

Tritium

The French situation

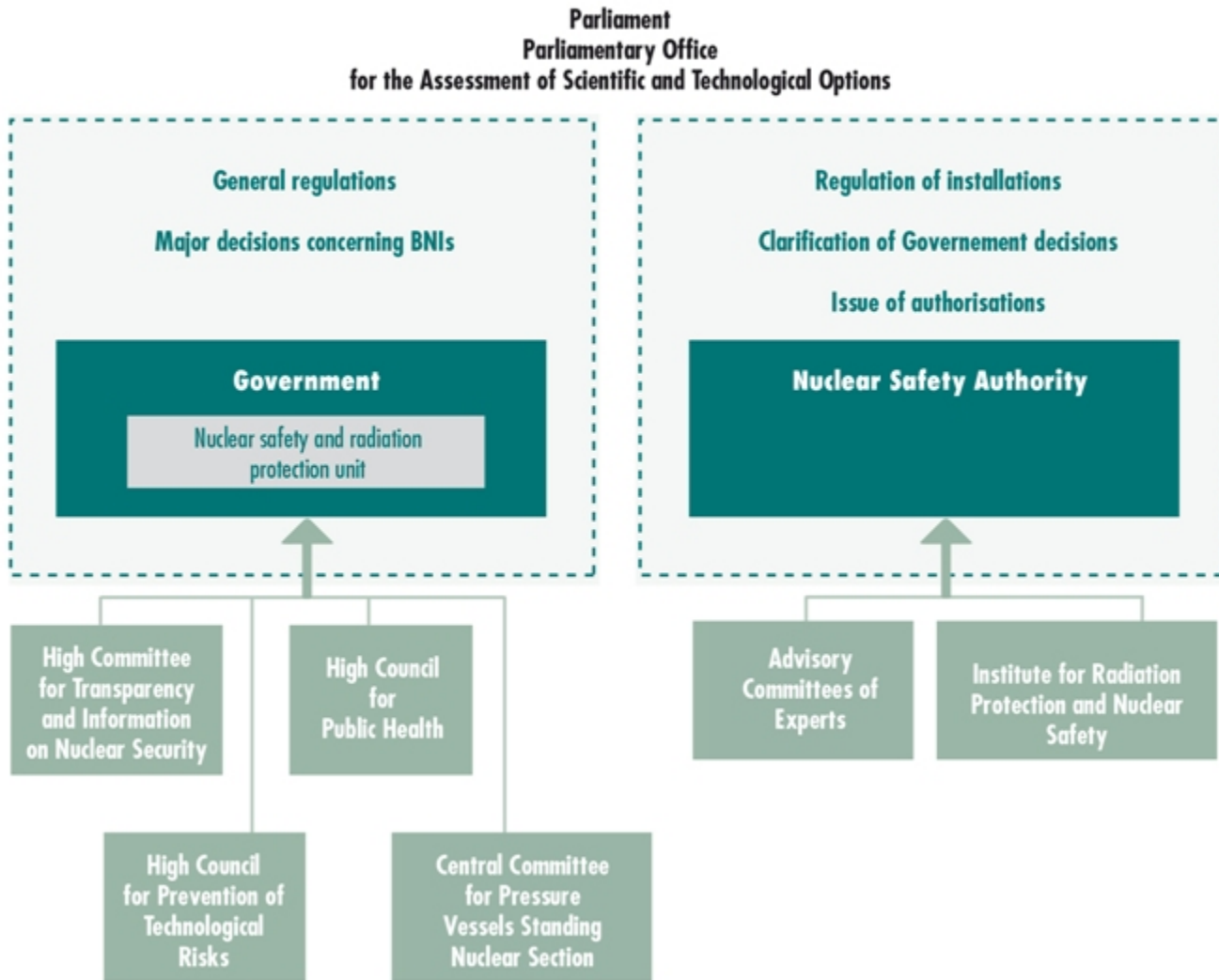
Jean-Luc LACHAUME
Deputy Director General
ASN

- The regulation of the discharges of tritium from nuclear facilities in France
- The tritium controversy in France
=> « The Tritium white book »

The regulation of the discharges of tritium from nuclear facilities in France

Regulation of the discharges of tritium from nuclear facilities

Regulation of nuclear safety and radiation protection in France





- **A board of 5 commissioners**

- A full-time job
- A non-renewable 6 year mandate

ASN Chairman:

Pierre-Franck Chevet (appointed in 2012 for 6 years)

Commissioners:

