Nuclear Energy: Institutional Arrangement and Public Engagement in France

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ENERGY MIX

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About Civic Exchange

Civic Exchange is a Hong Kong-based non-profit public policy think tank that was established in 2000. It is an independent organisation that has access to policy-makers, officials, businesses, media and NGOs – reaching across sectors and borders. Civic Exchange has solid research experience in areas such as air quality, energy, urban planning, climate change, conservation, water, governance, political development, equal opportunities, poverty and gender. For more information about Civic Exchange, visit http://www.civic-exchange.org.

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Professor Jacques Foos, a Doctor in nuclear chemistry and PhD, is an Honorary Professor at *Conservatoire National des Arts et Métiers* (CNAM), Paris, where he was Chair holder of 'radiation, isotopes and applications' (1983-2008). He is an expert in nuclear technology. He is also the Director of the National Society of Natural Sciences and Mathematics of Cherbourg. From 1968 to 1983, Professor Foos began his career as Assistant Professor and then Professor at the University of Paris, where he was the 4th successor in the Marie Curie's Chair.

Professor Foos was the Director of the Nuclear Science CNAM Laboratory from 1985, until his retirement in 2008. He ensured the scientific direction of a research program on the development of a new process for reprocessing the spent nuclear fuel. His other areas of research of Professor Foos include the treatment of radioactive wastes and uranium extraction from seawater. He is co-inventor of over 140 patents in 17 countries.

Professor Foos was selected by the Royal Academy of Sciences (Sweden) for giving proposals for the award of Nobel Prize in Physics awarded in 1989 and 1998, and Nobel Prize for Chemistry in 1998. Professor Foos is also an Expert-Scientist and Vice-President in 3 Local Information Committees for EDF Flamanville Nuclear Plant, Andra (storage center La Hague), and *Areva-La Hague Plant*. He is author of several books, including Handbook of Radioactivity. His latest book *Can we Abandon Nuclear Power? — After Fukushima, the Energetic Scenarios for 2050*, written in collaboration with Yves de Saint Jacob was awarded the French Atomic Forum in 2012. This award recognizes a work devoted to nuclear energy and contributing effectively to public information.

Professor Foos is "Chevalier" of the Legion of Honor, the highest distinction in France, "Chevalier" of the National Merit Order and also of the Academic Palms Order.

Ludivine Gilli has been a stakeholders' involvement manager with IRSN (French Institute for Radiation Protection and Nuclear Safety) for 6 years. A trained social scientist, she is a graduate from the Political Science Institute of Paris (Sciences Po), where she received a Master in Public Administration. She also received a PhD in Urban History and a Master's Degree in Foreign Relations from the Sorbonne and has a background in mathematics, economics, philosophy and literature. With IRSN, her work has been focused on projects relevant to governance, transparency matters and access to expertise. She has been studying and experimenting ways to engage the public on technical issues such as highly radioactive waste, and the aftermath of the Japanese nuclear accident in Fukushima. Many of these initiatives have been conducted in cooperation with international partners, from the society, governmental bodies and the industry alike, especially within the European Union.

Preface and acknowledgements

Civic Exchange has a long-standing interest in energy-related issues. Since 2006, we have organised seminars and published reports on energy-related topics to inform the public and stimulate community discussion. In early 2012, Civic Exchange embarked on a two-year energy mix research project, in an attempt to further advance relevant policy deliberation. Civic Exchange has released and will continue to release papers on topics such as Guangdong's energy outlook, Hong Kong people's attitudes towards Hong Kong's energy mix and nuclear energy.

This report mainly focuses on the public engagement process France has gone through while discussing their energy policy, in particular nuclear energy. It sheds light on various important components of the process, for example, availability of independent information, formation of independent agencies and their roles, involvement of independent experts, as well as general public education.

Hong Kong is currently considering and formulating its energy policy. How should the community be involved in the policy deliberation process? We hope that this report about the French experience will be a useful reference for us in Hong Kong. Civic Exchange will organise a public forum in mid-September 2013 to talk about the experiences of the US and the UK as well, in order to further our learnings through studying overseas experience. We encourage readers to also read the forum proceedings which will be available on Civic Exchange's website.

We thank Jacques Foos and Ludivine Gilli, the authors of this report, for their efforts in completing the research and informing us about the institutional engagement process France has gone through. We also thank Didier Kechemair of DK Consultant for his assistance throughout the whole research process. We also benefited from the insights of the following individuals: Andrew Lawson, Olivia Chen, Vincent Wong, participants in the discussion group and the report reviewer. We are grateful to CLP Power Hong Kong Limited for supporting this research project.

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Chief Executive Officer

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Executive Summary

France is a global leader in nuclear security, especially after the 2006 Nuclear Security and Transparency Act (TSN Act)

France is a highly nuclearised country. It is second in the world for the number of nuclear reactors (behind the US) and the number of nuclear kWh consumed per capita per year (behind Sweden), but it is the first in the world for electricity production from nuclear power. Since the late 1990s and the implementation of its important nuclear programme, France has been bound to ensure the supply of independent information to populations living around and close to nuclear facilities. This arrangement has been strengthened by the 2006 Nuclear Security and Transparency Act (TSN Act). Not only independent agencies were set up, such as the Nuclear Safety Agency (Autorité de sûreté nucléaire or ASN), but also independent committees (Commissions Locales d'Information or CLIs) to which several missions have been assigned, including the provision of information, environmental monitoring, as well as control of industrial operators.

