS, CEREMA, DREAL), radon measurement professionals and the associations intervening on this subject, this new plan identifies a strategy to inform and raise the awareness of the general public and stakeholders concerned as the first priority.

Steps will also be continued on the one hand to improve understanding of the risk, exposure and health impact of radon in France and, on the other, to improve how the management of this risk is dealt within buildings. Furthermore, on the basis of feedback from the previous plans, this third plan aims to support local stakeholders, in particular with drafting and implementing regional health and environment plans, for the implementation of local campaigns to raise awareness of the radon risk in existing residential buildings.

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1 Council directive 2013/59/Euratom of 5th December 2013 setting out the basic standards for health protection against the dangers arising from exposure to ionising radiation and abrogating Directives 89/618/Euratom, 90/641/Euratom, 96/29/Euratom, 97/43/Euratom and 2003/122/Euratom.

Finally, in parallel with the actions of this third plan, the legislative framework concerning the management of the radon risk was recently reinforced by Act 2016-41 of 26th January 2016 and Ordinance 2016-128 of 10th February 2016, thus completing the existing provisions by integrating radon into the system for managing indoor air, allowing the collection of all radon measurement data and making it compulsory to inform real estate buyers and tenants of the health risks linked to radon in the home.

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CONTENTS

A. Context

Radon is a natural radioactive gas resulting from the decay of uranium present in the soil. It enters buildings owing to a lack of leaktightness and can build up to particularly high levels.

For the French population, exposure to radon is the leading source of exposure to ionising radiation of natural origin. Since 1987, radon has been classified as a confirmed lung carcinogen for humans (group I) by the International Agency for Research on Cancer (IARC). According to estimates from the French Health Monitoring Institute (InVS), which subsequently became the ANSP, between 1,234 and 2,913 deaths from lung cancer can be attributed yearly to domestic exposure to radon in France, or between 5% and 12% of deaths from lung cancer observed in France[1]. Although relatively unknown to the general public, radon is one of the most worrying indoor air pollutants.

B. Governance and strategies of the plan

The national strategy for managing the radon risk and the resulting regulations are a responsibility shared by the Ministries responsible for health, the environment, construction and labour, with the support of ASN, each of which handles once facet of this strategy in their own particular field.

This strategy is built on two main pillars: the regulatory system and the performance of priority actions. It is implemented in the various fields at the national, regional or local levels and requires coordination by the various stakeholders involved in its implementation.

The national action plan for management of the radon risk is a means of addressing this need for coordinated action and the production of common tools which can be used by all the stakeholders concerned. It is the result of successive national health and environment plans (PNSE).

The third national action plan specifically responds to action 4 of PNSE 3 (2015/2019) and is now a part of the new Community framework set by Council Directive 2013/59/Euratom of 5th December 2013 defining basic radiation protection standards, more specifically its article 103 which requires that the Member States draw up a national action plan to deal with the long-term risks due to the exposure to radiation in homes, buildings open to the public and workplaces for all forms of radon ingress, whether it comes from the soil, construction materials or from water.

The actions listed in this third "Radon" national action plan, also take account of the three actions concerning management of this risk, contained in the PNSE 3, that is:

- promoting and supporting regional measures for integrated management of the radon risk in housing (action 5);
- promoting and supporting actions to prevent the radon risk, in synergy with actions on indoor air quality and on energy efficiency (action 6);
- updating of the radon health impact assessment, taking account of the latest measurements and the knowledge available in order to assess the effectiveness of public radon risk management policies and help to improve them (action 7).

1. Oversight and coordination of the national action plan

The governance of the action plan is the responsibility of the Director General for Health, the Director General for the Prevention of Risks, the Director General for Labour, the Chairman of the ASN and the Director for Housing, Town and Country Planning.

An oversight committee (COPIL), in charge of drafting, monitoring and evaluating the actions, is responsible for coordination of the plan. It comprises representa-

1 Catelinois O. et al., Assessment of the health impact of domestic exposure to radon in France, BEH 2007.

tives of the governance body (DGS, DGPR, DGT, DHUP, ASN), national experts (IRSN, ANSP, CSTB), regional stakeholders (ARS, DREAL, CEREMA), radon activity concentration measurement professionals and associations involved in this field. ASN acts as technical secretary to the committee. In conjunction with the National Health and Environment Plan 2015-2019 (known as PNSE 3), the assessment of this plan will be integrated into the system planned for PNSE 3.

2. Radon risk management stakeholders

The local authorities (municipalities, municipality groupings, départements and regions) are key players in the management of this risk, on the one hand as being responsible for facilities open to the public (ERP) which are subject to a radon monitoring and exposure levels reduction obligation (pursuant to the Public Health Code) and, on the other, for implementation of local initiatives to promote management of the radon risk in the home (information, measurements, financing of works, etc.). These local initiatives can be considered within the framework of actions 5 and 6 of PNSE 3.

Employers are responsible for the health and safety of workers in the workplace. With regard to air quality, the employer must guarantee an air quality in the premises where workers are to spend time such as to preserve the health of said workers.

Associations (CEPN, CLCV, Ligue contre le cancer, Approche-ÉcoHabitat, etc.) and IRSN are also involved in information campaigns concerning the radon risk and operational actions such as radon measurement in the home, in collaboration with public services and establishments (ARS and DREAL) and regional authorities.

Finally, each owner or occupant of a building may act directly to reduce the radon level present in their building, once they have been informed and made aware of this risk.

3. Summary of main actions carried out for management of the radon risk in France

3.1 The regulations

The performance of a large-scale campaign for measurement of radon in the home, carried out by IPSN (now IRSN) between 1982 and 2000, with the support of the DDASS (now the ARS), led to the production of a national map of radon exposure for the population with about 13,000 measurements, or about 1 measurement per 40 km^2.

The first ministerial circulars from 1999 to 2002 used this initial map to define 31 priority départements for management of the radon risk, in which measurements were required for facilities considered to be sensitive, such as schools, along with reduction of the radon concentration if higher than an action level set at 400 $Bq.m^{-3}$. A département was therefore classified as a priority once the arithmetical mean of the measurements in the département exceeded 100 $Bq.m^{-3}$.

The Order of 22nd July 2004 concerning procedures for management of the radon risk in places open to the public, made radon monitoring mandatory in these 31 priority départements, along with reduction below the action level of 400 $Bq.m^{-3}$, if necessary, in several categories of facilities open to the public (day schools and boarding schools, health and social facilities with in-patient capacity, spas and penitentiaries).

In the same way, the Order of 7th August 2008 made radon monitoring mandatory and, if necessary, the reduction of exposure below the action level of 400 $Bq.m^{-3}$ in certain workplaces, in particular those in basements.

These regulation obligations for radon management in places open to the public and in workplaces led to the identification and remediation of numerous situations in which the radon concentration was high. Nonetheless, monitoring of these actions still varies widely, mainly in workplaces, where few actions have been initiated.

3.2 Results of the measurements taken

The results of the radon measurement campaign conducted since 2005, pursuant to the order of 22 July 2004 concerning the management of the radon risk in places open to the public, by organisations approved by ASN, is presented in the following table.