Michel Bourguignon (appointed in 2008 for 6 years)

Jean-Jacques Dumont (appointed in 2010 for 6 years)

Philippe Jamet (appointed in 2010 for 6 years)

Margot Tirmarche (appointed in 2012 for 6 years)



Designated by



President of the Republic

President of the Senate

President of the National Assembly

- **ASN Commission Tasks:**

- Defines ASN general policy
- Takes the major decisions
- Adopts public statements on key issues within ASN competence



Regulation of the discharges of tritium from nuclear facilities

ASN duties

Regulates

Authorizes

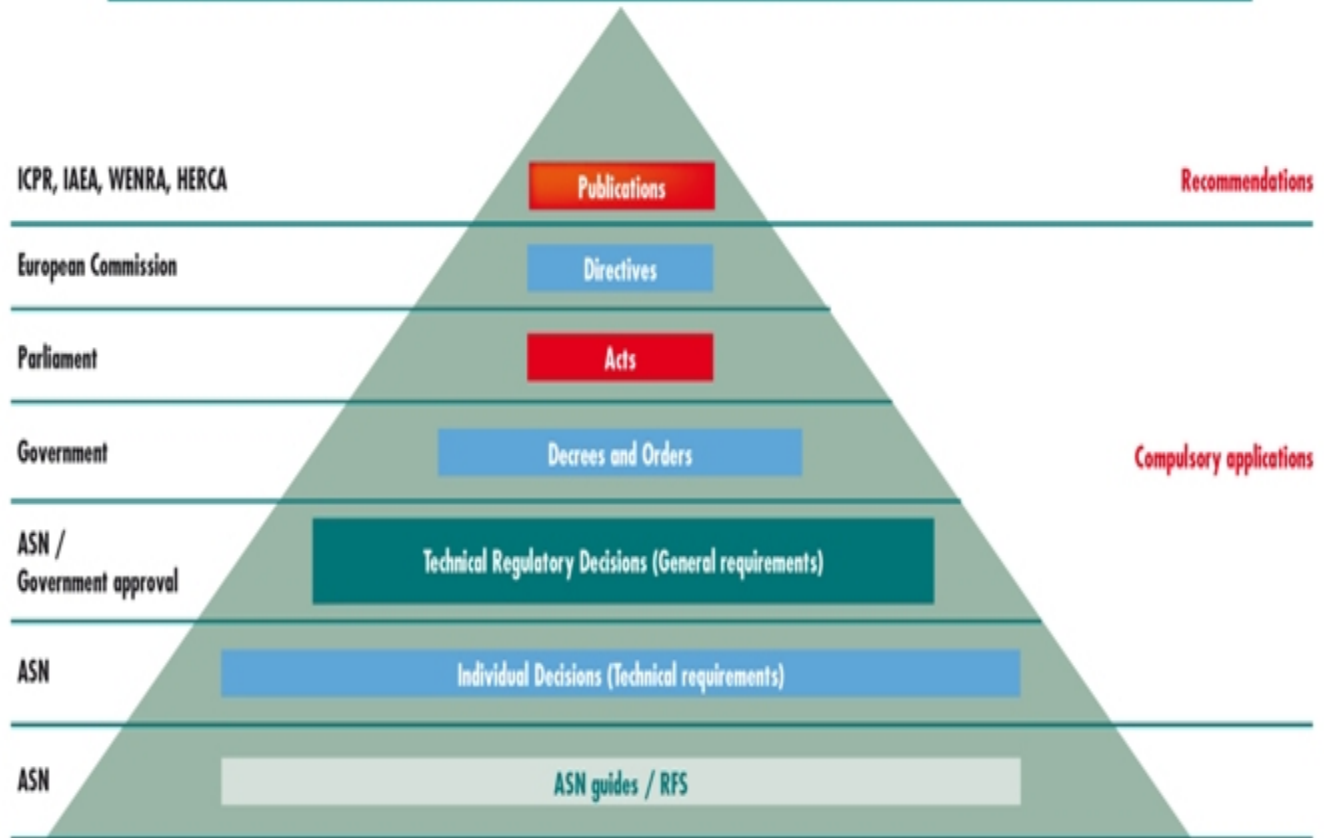
Controls: inspections and enforcement actions