After the introduction, the content of the TSN Act and descriptions of the agencies controlling nuclear activities, dependent on or independent of the State, are described in Chapter 2. Chapter 3 shows both the organisation and the missions of the independent citizens committees and gives examples of citizen vigilance actions. It is clear that nothing can be done without the agreement and the cooperation of operators. This is followed by considerations regarding nuclear science teaching in France and the actions undertaken by the 'learned society', and two examples of engagement in Sweden and the United Kingdom.

The experience that public engagement is important in nuclear power issues has led to considerations about public involvement, commissions, experts' voices, and education

Additional information and observation on a few recent developments are provided in the appendices for the readers. The experience feedback that can be drawn from the French experience (and that of other countries) of public engagement around nuclear facilities can lead to a certain number of considerations:

- Given the serious nuclear accidents that have occurred, nothing can be done in a sustainable and acceptable way in this industry without the active involvement of citizens;
- Commissions must be created around nuclear facilities. They can be very similar to the French committees that have been shown to work satisfactorily;
- These committees must always include independent scientific experts. They are, for the public, the guarantee of

good performance by these commissions, avoiding eventual sabotage attempts by activist organisations; and

- Rigorous teaching of nuclear science at every level of science education is extremely important. It gives the future citizens reference points and milestones that will allow them to exert critical thinking about nuclear events of the future.

Nuclear power is and will be an essential energy source, so it is important to earn the public's acceptance on this issue

It is clear that humanity, confronted with the problem of energy shortages in the future, will not be able to dispense with any energy source. Thus, all options should remain open but it's evident that nuclear power has a strong role in the energy mix. However, it has become clear during the past years that the era of forceful and secret decisions is over: nothing can and will be decided without citizens' involvement anymore.

1 Introduction

France is a relatively nuclearised country, with an established history in scientific research on nuclear power

France is a highly nuclearised country. This is due to its tradition in terms of research related to the discovery of natural radioactivity by Henri Becquerel, Pierre and Marie Curie, and then the discovery of artificial radioactivity by Irène and Frédéric Joliot-Curie. Finally, Irène Joliot-Curie, thanks to radiochemical methods that she developed with her mother Marie Curie, explained the phenomenon of spontaneous fission. This had been revealed but not explained by Enrico Fermi, who had then tried to discover the transuranium elements. Frédéric Joliot-Curie would be the first, in 1939, to submit three patents on power reactors.

75% of France's electricity, i.e. 17% of France's energy, is generated by nuclear plants

This culture was passed on to the current generation through the creation of the French Atomic Energy and Alternative Energies Commission (Commissariat à l'énergie atomique et aux énergies alternatives or CEA) after the Second World War. The first French reactor was activated in 1948 and the first fleet of nuclear reactors based on natural uranium and graphite produced electricity in the early 1960s.

Today, approximately 75 per cent of France's electricity is produced by nuclear plants. This represents 17 per cent of the energy used every year in the country. The production of this significant amount of energy is undertaken by 58 nuclear reactors located at 19 different sites. Radioactivity is also used in industry, in the medical field, in research and in the military. All these activities are regulated. And like all industrial activities, nuclear activities produce waste, which is also regulated.

Nuclear activities are highly regulated

Naturally then, French opinion has been for years that the public is an essential component in the safety process throughout the life cycle of nuclear installations. This is why, for several years, citizens have been engaged on technical issues pertaining to nuclear safety and radiation protection.

If all the actions undertaken in a national context have specific characteristics, some good practices can be shared with foreign countries. They can be used as starting points for a reflection on the practice of stakeholder involvement, and can also be adapted to other national contexts.

2 The French Institutional Landscape in Nuclear Safety

2.1 The main actors

2.1.1 Preliminary remarks

The 2006 TSN Act is France's latest agreement in nuclear safety control

The institutional landscape of nuclear safety in France has evolved over the years along with the nuclear field as a whole. The last major reorganisation took place in 2006 through the Nuclear Security and Transparency Act (Loi sur la Transparence et la Sûreté Nucléaire or TSN Act), which revamped the nuclear safety control system. The system's main elements have remained mostly unchanged since then.

It is first necessary to clarify a few key words. The TSN Act defines 'nuclear safety' and 'nuclear security' in a very specific way which must be explained here, since the distinctions between 'safety' and 'security' do not always match from one country to the other. Here is an excerpt of the TSN Act, giving definitions for both:

> "Nuclear safety is composed of all technical and organisational measures relevant to the conception, construction, operation, shutdown and decommissioning of nuclear installations, as well as those relevant to transportation of nuclear substances, taken so as to prevent accidents or limit their consequences."
>
> "Radiation protection is the protection against ionising radiation; that is to say all the rules, procedures and means of prevention and monitoring taken so as to avoid or limit the negative effects of radiation on people, directly or indirectly, including the effects on the environment."
>
> "Nuclear security comprises nuclear safety, radiation protection, prevention and fight against malevolent acts, as well as civil security actions to be taken in case of an accident."