The vast majority of the facilities inspected are teaching and health and social facilities.

The graph opposite shows that of the 14,153 facilities inspected, concentrations below the action level of 400 Bq.m^{-3} set by the current regulations were found in 82% of them. For the others, that is 18% of the facilities, steps must be taken to reduce human exposure to radon.

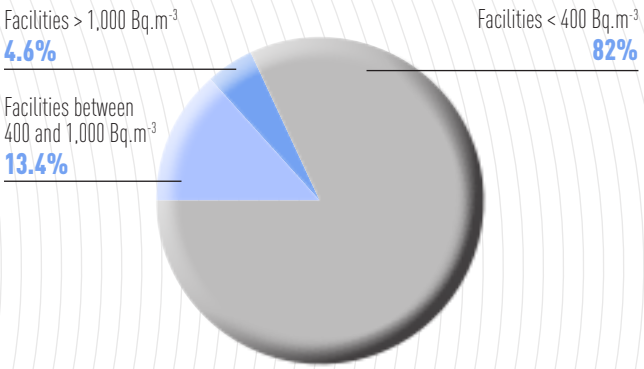
The results of the measurements taken by organisations approved by ASN in places open to the public have, since 2015, been input and centralised in a special system set up by the Ministry for Health (SISE-ERP). The data are used by the ARS and ASN for inspection purposes and are used at a national level for the production of statistics.

3.3 Measurements taken and local steps to raise awareness of the radon risk in the home

With regard to residential buildings, only the 13,000 results of measurements taken in the home between 1982 and 2000 are in the possession of IRSN. They enabled the radon atlas to be published in 2001 and the average exposure value for the French population to be estimated at about 63 Bq.m^{-3} (weighted average). In recent years, the implementation of various targeted actions or local initiatives to raise awareness of the radon risk in individual homes has led to the production of data supplementing that centralised by IRSN. The indoor air quality measurement campaigns organised in the past (OQAI, plateau de Millevaches) or those currently in progress in Montbéliard, Nantes, Concarneau, or in the Limousin region, comprise several thousand measurements in residential buildings. These measurements have provided additional information about the exposure of the population on a more local scale.

Experimental local awareness-raising actions concerning the radon risk in the home have been carried out in several départements (Finistère, Creuse and Haute-Corrèze, Franche-Comté, Pays de la Loire, Lozère, Midi-Pyrénées) within the framework of the PRSE or in areas covered by certain local health contracts (CLS). These actions concerned information, awareness-raising and assistance with the performance of works by private individuals and local authorities. Even if these actions are too few in number given the areas that are seriously affected by the presence of radon, the lessons learned are however of considerable use for the performance of the next campaigns.

Classification of facilities according to action levels (2005/2015 measurement campaigns)



Results of measurement campaigns in places open to the public (2005/2015)

Types of facilities	Total number inspected	Nb < 400 Bq.m^{-3}	Nb between 400 and 1,000 Bq.m^{-3}	Nb > 1,000 Bq.m^{-3}
Teaching facilities	8,895	7,096	1,352	447
Health and social facilities	5,191	4,474	520	197
Spas	28	16	10	2
Penitentiaries	39	29	9	1
TOTAL	**14,153**	**11,615**	**1,891**	**547**

All of these actions lead to feedback, enabling the most pertinent methods to be identified for effective awareness-raising among the population.

3.4 Actions implemented for new-build homes

The national "thermal" regulations, defined by Decree 2010-1269[2] and the Order[3] of 26th October 2010, apply to new-build homes for which the building permit application was submitted after 1st January 2013. Given the time between filing of the building permit and the end of construction, we can consider that about 300,000 homes were built with application of these new regulations, or 1% of the total of 30 million homes.

The homes currently being built have the advantage, for energy efficiency reasons, of being more effective in reducing air permeability. The radon ingress paths are thus far more limited than in buildings constructed before the new thermal regulations applicable to building permits submitted since 1st January 2013.

For new-build homes, particular attention is given to the tightness of the structure, through widespread use of tightness tests. This reduced permeability of the outer structure reduces unwanted air ingress, including that at the soil/structure interface. This soil-structure interface constitutes a barrier against the ingress of air but also of radioactive gases.

In addition, work[4] has shown that reducing the air permeability of the outer structure improves air renewal efficiency (the draft of ventilation systems is improved) and indoor air quality.

3.5 Management of abnormally high radon levels of man-made origin

Uranium was mined in France between 1948 and 2001, producing 170 million tonnes of waste rock, about 2 million of which were reused in the public domain, generally as backfill, according to Areva estimates.

The management of the former uranium mines and of the mining waste rock reused in the environment is given particular attention by the public authorities, leading to specific action plans. Circular MEDDE/ASN of 22nd July 2009, concerning the management of former uranium mines, more specifically requires that under its responsibility and in accordance with the undertaking by its management, Areva shall undertake a survey of the places where uranium mine waste rock has been reused and, on a case by case basis, take part in the necessary remediation work in the event of incompatible usage. This circular was then supplemented by an instruction of 8th August 2013 from the General Directorate for the Prevention of Risks (DGPR) at the Ministry for Ecology, regulating the process for surveying and removing waste rock reused in the public domain.

Following the discovery of the presence of radon at abnormally high levels in living or working spaces, an interministerial technical notice was issued in the second half of 2016 to help the local stakeholders concerned (decentralised services, ARS, ASN, etc.) manage these situations when man-made origin is suspected. These situations can be the result of the use of materials containing naturally occurring radiation or past activities utilising uranium or one of its daughter products, as is the case with the former radium industry sites.

2 Decree 2010-1269 of 26th October 2010 concerning the thermal characteristics and energy performance of constructions.

3 Order of 26th October 2010 concerning the thermal characteristics and energy performance requirements for new buildings and new parts of buildings.

4 Guide from the Ministry for Housing, Regional Equality and Rural Affairs: "Reconciling requirements for healthy air and comfort – Supplement to the healthy construction guide", 2015.

4. Regulatory changes and new strategies

4.1 Pursuing and reinforcement of the regulations in places open to the public and in workplaces

The national regulations on management of the radon risk in certain ERP (facilities open to the public) and certain workplaces must change owing to the transposition of directive Euratom 2013/59.

The main changes concern:

- a reduction in the action level from 400 to 300 $Bq.m^{-3}$ in ERPs and in workplaces;
- the consideration of radon on ground floors and basements of all workplaces in targeted areas with high radon potential.

In addition, for ERPs, the legislative framework makes provision for qualification of all organisations working in the field of radon monitoring. ASN thus maintains the qualification system for organisations carrying out radon measurements, according to ISO standards defined in ASN resolution 2015-DC-0506 of 9th April 2015 concerning measurement conditions. The system will also be supplemented by mandatory accreditation of laboratories analysing radon measuring instruments.

4.2 More precise mapping, a tool common to all management strategies

The second national action plan found that the département level adopted for implementation of the radon monitoring regulations (set by Order of 22nd July 2004) was unable to take account of geological differences between départements.