Contributes to the emergency situations response

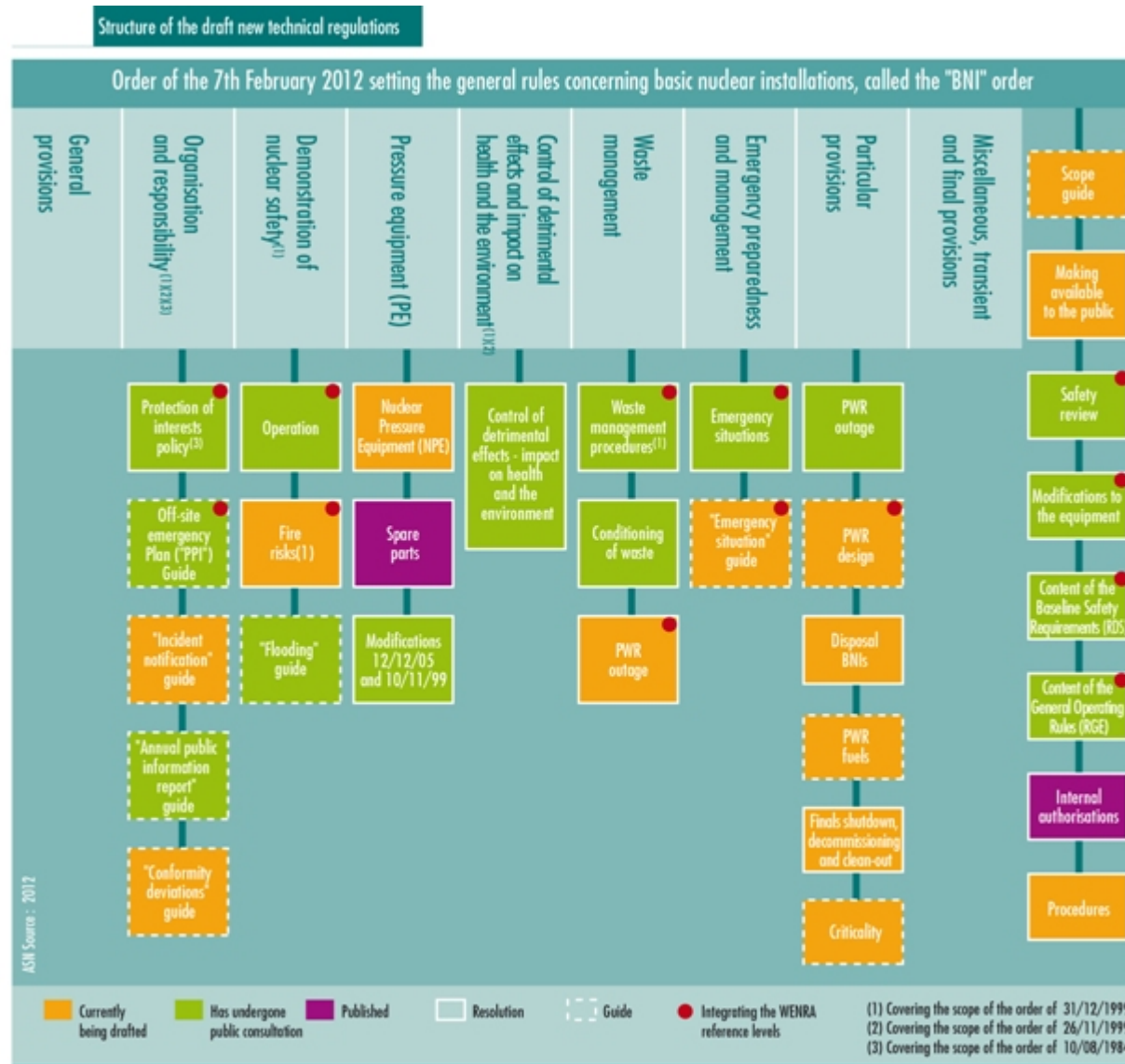
Informs the public

Regulation of the releases of tritium from nuclear facilities

Various levels of regulation in the field of small-scale nuclear activities in France (orientations, recommendations): legally binding or non-binding nature



Regulation of the discharges of tritium from nuclear facilities



Regulation of the discharges of tritium from nuclear facilities

- For each nuclear installation in France, there are two ASN's resolutions
 - water intake and discharges limits (gaseous, liquid)
 - general requirements (water intake, discharges operations, environmental and discharges monitoring...)
- The limit values for emissions, water intakes, and effluent discharges from the installation are set on the basis of the best available techniques under technically and economically acceptable conditions, considering the characteristics of the installation, its geographical location and the local environmental conditions