Nuclear safety issues involve four actors: political authorities, operators, safety authorities, and the public

The French landscape in nuclear safety revolves around three major actors: the political authorities, the operators and the safety authorities. The public is a fourth actor, often looking from the outside in, but increasingly involved, as explained in Chapter 3.

2.1.2 Political authorities

Political authorities design policies for nuclear regulation, with input from the ASN

This category comprises the Parliament, the government and the Ministries. Their primary role is to decide and pass the regulations (law, decree, etc.) relevant to nuclear safety issues (see also Appendix 1).

The Parliament votes to pass the law. For instance, two major laws were adopted in 2006: the TSN Act (on 13 June), relevant to transparency and security in the nuclear field, and the Act relevant to sustainable management of radioactive waste (on 28 June). As an independent authority, the French Nuclear Safety Agency (Autorité de sûreté nucléaire or ASN) (see section 2.1.4) reports to the Parliament annually (and neither to the government nor any of its ministerial departments) to present its activities and, whenever there is a need, on specific topics.

The government, once a law has been passed, is responsible for adopting decrees detailing its implementation. It is also responsible for making major decisions regarding nuclear installations, as required by the TSN Act. The ASN assists the government in this task by providing advice and recommendations.

2.1.3 Operators

Operators are mainly responsible for running safe facilities

The operators of nuclear facilities are mainly responsible for the safety of their installations, as mandated by international principles (e.g. those set out by the International Atomic Energy Agency or IAEA). They are subject to regulations enacted by the political and nuclear safety authorities. However, abiding by the regulations does not exonerate the operators from their primary responsibility, which is to maintain safe installations.

2.1.4 Safety control and expertise bodies

The French Nuclear Safety Authority (*Autorité de Sûreté Nucléaire or ASN*)

The French Nuclear Safety Authority (ASN) has overseen French nuclear activities for 40 years

ASN oversees nuclear safety and radiation protection in France to protect workers, patients, the public and the environment against risks related to the use of nuclear energy. ASN and its predecessors have been controlling French nuclear activities since 1973, when the Central Service of Nuclear Installations Safety (Service Central de Sûreté des Installations Nucléaires or SCSIN) was created. It was at that time reporting to the Ministry of Industry. In 1991, the SCSIN became the Directorate of Nuclear Installations' Safety (Direction de la Sûreté des Installations Nucléaires or DSIN), reporting to the Ministries respectively in charge of the Industry and the Environment. In 2002, DSIN added radiation protection to its field of competence and changed its name again to become the Directorate of Nuclear Safety and Radiation Protection (Direction Générale de la Sûreté Nucléaire et de la Radioprotection or DGSNR), adding the Ministry of Health to its two previous supervising authorities.

After the 2006 TSN Act, ASN assumed independence, which has enhanced its credibility

The 2006 TSN Act brought a major change to the French framework of nuclear safety control. ASN not only assumed its current name at that point. It also became an 'Independent Administrative Authority', independent from the Ministries, hence from the government. It had never been independent since its inception. This step was taken partly to reinforce ASN's credibility, hence reinforcing the credibility of the nuclear control system as a whole.

Special features to enhance ASN's independence

Many special features enhance ASN's independence. First, ASN funding comes from the Parliament, not from the government or the operators. Second, the six persons who are leading ASN (including the president) have a non-renewable mandate of six years. During the mandate, no one in the French government, whatever his rank is including the President, can force them out of their job. This is to ensure their independence in the decisions they will take during their mandate.

In practice, ASN can hold stronger decision power in nuclear issues than even President Hollande

Here is one example that shows the strength of this independence. There was the proposed shutdown of the nuclear power plant at Fessenheim in eastern France (two 900 MW reactors). During his campaign for presidency, the Socialist Party candidate François Hollande, who tried to win the favour (and of course the votes) of the environmentally conscious people promised to shut down the plant if elected to the presidency of the Republic. On becoming the President, he confirmed the shutdown in 2017, at the end of its mandate. However, there is no evidence today that the shutdown will be feasible, because before the election, the ASN had allowed these two reactors to continue their operation for 10 years,[1] and it is impossible for the government to change that decision.[2]

ASN's independence grew as the French public grew distrustful of the authorities' ability to deal with public health issues

This search for 'independence' took place in the wake of several French sanitary crises (for examples, the 'tainted blood' case, 'mad cow' disease, asbestos contamination, etc.) which left the public doubting its government when it comes to dealing with sanitary issues. Each crisis left the French public with a higher level of distrust towards the authorities and a matching rising desire for transparency and access to information. This desire for access to information appears every year in the IRSN Barometre on risk perception[3] (see Appendix 2).

ASN's tasks are organised around three core businesses:

- **Regulation:** ASN is in charge of contributing to regulatory development by giving its opinion to the government on the draft decrees and ministerial orders or by taking regulatory decisions on technical issues;
- **Control:** ASN is responsible for checking compliance with the rules and requirements to which operators or activities under its control are subjected; and
- **Public Information:** ASN is in charge of helping to keep the public informed, including in the case of emergency.