The municipality level revision of the map currently in force was adopted in order to create a new "radon risk zoning" in France. However, to achieve this scale, the number of measurements available was far too low to be able to produce a map based on exposure of the population, so another method had to be chosen.

The method applies consists in taking account of the main parameters influencing on the one hand the radon source term in the sub-soil and, on the other, the transport of radon from its source up to the soil surface. The work done by IRSN on this subject, as well as the preliminary study of the various methods developed in France and internationally, enabled the main criteria to be determined. They are not exhaustive, but do enable the approach to be applied uniformly across the country, through the use of existing data.

The approach adopted is based on the compilation and utilisation of geological data produced and consolidated by the BRGM but also additional data as a result of research work. It consists first of all in classifying the geological formations according to their radon source potential, in other words their probable uranium content. Secondly, the map obtained can be clarified in order to achieve the expression of a radon exhalation potential on the soil surface, taking account whenever possible of additional factors liable to facilitate the transport of radon through the rock and the soil.

The zoning established from the soil radon potential does not give a direct indication of the level of radon in a building or of human exposure to radon, as this level depends on the characteristics of the construction but also the conditions of occupancy by the persons in it. The approach based on radon potential does however make it possible to identify areas within which high radon concentrations are liable to be measured in a building, by comparison with the concentrations measured outside the zone.

Ordinance 2016-128 of 10th February 2016 containing various nuclear provisions, announces this new map based on the radon potential zones. It has yet to be published by an Order and it must continue to be improved, taking greater account of certain aggravating factors.

4.3 Towards centralisation of all radon measurement results

As a result of local radon risk awareness-raising measures or personal initiatives carried out by the owners or occupants of housing, new data concerning radon levels in the home are available.

Ordinance 2016-128 of 10th February 2016 containing various nuclear provisions introduces the possibility of centralising all radon measurement results. The nature and methods for transmission of these data by the radon measuring instruments analysis laboratories, will be clarified by the regulations.

The construction of the information system collating these results will help encourage the deployment of monitoring indicators for management of the radon risk. IRSN will be tasked with conducting a preliminary study for the development of this information system.

4.4 Information and recommendations for the home

The home is the main location for exposure to radon.

Under the previous national radon action plans, radon screening in the home, accompanied by awareness-raising measures, was the subject of local initiatives, mainly carried out by local authorities or associations and supported as necessary by the ARS, DGS and ASN. The aim of this third plan is more specifically to support and facilitate the deployment of new initiatives to raise awareness among the general public.

Moreover, to improve the understanding of this natural risk by the general public, Ordinance 2016-128 of 10th February 2016 introduced a new obligation to inform future buyers and tenants of property in zones with a radon potential, during the course of real estate transactions.

4.5 Including radon in indoor air quality and energy renovation management policies

The Act of 26th January 2016 modernising our health system recognised radon as an indoor air pollutant.

There will be a reference level for radon in all buildings, including in the home, in the same way as for certain indoor air pollutants, with indoor air guideline values (VGAI). This reference level corresponds to a level above which allowing the occurrence of exposure is considered to be inappropriate, even if this does not represent a limit not to be exceeded.

At a time of considerable incentives for energy renovation of buildings owing to the cost of energy, particular attention should be given to the design and performance of these operations, to avoid degrading indoor air quality. In order to improve the thermal quality of buildings, the solution is often to optimise heating systems and increase the insulation of buildings. In the case of energy renovation work, requirements exist for maintaining or creating permanent venting and ventilation systems and they must not be ignored. Improving indoor air quality follows the principle of air renewal, with the need to provide venting and ventilation according to the occupancy of the building and the nature of the activities carried out in it. With regard to radon, it also includes improved insulation of the soil-structure interface.

Poor thermal renovation choices can rapidly have consequences for both air quality and the structure (in particular the spread of mould).

This is why it is important to promote and support radon risk prevention measures, in synergy with indoor air quality and energy efficiency measures (action 6 of PNSE 3).

C. The main priorities of the 2016-2019 third national action plan

1. A plan focusing on three priorities

In response to Euratom Directive 2013/59 and to back up the current regulations, the following priorities were chosen for the third national action plan for management of the radon risk:

Priority 1: Set up an overall strategy for information and awareness-raising and develop tools for collecting and sharing information

The health issue represented by radon means that awareness-raising measures must be reinforced and amplified and must target all stakeholders (local authorities, employers, building professionals, etc.) and the general public in order to enhance their effectiveness.

- **Sub-priority 1.1: Set up an overall strategy for information and awareness-raising.**
- **Sub-priority 1.2: Develop tools for collecting and sharing information.**

Priority 2: Continue to improve knowledge

2016-128 of 10th February 2016 containing various nuclear provisions announces the new map based on the radon potential zones. In order to continue to improve this map, taking greater account of certain aggravating factors, the third national plan makes provision for specific action on this subject, in particular with a part taking account of karsts (underground limestone cavities carved out by water). This third plan also makes provision for specific action concerning the construction of the information system collating all radon measurement results.

- **Sub-priority 2.1: Continue to improve knowledge of the risk, exposure and the health impact of radon.**
- **Sub-priority 2.2: Improve knowledge on the "radon and buildings" topic.**

Priority 3: Greater consideration of the radon risk in buildings

Efforts must be continued to take account of the radon risk in buildings. This more particularly entails encouraging the development of skills among building professionals involved in building diagnostics covering the ingress of radon as well as in the performance of remediation works.

- **Sub-priority 3.1: Facilitate and support measures to address the issue of radon in buildings.**
- **Sub-priority 3.2: Develop the necessary tools and validate the systems.**

2. Detailed table of actions per priority

PRIORITY 1

Set up an overall strategy for information and awareness-raising and develop tools for collecting and sharing information.

Actions	Action sheet N°	Pilot(s)/ Coordinator(s)	Parties performing the action/ main parties involved in performance of the action
Sub-priority 1: Set up an overall strategy for information and awareness-raising			
Build an overall strategy for information and awareness-raising and deploy it with the public and the various stakeholders.	**1**	ASN	DGS, DGT, DHUP, DGPR
Organise a national radon risks prevention day.	**2**	DGS	DGPR, ASN, DGT, DHUP, ARS
Define and set up radon risk monitoring indicators.	**3**	ASN	DGS, DGT, DHUP, DGPR
Sub-priority 1.2: Develop tools for collecting and sharing information			
Set up a dedicated website.	**4**	ASN	DGS, DGT, DHUP, DGPR
Develop a methodology kit to assist with the performance of local initiatives.	**5**	DGS	IRSN, ARS, ASN, DREAL, CSTB, CEREMA

PRIORITY 2

Priority 2: Continue to improve knowledge.