- Gaseous discharges:
 - Usual limits (NPP) :
 - Yearly total discharged activity: 5 TBq (2 reactors), 8 TBq (4 reactors)
 - Weekly added volume activity, estimated after dispersion at ground level: 50 Bq/m³
 - Control:
 - Sampling at the stack with bubbling systems (2 jars), measurements for each period (7 to 10 days), DL = 40 Bq/m³



Regulation of the releases of tritium from nuclear facilities

- Liquid discharges (NPP) :
 - Usual limits:
 - 40/45 TBq (2 reactors)
 - discharged activity in the river (mixing area) : Volume activity in the river shall not be above: 280 Bq/l
- Control:
 - Measurement of each tank before discharge: DL=200 Bq/l
 - Sampling at discharge location and measurement in laboratory
 - Sampling in the river at the “well mixed” location and measurement in laboratory: DT≈10 Bq/L

Environment

- Atmosphere:
 - HTO in Air: $DT \approx 10$ Bq/L
 - HTO in precipitation: $DT \approx 10$ Bq/L
- Water body:
 - If the water is to be used for human consumption: a tritium activity equal or above 100 Bq/L implies an analysis to verify the absence of artificial radionuclides
 - For other uses: $DT \approx 10$ Bq/L
 - Piezometer: $DT \approx 10$ Bq/L

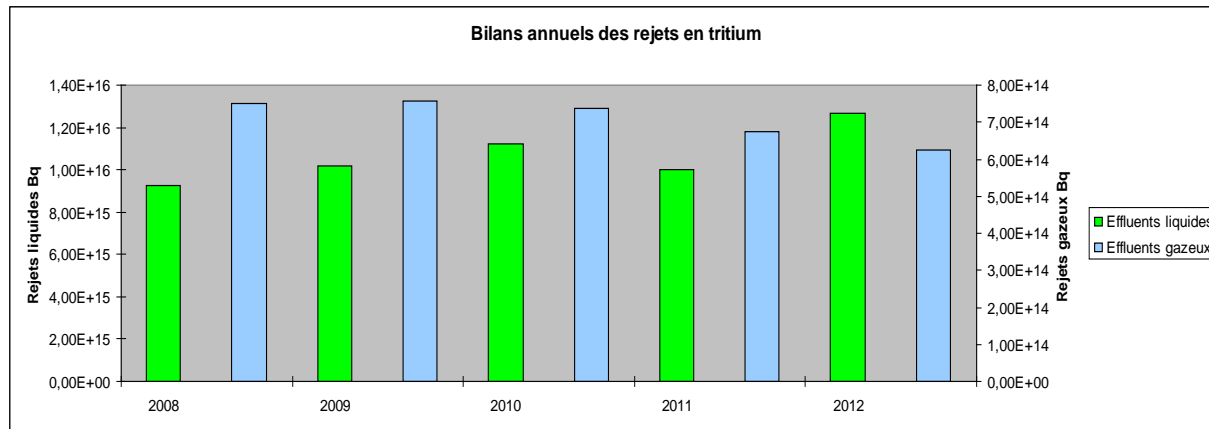
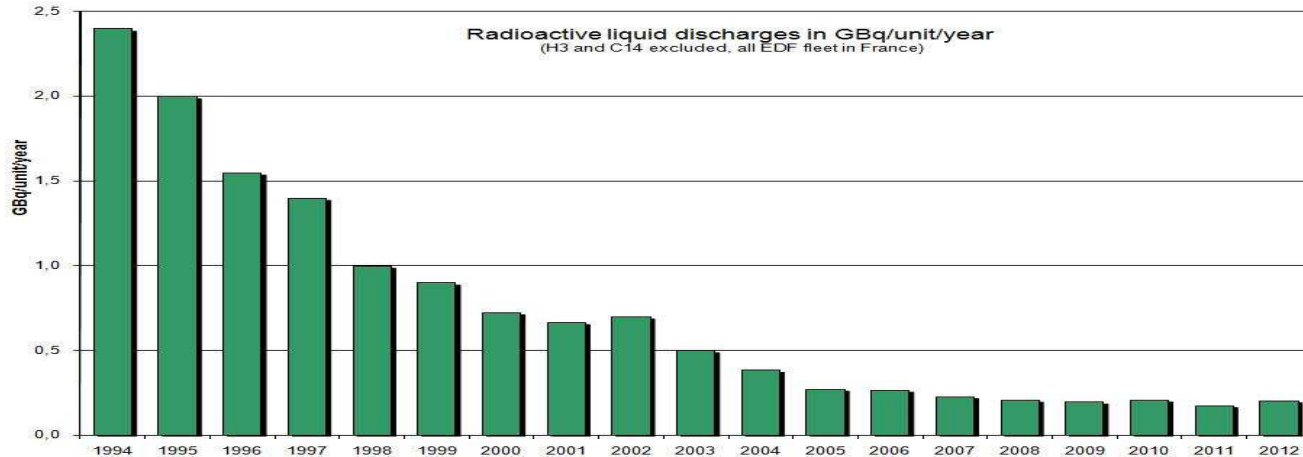