The ASN is responsible for advising authorities, making regulatory decisions, setting requirements for operators, accessing and authorising changes in installations

Thus, the main responsibilities of ASN are:

- Advise the political authorities on any legislation relevant to nuclear safety and radiation protection, for instance bills and decrees;
- Make technical regulatory decisions designed to better characterise implementation processes for the decrees taken by the government (some of these decisions must be approved by the ministries in charge of nuclear safety);

- Set requirements for operators of the nuclear installations (if such requirements are not met by the operators, ASN may impose penalties and has the legal power to demand a facility operator to stop without regard to the economic impact of such a decision);
- Assess licensing and decommissioning requests for nuclear installations; and
- Authorise licensing, commissioning and decommissioning of installations.

The ASN relies on technical support from the IRSN and experts in this field

ASN relies on technical support to prepare its decisions, which is primarily found at the Institute for Nuclear Safety and Radioprotection (Institut de Radioprotection et de Sûreté Nucléaire or IRSN), the French public expert in this field. Technical support also comes from complementary sources. Debates in the Permanent Expert Group (Groupe Permanent d'Experts or GPE) meetings under ASN supervision allow for the introduction of contradictory positions in order to consolidate final decisions. Of course, the efficiency of this process relies on the assumption of equivalent technical competence of the members of each GPE.

The Institute for Nuclear Safety and Radioprotection
(Institut de Radioprotection et de Sûreté Nucléaire or IRSN)

The Institute for Nuclear Safety and Radioprotection (IRSN) is a technical support organisation serving the ministries of environment and the ASN

IRSN was created in 2002. Previously, it was part of the French Alternative Energies and Atomic Energy Commission (CEA) because of its main research mission. It is a publicly funded institution — a technical support organisation. As such, it is a key element in the control system of nuclear safety and radiation protection in France. IRSN was created as an institute that would gather in one place means of technical expertise and research in nuclear safety and radiation protection. Solid research capabilities are seen as an essential component because the Institute's expertise relies on continuous research activities to make sure it remains on top of scientific progress.

IRSN is under the purview of the ministries in charge of the environment (primarily), as well as health, research, industry and defence. Its main mission is to assist the nuclear safety authority (and if necessary the public authorities) on technical issues of safety, radiation protection and security. IRSN also assumes a public service mission of environmental monitoring and control of people who are exposed to ionising radiation.

The second contract of objectives for IRSN was signed for four years in April 2011 by the responsible ministers and the leaders of IRSN. This contract defines the strategic objectives and improvement areas for the Institute, identifies key operational challenges facing it, and aims to optimise its governance and its efficiency.

The 'Permanent Expert Groups' *(Groupe Permanent d'Experts or GPE)*

Seven permanent expert groups (GPE) advise the ASN on major decisions

To prepare its decisions, ASN also relies on seven Permanent Expert Groups. These GPE provide positions and recommendations on radioactive waste, pressure-operating equipment, radiation protection in the medical field, radiation protection in all other fields, radioactive material transportation, laboratories and fuel cycle installations. The GPE members are appointed by ASN for their competence. They originate from research institutions, technical support agencies in the nuclear field or others, and even non-governmental organisations (NGOs). Some may be working for an operator, but they are only representing themselves, not their employer, when they attend GPE meetings. Finally, some are foreigners, hence bringing an 'outside' perspective to the debate.

The GPE is interviewed by ASN on major decisions. The evaluation of the reports on the safety of nuclear installations is a good example of this type of decision. A GPE can also be consulted on the legislation or the doctrine of development projects. The GPE does not produce its own reports. To prepare their positions and recommendations, the members study the records of the operators as well as other evaluation reports, such as those of IRSN.

The ASN also consults with institutions of nuclear security and public health, etc.

ASN sometimes also consults other institutions such as the High Committee on Transparency and Information in Nuclear Security (HCTISN) (see section 3.1.3) and the High Council for Public Health.

2.2 Nuclear safety regulatory framework

2.2.1 General principles

French regulations accommodate a variety of nuclear activities: industrial, medical, research, etc., with the TSN Act as a touchstone

Nuclear activities can vary widely in nature: industrial, medical, research, etc. The legal framework is adapted to the different types of activities to ensure that every nuclear activity is taken into account and that none can compromise the safety and health of the population and the environment. For instance, medical or industrial activities using ionising radiation are regulated by public health laws, up to a certain threshold of radioactive substance use. Beyond this threshold, they fall under the regulations of nuclear installations.

The French legal framework is a combination of international regulations (IAEA, European Commission, etc.) and specific national laws.

The TSN Act is clearly the touchstone of the national nuclear legal framework, and its implementation is ensured by a dozen of decrees providing more detail. Nuclear waste management is regulated by its own law, usually called the 'Waste Act', which was enacted in 28 June 2006. The TSN Act significantly renewed the legal framework for nuclear safety, which has continued to be adapted over the following years, as has the implementation

of decrees and other adopted regulations. The last significant regulation to date is the INB decree (for nuclear facilities, Installation *Nucléaire de base* or INB), which provides details and formalises thorough requirements practices that were not formally regulated before.