Actions	Action sheet N°	Pilot(s)/ Coordinator(s)	Parties performing the action/ main parties involved in performance of the action
Sub-priority 2.1: Continue to improve knowledge of the risk, exposure and the health impact of radon			
Conduct a survey of knowledge about the health risks associated with radon and propose research priorities.	**6**	IRSN	ANSP, Inserm, Hospices civils de Lyon, INCA
Assess the effectiveness of public policies concerning management of the radon risk and help improve them.	**7**	IRSN, ANSP	DGS, ASN, DGPR, DHUP, CSTB
Complete the radon potential map, studying the influence of certain aggravating geological factors and identifying areas with a particularly high risk of radon exposure (areas warranting particular vigilance).	**8**	DGS, DGPR	IRSN, BRGM Université de Franche-Comté, CNRS (Laboratoire Chrono Environnement)
Help implement the regulations in the overseas departments and territories (DROM/COM).	**9**	DGS, ASN	IRSN, CSTB, ARS, DHUP
Identify new types of workplaces and new professional activities liable to generate exposure to radon, which cannot be ignored in terms of worker exposure.	**10**	DGT	IRSN, DGPR, ASN
Conduct a preliminary study and develop an information system to enable the analysis laboratories to transmit radon measurement data.	**11**	ASN, DGS	IRSN, Dosimetry laboratories, DGT
Sub-priority 2.2: Improve knowledge on the "radon and buildings" topic			
Identify best practices concerning: • programmes and performance of works, in existing buildings, compatible with the radon risk and maintaining good indoor air quality; • remediation work, radon attenuation and experience feedback from local initiatives.	**12**	DHUP	CSTB, IRSN, CEREMA
Measure and analyse the radon activity concentration in new buildings in areas with medium to high radon potential.	**13**	DHUP	CSTB, IRSN, CEREMA
Assess the radon risk of man-made origin.	**14**	DGPR	IRSN, CSTB, Andra, ASN
Conduct a forward-looking study to identify building materials or products liable to emit significant levels of radon.	**15**	DGPR, DHUP	CSTB, IRSN

PRIORITY 3

Greater consideration of management of the radon risk in buildings.

Actions	Action sheet N°	Pilot(s)/ Coordinator(s)	Parties performing the action/ main parties involved in performance of the action
Sub-priority 3.1: Facilitate and support measures to address the issue of radon in buildings			
Study the feasibility of setting up a system for help with performance of the works (legal, financial, etc.).	**16**	DGPR, DHUP	DGS, ASN
Raise awareness of the radon risk among building professionals during their initial and further training.	**17**	DHUP	FFB, CAPEB, CEREMA, CSTB, AQC
Sub-priority 3.2: Develop the necessary tools and validate the systems			
Develop one or more tools to facilitate the performance of radon assessments in buildings.	**18**	DHUP	CEREMA
Adapt measurement practices in the workplace.	**19**	DGT	IRSN, CSTB, ASN
Continue with performance evaluations of radon measurement devices and implement accreditation of dosimetry laboratories.	**20**	DGS, DGT, ASN, IRSN	IRSN, IRSN, manufacturers of radon measurement devices, dosimetry laboratories

D. ACTION SHEETS FOR THE PERIOD 2016/2019

1. Action sheets 1 to 5 concerning priority 1: Set up an overall strategy for information and awareness-raising and develop tools for collecting and sharing information.

ACTION SHEET No. 1

Priority 1: Set up an overall strategy for information and awareness-raising and develop tools for collecting and sharing information.

Sub-priority 1.1: Set up an overall strategy for information and awareness-raising		
Action title	**Build an overall strategy for information and awareness-raising and deploy it with the public and the various stakeholders concerned.**	
Subject (description)	Several barometers produced by INPES (now ANSP) or IRSN, concerning the perception of certain risks by the general population, radon in particular, reveal a lack of familiarity with this risk and an under-estimation of its impact when it is known. In order to provide the relevant audiences with targeted information, an overall information and awareness-raising strategy must be put together to ensure that it is coordinated and effective.	
Objective(s)	• Organise an overall information and awareness-raising strategy to ensure that it is coordinated and effective. • Improve understanding of the radon risk by the various audiences. • Raise public awareness about radon-tobacco cumulative risk. • Communicate concerning implementation of the regulations, support for local remediation initiatives with the various audiences concerned (general public, health professionals as an information relay, building professionals involved in remediation, employers and staff representatives, plus local authorities).	
Method/tools	Set up a WG to put this overall strategy together: • on the basis of an inventory of the communication actions taken and their impacts (both positive and negative) on the target national and international audiences, construction of an overall information and awareness-raising strategy; • drafting of information messages; • creation and/or deployment of communication media..	
Pilot(s)/coordinator(s)	ASN.	
Parties performing the action/main players taking part in performing the action	DGS, DGT, DHUP, DGPR.	
Possible implementation time-frame	Deployment of communication tools in 2017.	
Date of creation November 2016	**Updating date** -	**Current state of progress** To be initiated

ACTION SHEET No. 2

Priority 1: Set up an overall strategy for information and awareness-raising and develop tools for collecting and sharing information.

Sub-priority 1.1: Set up an overall strategy for information and awareness-raising		
Action title	**Organise a national radon risks prevention day.**	
Subject (description)	Involve France in the European radon risks prevention day launched in 2014 by the ERA association (7 November).	
Objective(s)	The aim of this day is to improve understanding of this health risk among the general public, professionals and employers and personnel representatives, and to raise awareness of exposure levels, technical means and best practices for lowering existing radon concentrations.	
Method/tools	• Development and/or deployment of graphics and communication tools on partner websites and on social networks. • Organisation of initiatives: conferences, exhibitions, discussion forums.	
Pilot(s)/coordinator(s)	DGS.	
Parties performing the action/main players taking part in performing the action	DGPR, ASN, DGT, DHUP, ARS.	
Possible implementation time-frame	Novembre 2017.	
Date of creation November 2016	**Updating date** -	**Current state of progress** To be initiated

ACTION SHEET No.3

Priority 1: Set up an overall strategy for information and awareness-raising and develop tools for collecting and sharing information.

Sub-priority 1.1: Set up an overall strategy for information and awareness-raising		
Action title	**Define and set up radon risk monitoring indicators.**	
Subject (description)	The national radon risk management strategy is built on two main pillars: • the regulatory mandatory radon monitoring system in certain ERP and workplaces and the forthcoming implementation of mandatory information of real estate buyers and tenants in areas with radon potential; • local radon risk awareness-raising actions. The national strategy for reducing exposure of the population to radon and raising awareness of this risk requires objective monitoring indicators in order to allow an assessment of the effectiveness of the strategy and the possible need for modifications to be made to it.	
Objective(s)	Define indicators allowing monitoring of radon risk management in ERP and workplaces.	
Method/tools	Set up a WG.	
Pilot(s)/coordinator(s)	ASN.	
Parties performing the action/main players taking part in performing the action	DGS, DGT, DHUP, DGPR.	
Possible implementation time-frame	2018.	
Date of creation November 2016	**Updating date** -	**Current state of progress** To be initiated

ACTION SHEET No. 4

Priority 1: Set up an overall strategy for information and awareness-raising and develop tools for collecting and sharing information.