Regulation of the discharges of tritium from nuclear facilities

Tritium discharges in France

	Annual average releases	
	Liquid releases (TBq/year)	Air releases (TBq/year)
La Hague	12 000	70
Parc EDF (58 reactors)	1 000	30
Research (CEA)	20 (99% Marcoule)	700 (85% Marcoule and Valduc)

Conclusion



Radioactive discharges have very much decreased during the last 20 years in France. However, Tritium discharges are stable and are an issue for the stakeholders
=> The tritium white book



The Tritium white book



The Tritium “white book”

Context in 2007:

- Global agreement about the low toxicity of tritium and no technical possibilities for treating tritium in the industry; agreement about the low health impact of tritium
- France consider that the way of dealing with tritium should be periodically reviewed
- End of 2007: ASN decided to create two independent working groups with the stakeholders
 - The "tritium impact" group: inventory of the scientific knowledge concerning tritium's impact on health;
 - The "defense in depth" group: state of the art about technical possibilities for treating tritium.

Results:

- A « state-of-art » white book is published the 8th of July 2010
 - <http://www.asn.fr/sites/tritium/>



The Tritium “white book”

Tritium Working Groups Recommendations

<http://www.asn.fr/sites/tritium/fichiers/summary-of-work-and-recommendations-tritium-impact.pdf>

The issue of bioaccumulation

Measurements

Health effects of tritium

<http://www.asn.fr/sites/tritium/fichiers/summary-of-work-and-recommendations-defence.pdf>

Recommendations from the “Tritium Impact” working group

All these recommendations are taken into account in the ASN position

<http://www.asn.fr/sites/tritium/fichiers/position-and-action-plan.pdf>



The Tritium “white book”

ASN position

1 ASN action plan

1.1 Measurements

There is currently no standardised measurement protocol for the various physico-chemical forms of tritium, in particular the various organic forms of tritium (exchangeable and non-exchangeable). The fact that there is no standardised method makes it difficult to interpret existing studies and data. The CEA’s CETAMA (commission for the establishment of analysis methods) has started work to define shared and recognised measurement protocols.

In the ASN’s view, this work:

- must lead to the production of a guide to the measurement of organically bound tritium;
- is a vital first step prior to launching further studies.



The Tritium “white book”

ASN position

1 ASN action plan

1.2 Control of discharges

It is currently felt to be unrealistic to detritiate discharges from nuclear reactors and the La Hague fuel reprocessing plant at an acceptable cost using the best technologies currently available. In addition, detritiation would only have a limited effect on the radiological impact from these facilities. Given the increase observed in tritium discharges from civilian nuclear facilities and the absence of a detritiation method, the ASN, as part of the development of defence in depth, considers that:

- publishing the quantities discharged for each facility on an annual basis will ensure a long-term, reliable inventory of sources of tritium production. The public should be regularly and specifically informed of this inventory of tritium discharges by nuclear operators;
- accounting for discharges from all facilities should continue to be managed in all circumstances, as is the case today;
- a “technology watch” should be set up with respect to detritiation technologies.



The Tritium “white book”

ASN position

1 ASN action plan

1.3 Environmental monitoring

Tritium monitoring in the environment and throughout the food chain must be supplemented as follows:

- measurements performed must take into account the physico-chemical forms present. The ASN will consequently ask operators to characterise the physico-chemical forms of tritium in the discharges, particularly with regard to any possible organic precursors (small tritiated organic molecules);
- sampling plans in the different compartments of the environment must be undisputed and shared. In particular, the choice of animal and plant species to be measured must be reviewed in order to remove any species bias.



The Tritium “white book”

ASN position

1 ASN action plan

1.4 Impact assessment

Some studies mention the potential for underestimating the relative biological effectiveness (RBE) of tritium radiation. The ASN will ask the ICRP to review the value of the tritium weighting factor (w_R) used in calculating effective doses. Even before the ICRP’s response is known, the ASN will ask operators to supplement the radiological impact studies for their projects with a critical study in which a variant using a tritium weighting factor (w_R) of two is included.