2.2.2 Regular assessment process

The ASN monitors and controls every stage of a nuclear installation's life. This includes the design, siting, licensing procedure, safety in installation, operation, decommissioning and dismantling

The nuclear safety authority applies control at every stage of a nuclear installation's life, from its planning stage to its decommissioning. The process is as follows:

- A **projected design** is subject to approval by ASN;
- The **siting** of an installation is assessed to make sure all foreseeable risks have been taken into account, from seismicity to industrial environment, cold water intake, etc.;
- The **licensing request** is supported by a technical file providing among other elements the installation blueprint, the environmental impact assessment (EIA) study, the preliminary safety report and the risk management study. The request is assessed by ASN with the support of IRSN and sometimes the GPE (depending on the scale of the project). The environmental authority assesses the EIA. The public is consulted through a process of public inquiry or public debate (described in more detail below) depending on the project's scale. Figure 1 provides a view of the steps and the actors involved in a licensing procedure;
- Before the installation is allowed to start operating, an **updated safety report** is submitted by the operator to ASN so that the actual installation, as it has been built, can be assessed. The file also contains the general operating rules, the waste management study, and the internal emergency plan (procedures to be followed in case of incident or accident), as well as the decommissioning plan. ASN authorises the start of the installation only after its conformity to the regulations has been studied and confirmed;
- During the installation's lifetime, the operator may have to modify certain elements. All **modifications** are subject to assessment, the level of scrutiny depending on the type of change pursued. The TSN Act and its implementation decrees provide a clear map of the control required for each type of modification. The general principle is to request a high scrutiny for significant changes and a low degree of scrutiny for smaller modifications; and
- Finally, the **decommissioning** and **dismantling** of the installation also takes place under strict control. The schedule, the procedures and the safety of the entire process must be approved before any action can be taken.[4]

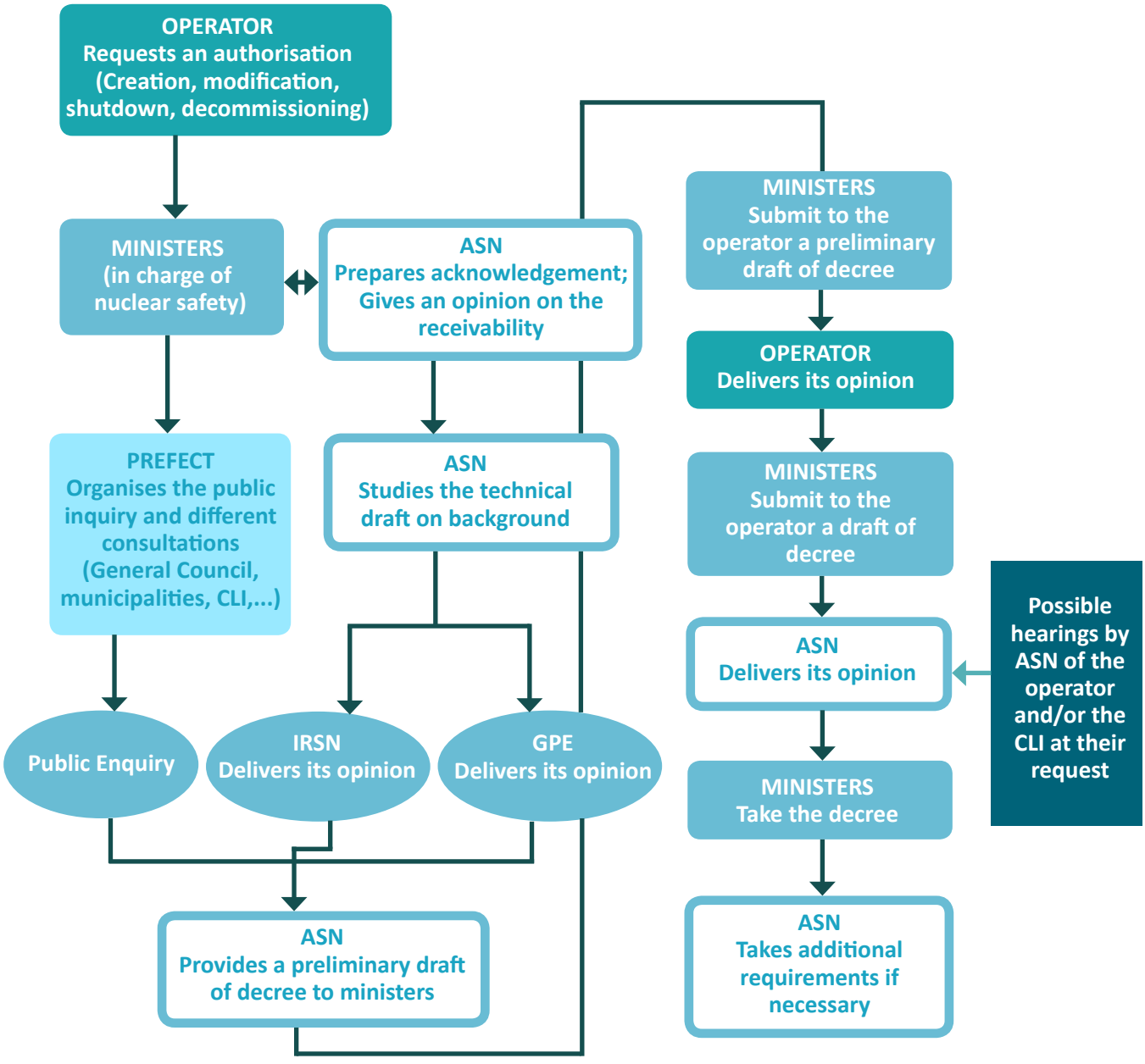
At any stage of the process, ASN can subject the operator to requirements designed to ensure the security of the workers, the public and the environment.