Sub-priority 1.2: Develop tools for collecting and sharing information		
Action title	**Set up a dedicated website.**	
Subject (description)	To facilitate access to information about radon by the general public, professionals and all partners involved or wishing to be involved in this subject, ASN will be deploying a website. This site will compile all useful information about radon, exposure to it in buildings, the risks associated with this exposure, the importance of measurement and the technical means for reducing radon levels.	
Objective(s)	This dedicated website will help build on and share local experience and make the national framework available, as well as providing private individuals and professionals with information.	
Method/tools	Set up the dedicated website: • draft specifications with the oversight committee partners; • develop the dedicated website; • deploy the site.	
Pilot(s)/coordinator(s)	ASN.	
Parties performing the action/main players taking part in performing the action	DGS, DGT, DHUP, DGPR.	
Possible implementation time-frame	2017/2018.	
Date of creation November 2016	**Updating date** -	**Current state of progress** To be initiated

ACTION SHEET No.5

Priority 1: Set up an overall strategy for information and awareness-raising and develop tools for collecting and sharing information.

Sub-priority 1.2: Develop tools for collecting and sharing information		
Action title	**Develop a methodology kit to assist with the performance of local initiatives.**	
Subject (description)	The development of local initiatives to raise the population's awareness of the radon risk is one of the goals of the radon plan and the PNSE 3. On the basis of local initiatives already carried out and driven mainly by the ARS within the framework of the regional health and environment plans, or the local health contracts, the aim is to provide a methodology kit to the promoters of these actions, to help them with implementation. This kit will in particular aim to: • determine the various partners (technical and financial) who could take part in implementing and monitoring these initiatives; • list the various steps (information, communication, production of results, remediation) and the areas for vigilance required for each of these steps; • provide templates for the documents of use for implementation of these actions (information brochure, standard letters, etc.); • define the measurement data and describe the residential building characteristics for collection to allow nationwide consolidation; • list the tools made available (radon measurement kits, standard sheets for attenuation works by building occupants, etc.).	
Objective(s)	Define the contents of the kit and make it available to the local stakeholders (first of all via the exchange networks and then on the website set up by ASN - action 4) to support the creation of new local initiatives for raising awareness of the radon risk.	
Method/tools	• Build on the tools used in local initiatives. • Set up a WG to assess the pertinence and exhaustiveness of the available tools. • Draft or update standard documents.	
Pilot(s)/coordinator(s)	DGS.	
Parties performing the action/main players taking part in performing the action	IRSN, ARS, ASN, DREAL, CSTB, CEREMA.	
Possible implementation time-frame	2017.	
Date of creation November 2016	**Updating date** -	**Current state of progress** To be initiated

2. Action sheets 6 to 15 concerning priority 2: "Continue to improve knowledge".

ACTION SHEET No. 6

Priority 2: Continue to improve knowledge.

Sub-priority 2.1: Continue to improve knowledge of the risk, exposure and the health impact of radon		
Action title	**Conduct a survey of knowledge about the health risks associated with radon and propose research priorities.**	
Subject (description)	The lung cancer risk associated with exposure to radon is today well characterised in adults. However, there are still gaps in knowledge for certain groups of individuals (risk of lung cancer in non-smokers, risk linked to radon exposure during childhood) and the possibility of links to other pathologies (leukemias, non-pulmonary cancers).	
Objective(s)	The aim is to carry out a scientific watch and identify points where knowledge on the health risks associated with radon could be improved, in order to define priority avenues for research.	
Method/tools	This action will rely on a scientific watch and research projects involving epidemiology and biology (molecular epidemiology) in the following priorities: • risk of lung cancer associated with radon in non-smokers; • variation in risk of lung cancer as a function of the age of exposure to radon; • risk of pathologies other than lung cancer potentially associated with radon. This watch will make it possible to evaluate the need to continue with and/or develop these studies (international collaboration, integration of biological and genetic parameters), in order to produce pertinent information on the risks associated with radon in the coming years.	
Pilot(s)/coordinator(s)	IRSN.	
Parties performing the action/main players taking part in performing the action	ANSP, Inserm, Hospices civils de Lyon, INCA.	
Possible implementation time-frame	2018.	
Date of creation November 2016	**Updating date** -	**Current state of progress** To be initiated

ACTION SHEET No.7

Priority 2: Continue to improve knowledge.

Sub-priority 2.1: Continue to improve knowledge of the risk, exposure and the health impact of radon		
Action title	**Assess the effectiveness of public policies concerning management of the radon risk and help improve them.**	
Subject (description)	Action 7 of the PNSE 3 "updating of the radon health impact assessment, taking account of the latest measurements and the knowledge available in order to assess the effectiveness of public radon risk management policies and help to improve them".	
Objective(s)	The aim is to update the quantitative evaluation of the health impact (EQIS) of domestic radon on the basis of various criteria (geographical zone, types of building, exposure levels, lifestyle, etc.) and thus enable the management actions (information, regulation, incentives, etc.) to be adapted, by identifying those which are most effective in terms of expected health benefits and back up communication with the decision-makers and general public by illustrating the expected health benefits.	
Method/tools	The health impact evaluation will be based on: • various scenarios for radon risk management and for changes in radon levels in the home as a function of the characteristics of the home, in order to assess the expected health benefits; • the use of the most recently available input data (radon exposure, base rate for lung cancer, tobacco consumption, etc.).	
Pilot(s)/coordinator(s)	IRSN, ANSP.	
Parties performing the action/main players taking part in performing the action	DGS, ASN, DGPR, DHUP, CSTB.	
Possible implementation time-frame	2018.	
Date of creation November 2016	**Updating date** -	**Current state of progress** To be initiated

ACTION SHEET No. 8

Priority 2: Continue to improve knowledge.

Sub-priority 2.1: Continue to improve knowledge of the risk, exposure and health impact of radon		
Action title	**Complete the radon potential map, studying the influence of certain aggravating geological factors and identifying areas with a particularly high risk of radon exposure (areas warranting particular vigilance).**	
Subject (description)	IRSN produced a radon potential map for metropolitan France in 2010 and one for the DROM-COM (French overseas departments and territories) in 2014. This map was used to classify the municipalities according to the radon potential of the rock making up their subsoil. Additional work is considered to be necessary to improve knowledge of the radon risk nationwide, in two priorities: clarify the influence of certain aggravating geological factors (underground cavities) and identify zones with a particularly high risk of radon exposure.	
Objective(s)	With regard to the first priority and at the request of the DGS, IRSN initiated a study in 2015 on the influence of karstic environments (presence of natural underground cavities) on the geogenic radon potential. A pilot zone in the Franche-Comté region was selected for this study. The results in this zone will help assess the need to clarify the radon potential map, taking account of the presence of these cavities and more closely tailor management of the radon risk to the zones concerned. The second priority consists in utilising the available information to define a method for identifying areas in which exposure to domestic radon can be considered to be significantly higher than that expected in the rest of the country. Defining such zones could eventually lead to the development of particular awareness-raising, remediation or prevention actions.	
Method/tools	This study will be based on: • an inventory of available knowledge; • the geogenic radon potential map produced by IRSN; • regional or local geological data; • experimental data acquired in the field; • domestic radon concentration measurement data obtained during various measurement campaigns (IRSN/DGS national campaigns and more recent regional actions) and radon transfer modelling tools developed at IRSN; • the results of the update of the quantitative evaluation of health impact (EQIS) linked to radon (IRSN/ANSP collaboration, action sheet 7, action of the PNSE 3).	
Pilot(s)/coordinator(s)	DGS, DGPR.	
Parties performing the action/main players taking part in performing the action	IRSN, BRGM, University of Franche-Comté, CNRS (Chrono Environnement Laboratory).	
Possible implementation time-frame	• 2017 (influence of aggravating factors). • 2018 (zones with a particularly high risk of exposure to radon).	
Date of creation November 2016	**Updating date** -	**Current state of progress** In progress

ACTION SHEET No. 9

Priority 2: Continue to improve knowledge.