The Tritium “white book”

ASN position

2 Research themes

Current knowledge about the biological effects of tritium is in some areas rather fragmentary. The following topics should be investigated further by research bodies in order to answer all the questions:

- Harmonisation of dose assessment methods according to the physico-chemical form of the tritium, contamination pathway and length of exposure;
- Studies into the effects of tritium exposure on embryos and fetuses;
- Investigation of new approaches to the potential induction of hereditary effects.

In most cases, this research will require international cooperation.



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Tritium Monitoring Committee

Finally, the ASN believes that all stakeholders must continue to think about and discuss these issues and to this end suggests the establishment of a supervisory committee to oversee the actions undertaken following the recommendations of the working groups.

- A monitoring committee was created
 - to follow action plan progress with all stakeholders
 - to oversee the actions undertaken following the recommendations of the working groups
- A meeting once a year (2011, 2012, 2013)
 - Progress on research and ideas ;
 - Action plan



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ASN action plan : measurements

French interlaboratory test (ILT) was organized in 2010 in biological sample for the measurement of OBT : ASN delivered specific approvals for OBT

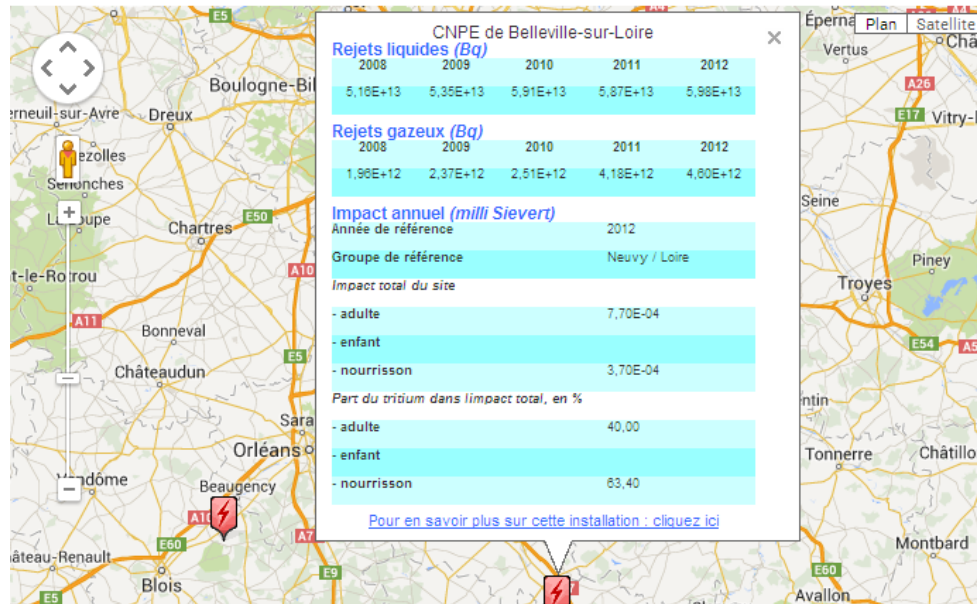
Standard for OBT measurement (AFNOR/BNEN) : ASN ask french standardisation organisation to provide a standard for OBT measurement. A draft has been established

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ASN action plan : environmental and discharges monitoring

ASN publishes on a web site the quantities discharged for each facility on an annual basis : <http://www.asn.fr/sites/tritium/>

- annual liquid and gaseous discharges ;
- estimation of the doses received by the public based on the actual discharges
- dose share of tritium





The Tritium “white book” ASN action plan : environmental and discharges monitoring

ASN asked operators to demonstrate that they release only HTO

Measurement of OBT is required by regulation in environmental monitoring (ASN Resolution 2013-DC-0360 of 16th July 2013 relative to control of nuisance effects and the impact of basic nuclear installations on health and the environment) :

- sampling of aquatic flora and fauna (yearly) ;
- sampling of the main agricultural produces, particularly in areas situated downwind of the prevailing winds (yearly)



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ASN action plan :

Impact assessment

ASN asked the ICRP to review the value of the tritium weighting factor (w_R) used in calculating effective doses.

ICRP response

ASN asked operators to supplement the radiological impact studies for their projects with a critical study in which a variant using a tritium weighting factor (w_R) of two is included.

General Conclusion

- Important decrease of the radioactive discharges in France during the last 20 years; however, the tritium discharges remain stable
- The Tritium whitebook: a fruitful experience still going on