The ASN continuously carries out regular reviews and requests necessary modifications

Moreover, no operating license is granted in perpetuity in the French nuclear field. By law, every nuclear installation must undergo a periodic safety review every 10 years. The review is not only an occasion to verify the conformity of the installation with the initial requirements but also to re-evaluate the requirements in the light of new discoveries, allowing the enhancement of the installation's safety.

For instance, the ten-yearly safety reviews are a major component of the nuclear plants' safety control systems. They are prepared years in advance and involve hundreds of engineers, some working for the operator, some working for ASN or IRSN. They can also be controlled by independent organisation like the Local Information Committees (see section 3.3). In addition, some safety reviews can be requested after major events anywhere in the world, such as the Fukushima accident, in order to introduce lessons learned to improve safety.

Figure 1: Licensing procedure of a nuclear installation according to the 2006 TSN Act



(Source: ASN diagram, translation by the authors)

The nuclear safety control framework has started to include the public more and more

The nuclear safety control framework used to be a job of experts and institutions. Over the past few years, it has been opened more and more to the public. In the next section, the communication and public engagement mechanisms set up on an institutional level will be explored.

2.2.3 Assessment procedures and public involvement

As mentioned above, the regular assessment procedures now entail a particular type of public consultation whenever significant nuclear projects are envisioned or significant changes are planned in existing installations.

The public debate (*le débat public*)

Public debates must take place when a new nuclear power plant is under consideration or when a new installation would cost over €300 million

A public debate is required on two occasions: first, when the construction of a new nuclear power plant is under consideration; and second, when a new installation is planned with a cost over €300million. It can also be required when a new installation, costing between €150million and €300million, is planned and if local or national elected officials or environmental NGOs wish so. The debate focuses on the opportunity, the aims and the characteristics of the project. But such public debates are not limited to nuclear projects; they are relevant to any project whose budget is in the €150 to €300million bracket or over €300million. It applies, for instance, to highways, train tracks and bridges.

The National Commission of Public Debate (CNDP) organises and supervises structured public debates, making its decisions mainly on the basis of respecting public participation

In the abovementioned context, a public debate is a very precise setup which has little to do with a classic public meeting, although it involves public meetings. It is a complex and extremely carefully framed process. The National Commission for Public Debate (*Commission Nationale du Débat Public* or CNDP) is tasked with organising and supervising the public debates. Every debate lasts at least four months, with a possible two-month extension. Practically speaking, it consists of a succession of public meetings where the operator explains its project and answers all queries. Several documents are available to the public beforehand: not only the operator's technical file containing the project specifications but also a four-page set of 'stakeholders' notebooks' (cahiers d'acteurs), which any stakeholder including the public can submit to the CNDP. Two months after the end of the public meetings, the President of the CNDP publishes his or her conclusions. The operator then has three months to follow up and present any changes made to the project and the next steps.

The CNDP gives no decision on the merits of the projects submitted, but it is charged with ensuring respect for public participation in the process of project development, from its inception to its construction.

Projects costing less than the €150m threshold can sometimes be submitted to a 'local consultation' process, under the auspices of a 'consultation commission'. This was the case in 2005 regarding the project of CEA's research facility Reactor Jules Horowitz (RJH) in Cadarache in southern France.

The public inquiry (*l'enquête publique*)

Public inquiries inform the public and gather public opinion, but are less serious than public debates

The public inquiry is a less elaborate consultation process than the public debate. It is, however, required much more frequently. The purpose of a public inquiry is to inform the public and to collect its remarks, suggestions and counter-proposals regarding a project, hence giving additional elements to the deciding authority before a decision is made. The procedure, which has been conducted in different forms since 1810, was revamped in 1983 to become an information and consultation process.

Public inquiries take place on a local level, lasting one or two months

A public inquiry takes place at a local level for one month at least, and two months at most. It is opened by the Prefect (*Préfet*), who is the local representative of the State (see Appendix 1), and is conducted by a commissioner appointed by the administrative court (an institutional court in France). For the duration of the inquiry, the operator's file is made available to the public in all municipalities located less than five kilometres away from the installation. It is noteworthy that the CLI is granted a longer time for studying such a technical file; the commissions are indeed required to answer and to give notice (on the relevance of works or changes desired by the operator) at each opening of a public inquiry.

At the end of the process, the commissioner prepares an inquiry report giving a favourable or unfavourable opinion on the continuation of the project. The report is addressed to the Prefect.

The final decision is taken by the authority, based on the findings of the investigator. It should be noted that the authority is not bound to follow the opinion of the investigator. However, if it does not, the arguments and the opinion of the investigator may be used in an administrative court hearing against the project.

Upon completion of this process, a decision will be made to complete the project or not.

A new process: electronic communication

The government uses electronic communication to enhance public engagement, to increase the public access to information

In December 2011, a new decree created an experimental way to inform and engage the public. All procedures regarding nuclear installations that require a public inquiry be made must involve communication to the public through electronic channels. The authority responsible for the public inquiry must disseminate electronic versions of the public inquiry file to the public. This experiment aims at facilitating public access to information, especially for people who do not live where the public inquiry is taking place. This new way of communicating also allows the public to send its comments via internet, which makes participation more accessible.