Sub-priority 2.1: Continue to improve knowledge of the risk, exposure and health impact of radon		
Action title	**Help implement the regulations in the DROM/COM (French overseas departments and territories).**	
Subject (description)	The map of the 31 priority départements for management of the radon risk did not take account of the overseas territories. At the request of ASN, IRSN carried out work to identify radon exhalation potential from soils in metropolitan France and the overseas territories. This work must be supplemented by radon level measurements in ERP, in sectors with medium to high radon exhalation potential, so that the risk management procedures can as necessary be adapted to the specific nature of the types of construction.	
Objective(s)	Evaluate the radon exposure levels in municipalities of the overseas territories with medium to high potential, taking account of the types of buildings.	
Method/tools	• Draft specifications. • Carry out measurement campaigns representative of the types of buildings. • Take account of the results of these campaigns and of implementation of mandatory monitoring and communication about the radon risk.	
Pilot(s)/coordinator(s)	DGS, ASN.	
Parties performing the action/main players taking part in performing the action	IRSN, CSTB, ARS, DHUP.	
Possible implementation time-frame	2017.	
Date of creation November 2016	**Updating date** -	**Current state of progress** To be initiated

ACTION SHEET No. 10

Priority 2: Continue to improve knowledge.

Sub-priority 2.1: Continue to improve knowledge of the risk, exposure and the health impact of radon		
Action title	**Identify new types of workplaces and new professional activities liable to generate exposure to radon, which cannot be ignored in terms of worker exposure.**	
Subject (description)	The list of activities or categories of professional activities carried out in underground places in the départements currently with priority, was set by the regulations in 2008. They are subject to specific regulatory requirements, more particularly the obligation to have the radon activity concentration measured by an approved organisation and the performance of measures to reduce this concentration as applicable. The purpose of this action, given the broadening of the scope of application set by Directive 2013/59/Euratom, more specifically to workplaces on ground floors, is to update this list by identifying new workplaces or new professional activities for which radon exposure cannot be ignored from the radiation protection viewpoint (intrinsic characteristics of the workplace, professional activity or process, etc.).	
Objective(s)	With a view to a change in the regulations resulting from transposition of Directive 2013/59/Euratom, this identification will make it possible to adapt the need for an in-depth assessment of this risk and, as applicable, to adapt the technical or organisational measures to be taken.	
Method/tools	• Review of workplaces and professional activities or activity categories covered by the regulations of the Member States of the European Union. • Analysis of the results of exposure evaluations and available measurements.	
Pilot(s)/coordinator(s)	DGT.	
Parties performing the action/main players taking part in performing the action	IRSN, DGPR, ASN.	
Possible implementation time-frame	2018.	
Date of creation November 2016	**Updating date** -	**Current state of progress** To be initiated

ACTION SHEET No. 11

Priority 2: Continue to improve knowledge.

Sub-priority 2.1: Continue to improve knowledge of the risk, exposure and health impact of radon		
Action title	**Conduct a preliminary study and develop an information system to enable the analysis laboratories to transmit radon measurement data.**	
Subject (description)	Numerous data about exposure of the French population are produced every year as a result of application of the regulations (monitoring in ERP and workplaces) as well as during the performance of local domestic radon screening initiatives. Ordinance 2016-128 of 10th February 2016 containing various nuclear provisions introduced the possibility of centralising all radon measurement results. Specifications for this future information system must now be defined, anticipating any future changes, and the system must then be deployed.	
Objective(s)	Development of an information system collating all radon measurement data in buildings.	
Method/tools	• Identification of requirements. • Drafting of specifications. • Implementation of the chosen scenario.	
Pilot(s)/coordinator(s)	ASN, DGS.	
Parties performing the action/main players taking part in performing the action	IRSN, dosimetry laboratories. DGT.	
Possible implementation time-frame	End 2017.	
Date of creation November 2016	**Updating date** -	**Current state of progress** To be initiated

ACTION SHEET No. 12

Priority 2: Continue to improve knowledge.

Sub-priority 2.2: Improve knowledge on the "radon and buildings" topic		
Action title	**Identify best practices in this priority:** • **programmes and performance of works, in existing buildings, compatible with reducing the radon risk and maintaining good indoor air quality;** • **remediation work, radon attenuation and experience feedback from local initiatives.**	
Subject (description)	If carried out in a coherent manner, work or maintenance on buildings poses little or no risk of exacerbating the radon level. Depending on the quality of the work done and any upgrading of the building's ventilation, the overall impact of the work on exposure to radon and on indoor air quality in general may differ. With respect to any works on a building in a zone with a medium to high radon potential, it is therefore particularly important to pay close attention to the soil/structure interface, the initial venting and ventilation conditions, etc.	
Objective(s)	• Identify the priority technical points liable to aggravate the radon risk or degrade indoor air quality, to be taken into account when scheduling works and when performing the work. • Identify best practices for radon risk mitigation works. • Build on local and national information in order to target the most effective protection solutions and disseminate them.	
Method/tools	• Set up a working group with experts on thermal aspects, ventilation, construction, radon. • Utilise the available measurement data before/after the works and the studies already performed on the subject (for example, use of ERP monitoring data between 2004 and today). • As necessary, obtain additional measurement data during regional field campaigns. • Identify the priority technical points liable to aggravate the radon risk and to be taken into account when scheduling works and when performing the work. • Summarise the conclusions of the working group in a report. • Coordinate networks of professionals performing radon attenuation works locally (CEREMA). • Set up a national working group with representatives of professional federations, the CSTB, the CEREMA and the stakeholders involved in local experiments.	
Pilot(s)/coordinator(s)	DHUP.	
Parties performing the action/main players taking part in performing the action	CSTB, IRSN, CEREMA.	
Possible implementation time-frame	• Start of the action: 2017. • Completion of the action: 2019.	
Date of creation November 2016	**Updating date** -	**Current state of progress** To be initiated

ACTION SHEET No. 13

Priority 2: Continue to improve knowledge.

Sub-priority 2.2: Improve knowledge on the "radon and buildings" topic		
Action title	**Measure and analyse the radon activity concentration in new buildings in areas with medium to high radon potential.**	
Subject (description)	It is possible to reduce radon exposure in buildings by limiting the ingress of radon by having a soil/building interface that is as tight as possible and by diluting it in the indoor air through a satisfactory air renewal rate. Buildings currently being constructed, with the current regulations, have the advantage of being more effective in reducing air permeability. The radon ingress pathways are theoretically more limited than in buildings constructed before the new thermal regulations applicable to building permits submitted since 1st January 2013.	
Objective(s)	Check that current construction rules do allow a reduction in the activity concentration of radon in new buildings, by means of direct measurements.	
Method/tools	• Set up a working group with experts on thermal aspects, ventilation, construction, radon. • Draft a measurement protocol and a questionnaire, the results of which can be interpreted to make it possible to isolate the role of the building and that of other factors. • Measure radon levels in buildings constructed in accordance with the current standards in areas with medium to high radon potential. • Analyse the levels measured in the buildings constructed in accordance with current standards and any cases of high concentrations, interpreting the role of the building and that of other factors (subsequent work on the building, use of the building, etc.). • As necessary, identify any points requiring particular vigilance then propose technical solutions and best practices providing an optimum solution for new-build health objectives. • This study will be based on: - existing data collected through local actions (CEREMA, etc.); - data from the campaign carried out by the OQAI in energy-efficient buildings (BPE); - experimental data or additional digital sensitivity studies as applicable.	
Pilot(s)/coordinator(s)	DHUP.	
Parties performing the action/main players taking part in performing the action	CSTB, IRSN, CEREMA.	
Possible implementation time-frame	• Start of the action: 2017. • Completion of the action: 2019.	
Date of creation November 2016	**Updating date** -	**Current state of progress** To be initiated

ACTION SHEET No. 14

Priority 2: Continue to improve knowledge.

Sub-priority 2.2: Improve knowledge on the "radon and buildings" topic		
Action title	**Assess the radon risk of man-made origin.**	
Subject (description)	Radium-bearing waste resulting from human activities can in certain situations constitute man-made sources of radon in buildings and lead to high levels of radon exposure. The action consists in evaluating the potential influence of man-made sources on the radon levels in the indoor air of homes for typical situations that can be encountered when waste rock/residues resulting from mining of uranium ore is reused and when homes are built on a radium-bearing waste or mining residues dump following the loss of all record of these disposal sites.	
Objective(s)	Three objectives are defined for this action: • definition of a modelling strategy; • drafting of various typical scenarios; • evaluation of these scenarios in terms of exposure to radon.	
Method/tools	This study will be based on: • the modelling tools developed by the CSTB and IRSN and experience feedback from knowledge of the factors influencing radon levels in homes; • the data and statistics used to define the main types of residential accommodation in France; • the state of knowledge on existing pollution from the waste concerned and on the disposal concepts; • analysis of the scenarios identified in the baseline technical requirements in France and internationally and the dossiers filled out by the licensees for disposal sites (radium-bearing waste or uranium mining residues).	
Pilot(s)/coordinator(s)	DGPR.	
Parties performing the action/main players taking part in performing the action	IRSN, CSTB, Andra, ASN.	
Possible implementation time-frame		
Date of creation November 2016	**Updating date** -	**Current state of progress** To be initiated

ACTION SHEET No. 15

Priority 2: Continue to improve knowledge.

Sub-priority 2.2: Improve knowledge on the "radon and buildings" topic		
Action title	**Conduct a forward-looking study to identify building materials or products liable to emit significant levels of radon.**	
Subject (description)	Paragraph 1° of article 103 of Directive 2013/59/Euratom concerning the action plan, requires that all forms of radon ingress in buildings must be studied, more specifically when the radon comes from the construction materials. There is little available knowledge on building materials or products and their radon exhalation, in particular in France. It will first of all be necessary to survey and analyse the various existing studies on this subject internationally, in Europe and in France, in order to list the basic materials or building products known to give off radon. Secondly, it will be necessary to extend this to cover materials or products mainly used in France, more specifically those containing materials or residues on the list in Appendix XIII of Directive 2013/59. Finally, practical tests to measure the exhalation rates from these targeted materials and products will enable the list to be refined.	
Objective(s)	Produce a list of building materials and products giving off the highest levels of radon.	
Method/tools	• Bibliographical survey. • Tests on targeted materials or products.	
Pilot(s)/coordinator(s)	DGPR, DHUP.	
Parties performing the action/main players taking part in performing the action	CSTB, IRSN.	
Possible implementation time-frame	• End 2017 for first stage. • End 2018 for production of a consolidated list.	
Date of creation November 2016	**Updating date** -	**Current state of progress** To be initiated

3. Action sheets 16 to 20 concerning priority 3: "Greater consideration of management of the radon risk in buildings".

ACTION SHEET No. 16

Priority 3: Greater consideration of management of the radon risk in buildings.

Sub-priority 3.1: Facilitate and support measures to address the issue of radon in buildings		
Action title	**Study the feasibility of setting up a system for help with performance of the works (legal, financial, etc.).**	
Subject (description)	Within the context of local initiatives to raise awareness of the radon risk which revealed high levels of radon in the home, the performance of remediation work by private individuals to reduce their exposure remains relatively rare. Apart from under-estimation of the risk by a part of the population, the financial cost of the work, which is sometimes considerable for high levels of radon, is unacceptable in many cases. The action envisaged aims to study the feasibility of setting up a system to help private individuals obtain financing for performance of the works. Currently, only financing from the Anah is available for the works, but this is means tested.	
Objective(s)	Study the feasibility of setting up a system for financial help with performance of the works.	
Method/tools	• Inventory existing financing systems (for radon and other risks). • Meet partners liable to finance the work.	
Pilot(s)/coordinator(s)	DGPR, DHUP.	
Parties performing the action/main players taking part in performing the action	DGS, ASN.	
Possible implementation time-frame	2018.	
Date of creation November 2016	**Updating date** -	**Current state of progress** To be initiated

ACTION SHEET No. 17

Priority 3: Greater consideration of management of the radon risk in buildings.

Sub-priority 3.1: Facilitate and support measures to address the issue of radon in buildings		
Action title	**Raise awareness of the radon risk among building professionals during their initial and further training.**	
Subject (description)	If carried out in a coherent manner, work or maintenance on buildings poses little or no risk of exacerbating the radon level. Depending on the quality of the work done and any upgrading of the building's ventilation, the overall impact of the work on exposure to radon and on indoor air quality in general may differ. With respect to any works on a building in a zone with a medium to high radon potential, it is therefore particularly important to pay close attention to the soil/structure interface, the initial venting and ventilation conditions, etc.	
Objective(s)	Raise awareness among building professionals and inform them as of their initial training and during continuing training of the issues relating to indoor air quality and the radon risk.	
Method/tools	• Identify the existing national training modules specific to radon or to indoor air quality and ventilation. • Identify and build on local experience of initial and continuing training. • As necessary, propose national or local additional training or new training modules. • Distribute and promote the guide intended for building professionals (information kit). This study will be based on the initiatives that already exist.	
Pilot(s)/coordinator(s)	DHUP.	
Parties performing the action/main players taking part in performing the action	FFB, CAPEB, CEREMA, CSTB, AQC.	
Possible implementation time-frame	• Start of the action: 2017. • Completion of the action: 2019.	
Date of creation November 2016	**Updating date** -	**Current state of progress** To be initiated

ACTION SHEET No. 18

Priority 3: Greater consideration of management of the radon risk in buildings.