Communication and public engagement are two endeavours which pursue different aims. Both are important, therefore both must be undertaken. However, it is essential to differentiate one from the other.

The limits of this procedure are well known: the consultation can lead to numerous messages, many from activists of one persuasion or another. The information cannot be verified and the time to synthesise it would be huge.

However, this process is currently showing its effectiveness, and has for the whole of 2013. The French project 'Cigéo' to provide a means for reversible storage of high-level nuclear waste is under preparation by the National Agency for Radioactive Waste Management (*Agence Nationale de gestion des Déchets RAdioactifs* or ANDRA). It should be subject to the public debate procedure, but the procedure has been rejected by the project's opponents for months. They have prevented by holding hostile protests. To fulfil the law, electronic communication remains the only option in this case.

Potential misuse of citizen's participatory process

Citizen participation may be misused

As with all systems, this citizen participatory process has its shortcomings.

While public meetings should provide opportunities for everyone to speak, experience in France shows that organised opponents tend to monopolise the microphone on some occasions, feeling this is their chance to be heard, especially by the media, but therefore preventing other participants from expressing their own views. Indeed, the press generally relays comments from these organisations much more willingly than those coming from scientific or technical reports (it is well known that two trains arriving late get more interest in media than 10,000 trains on time).

Debates can also be boycotted by part of the public, holding the belief that it comes too late and that the decisions have already been made. When opponents choose this strategy, they will make it public through the media in order to promote their views that the debate is not really fair, without their participation. More often, such a strategy is chosen for national level debate, whereas at the local level constructive contributions from various points of views can take place more easily.

Finally, the 'independence' concept itself can also be subject to misuse. For the supporting and opposing organisations, associations, political parties, and company managers, choosing their surrounding or advisory bodies in an unbalanced manner, and giving priority to the proponents or opponents is the normal way to promote their convictions. However for organisations which should remain neutral and focus on fulfilling their missions, the trend to give priority to opponents as if it is a way to increase their 'credibility' in the opinion could become a drift. It is a trend to which one should remain vigilant, as independence, neutrality, and balanced attention given to various viewpoints are key as far as nuclear safety is concerned in order to insure confidence.

However, those shortcomings and drifts in the process, far from being the only ones, demonstrate that no participatory process is perfect. One can consider that they are specific to democracy, and contributing to strengthen it. This is why the issues highlighted here should not prevent the use and improvement of such processes, while the reflection continues on new ways to achieve a more effective decision making process, including through lessons learnt from good practices in foreign countries.

3 Communicating with and Engaging the Public on Nuclear Safety Issues

3.1 Transparency regulations: from 1978 to 2006

3.1.1 Preliminary remarks

The public needs access to all relevant information in order to stay engaged and have an opinion

Information is a key commodity for the public. If people want to get involved in public inquiries or public debates, or simply understand the new projects appearing every day and take a stand in the public arena, they need information. This means access to technical data from all the field's players, including the operators, the public authorities and the public experts. The public cannot be expected to take a stand on licensing processes, for instance, without having access to all the relevant information.

Being informed is a universal right in France and transparency is very important

The necessity of the public having access to information has been recognised officially in France and was formalised into a right in the 1970s. The first law of this type, directed towards public authorities, was passed in July 1978. This French 'Freedom of Information Act' still constitutes to this date the basis of the right to access information in France. It sets transparency as a rule and confidentiality as an exception actionable under precise circumstances only. As a consequence, public authorities have since had to communicate any document in their possession that was requested and to which one of the secrets protected by law (security, commercial, industrial, medical reasons, etc.) was not applicable.

The legal framework did not evolve much until the late 1990s, which brought about a new context. Since then, the requirements have gone much further than these basic rights, especially when environmental questions have been involved. In 1998, the Aarhus Convention[5] created new transparency requirements for public authorities on all matters regarding the environment. It further restricted the conditions under which public authorities could deny the public access to information. These were included in European Union law in 2003 as Directive 2003/4/EC and transposed into French law in 2005. In 2004, an 'Environment Charter' was included in the French Constitution. Article 7 of the Charter states that:

> "Every person has the right, under the conditions defined by the law, to access information on the environment held by public authorities, and to participate in public decisions impacting the environment."

In 2006, as mentioned, further progress was made in the nuclear field thanks to the TSN Act.

3.1.2 The impact of the 2006 TSN Act on transparency requirements for operators

The TSN Act extended public administrations requirements for transparency to nuclear operations

Article 19 of the TSN Act prompted a major change in transparency practices in the nuclear field. This article on transparency requirements that had been applied until then only to public administrators was extended to nuclear operators. At once, transparency became the rule and confidentiality an exception, actionable under precise circumstances only. The article reads as follows:

> "any person is entitled to get from the operator of a nuclear installation … the information available … regarding the risks associated with the exposure to ionising radiation that could result from [its] activities and regarding the safety measures … taken to… limit these risks".