Sub-priority 3.2: Develop the necessary tools and validate the systems		
Action title	**Develop one or more tools to facilitate the performance of radon assessments in buildings.**	
Subject (description)	When a radon measurement reveals medium or high concentrations, it is recommended, or even mandatory in certain situations, to carry out a radon assessment in the building to be able to identify the potential sources of radon ingress and, as necessary, carry out pertinent, targeted actions. To facilitate the radon assessment in buildings, the creation of tools to improve the understanding of radon in a building (reflex sheets) is proposed, for professionals and private individuals alike.	
Objective(s)	• Create a tool making it easier to carry out a radon assessment in buildings, intended for professionals. • Create a tool suitable for private individuals, to facilitate a radon assessment in their homes.	
Method/tools		
Pilot(s)/coordinator(s)	DHUP.	
Parties performing the action/main players taking part in performing the action	CEREMA.	
Possible implementation time-frame		
Date of creation November 2016	**Updating date** -	**Current state of progress** To be initiated

ACTION SHEET No. 19

Priority 3: Greater consideration of management of the radon risk in buildings.

Sub-priority 3.2: Develop the necessary tools and validate the systems		
Action title	**Adapt measurement practices in the workplace.**	
Subject (description)	To facilitate the evaluation of the radon risk in the workplaces concerned, for which a measurement obligation is defined, more specifically as a result of the broader scope of application set by Directive 2013/59/Euratom, now including ground floor workplaces, the aim of the action is to develop criteria to be considered to ensure that the measurement solutions adopted are adequate. Depending on the nature of the workplaces concerned, the measurement process may be more or less complex. In the simplest cases, the use of self-measurement may be sufficient, even though this is a new regulatory approach, while in other more complex cases it is essential to call in competent organisations.	
Objective(s)	Develop criteria to help the employer choose the most appropriate evaluation technique for measuring radon in the workplaces, from among the range of recognised practices (self-measurement, measurement by an approved organisation) and thus facilitate performance by whenever possible allowing the use of methods accessible to very small and small to medium sized companies.	
Method/tools	• Review of practices and any criteria selected, by the other Member States. • Analysis of types of workplace. • Formulation of recommendations to adapt the performance of radon measurements.	
Pilot(s)/coordinator(s)	DGT.	
Parties performing the action/main players taking part in performing the action	IRSN. CSTB, ASN.	
Possible implementation time-frame	2018.	
Date of creation November 2016	**Updating date** -	**Current state of progress** To be initiated

ACTION SHEET No. 20

Priority 3: Greater consideration of management of the radon risk in buildings.

Sub-priority 3.2: Develop the necessary tools and validate the systems		
Action title	**Continue with the evaluation of the performance of radon measurement devices and implement dosimetry laboratories accreditation.**	
Subject (description)	The actions currently initiated by the public authorities via the obligation of measurement in places open to the public and in workplaces, along with the information and support actions initiated for private homes (development of regional integrated management actions concerning the radon risk in the home, information about zones with radon potential during real estate transactions, etc.) are leading to increased awareness of the radon risk among the populations and growing interest in measurement. One potential consequence of this context is a rise in the number of measurement requests, whether performed within a regulatory framework by approved organisations or by private individuals (self-measurement) and thus an increase in the commercial supply of measuring instruments. This context thus demands that particular vigilance be maintained regarding the quality of radon activity concentration measurements in France and that systems be put into place for evaluating and improving the general quality of the measurement results produced by the laboratories in France. This on the one hand requires that evaluation of the performance of these measuring devices be maintained, following on from the inter-comparison performed by IRSN on the DSTN (solid-state nuclear track detectors) used in France and, on the other, that the accreditation of laboratories analysing these devices be set up.	
Objective(s)	For integrated measurement devices, more specifically used within a regulatory framework: guarantee the reliability of all measurement devices that could be used for integrated measurement of radon activity concentration in all types of premises (ERP, workplace, home). For the other measurement devices (integrated or continuous) : keep a watch and issue alerts on products with notable measurement reliability defects and propose support for improving measurement quality (calibration).	
Method/tools	• Set up an inter-comparison of integrated measurement devices by IRSN and encourage technical dialogue with the suppliers. For continuous measurement devices: propose calibration of the activity concentration of radon in the air and develop the calibration of instruments for measuring the activity concentration of thoron in the air. • Set up a standard measurement laboratories accreditation system.	
Pilot(s)/coordinator(s)	DGS, DGT, ASN.	
Parties performing the action/main players taking part in performing the action	IRSN, manufacturers of radon measurement devices, dosimetry laboratories.	
Possible implementation time-frame	• Performance of inter-comparison in 2017/2018; Performance of calibration each year. • Monitoring of implementation of accreditation.	
Date of creation November 2016	**Updating date** -	**Current state of progress** To be initiated

ACRONYMS AND NAMES

AFNOR: French National Standards Association

AIEA: International Atomic Energy Agency

ANSP: National Public Health Agency, Santé publique France

AQC: French construction quality agency

ARS: Regional health agency (Agence Régionale de Santé)

ASN: French nuclear safety regulator

ATMO: French air quality monitoring association

BPE: Energy efficient buildings

BRGM: French geological and mining research office

CAPEB: French Confederation of arts and crafts and small building companies

CCA: Concarneau Cornouaille municipality

CCH: French construction and housing code

CEPN: French centre for assessment of protection in the nuclear field

CEREMA: French centre for study and assessment of risks, the environment, mobility and development

CETE: French centre for the study of equipment techniques (now CEREMA)

CLCV: Consumer affairs, housing and living environment

CNFPT: French national centre for regional civil service affairs

CSP: French Public Health Code

CSTB: French scientific and technical centre for the building trades

CT: French Labour Code

DGPR: General Directorate for the prevention of risks

DGS: General Directorate for Health

DGT: General Directorate for Labour

DHUP: Directorate for housing, town and country planning

DREAL: Regional Directorate for the environment, planning and housing

DSTN: Solid-state nuclear track detectors

EDCH: Water intended for human consumption

EQIS: Qualitative evaluation of health impact

ERP: Facilities open to the public

FFB: French building federation

IAL: Buyer/tenant information

IARC: International Agency for Research on Cancer

INCA: French national cancer institute

INPES: French national institute for prevention and education for health (now ANSP)

InVS: French health monitoring institute (now ANSP)

IRSN: Institute for radiation protection and nuclear safety

MSNR: Nuclear safety and radiation protection mission

NEA: Nuclear Energy Agency

OQAI: Indoor air quality observatory

PMA: Pays Montbéliard municipality

PNSE: National health and environment plan

PRSE: Regional health and environment plan

UPRAD: Union of radon professionals

WHO: World Health Organisation

NOTES

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