However, transparency in nuclear power is sometimes restricted by a necessity for confidentiality

Of course, the new regulations have raised some practical issues. Operators have constraints. For instance, facility security requires confidentiality to be efficient. Operators need to keep some information confidential for three main reasons. First, when the information is instrumental to their industrial process; second, when it may jeopardise their commercial strategy; and third, when information is classified for national security reasons. Therefore, the implementation of the new regulations requires finding a balance between the transparency and confidentiality imperatives. While the public needs access to information if it wishes to understand technical matters, the operators need to protect their technology and strategic data. A middle ground has to be found for satisfying both sides and keeping them playing a part in the dialogue process.

Citizens can appeal if they are denied information, and every nuclear installation must publish annual reports

If the operator refuses to give to a citizen the information requested, the citizen can appeal to the Commission for Access to Administrative Documents (Commission d'Accès aux Documents Administratifs or Cada). This Commission, which is an independent administrative authority (just like ASN or CNDP), gives a position on the soundness of the operator's refusal. If the refusal is ruled abusive, the operator must comply and give the information. If it does not, the citizen can appeal to the administrative court.

Moreover, the TSN Act requires that every nuclear installation prepare and make public an annual report on its activities.

3.1.3 The High Committee on Transparency and Information in Nuclear Security (*Haut Comité pour la Transparence et l'Information sur la Sécurité Nucléaire* or HCTISN)

The High Committee on Transparency and Information in Nuclear Security (HCTISN) was established under the TSN Act as a forum of information, consultation and debate

Another significant component of the TSN Act is the creation of HCTISN. The High Committee is composed of 40 members appointed by decree for six years. Among them are:

- two Deputies;
- two Senators;
- six CLI representatives (see section 3.3);
- six environmental and patient protection NGO representatives;
- six nuclear operator representatives;
- six labour union representatives;
- six persons chosen for their competence in scientific, technical, economic, social or information issues; and
- the ASN President, a representative from IRSN and four representatives from the relevant Ministries.

The HCTISN also investigates information access issues of its own accord

The role of HCTISN is to be a forum for information, consultation and debate on the risks inherent to nuclear activities, and on the impact of such activities on people's health, the environment and nuclear security.

HCTISN is entitled to produce positions on any issues related to the abovementioned fields, as well as on the control and information activities related to them. It can be mandated by the government, the Parliament, a CLI or the nuclear operators to investigate any question regarding information on nuclear security. It can also decide on its own to investigate any question related to information access regarding nuclear security and to suggest measures to be taken so as to guarantee or improve transparency.

In 2011, for instance, HCTISN produced reports entitled *Transparency and Secrets in the Nuclear Field* and *The Siting Process of a Repository of Low-level Long-lived Radioactive Waste*. It is currently working on 'Cigéo', the project of repository of high-level medium and long-lived radioactive waste. HCTISN has also been involved in the 'stress tests' conducted on all French nuclear installations after the Fukushima nuclear accident. However, its notices are only consultative.

3.2 The role of institutions in transparency

3.2.1 Classic institutional tools

Information access is effectively supported by institutions' websites, a public magazine, and a documentation centre

Transparency and public information are among ASN's missions. They are conducted in many different ways, beginning with a well-stocked website, a public magazine, and a documentation centre.

The website is of particular interest to the public. Indeed, it provides a wealth of background information on a number of issues like nuclear installations, radioactive waste, radon, ionising radiations, and medical and industrial uses of radiation. Last but not least, it provides updated information on the assessments under way, as well as access to ASN's positions and decisions as soon as they have been taken. In response to growing international requests, ASN now has an English version of its website: www.french-nuclear-safety.fr

IRSN also maintains a website containing a wealth of information on nuclear activities and radioactivity, as well as research. However, the most interesting feature on the website is probably the access it gives to all the positions taken by the Institute on nuclear installations, which used to be restricted. Starting a few years ago, a summary of each position has been made available, allowing the public to get the facts about such positions without compromising the sensitive data the full report may contain. As yet, full reports have not been made available for the confidentiality reasons mentioned above. Still, a wide and widening level of access is now available to the public.

Another good example of transparency efforts is the network for radioactivity measurements, which was developed over several years and is now fully operational.

3.2.2 The National Measurements Network (Réseau National de Mesures or RNM)

The National Measurements Network (RNM) is an online portal used to collect radioactivity measurements from 'official' sources and certified laboratories

RNM[6] is an online portal created by ASN and IRSN. It is designed to give the public direct access, through a website, to radioactivity measurements as well as to information on the sanitary impact of radioactivity. As of today, RNM provides more than 750,000 radioactivity measurements resulting from the monitoring of radioactivity levels in the environment. Some are live measurements, others are incremented periodically.

The 'official' measurements are not the only ones fed into the RNM. Any certified laboratory approved by ASN to do so can add its own monitoring measurements. As a consequence, aside from IRSN, contributors include other agencies (InVS[7], Anses[8]), operators (EDF[9], Areva[10], CEA, the French Navy), local communities, NGOs (ACRO[11], GSIEN[12], associations claimed to be independent but with a rather anti-nuclear sensitivity), as well as ASPA[13], BNEN[14] and IPHC[15].

This system proved useful in the aftermath of the Fukushima nuclear accident, when the public was very concerned about radioactivity levels

This existing structure proved useful in the aftermath of the Fukushima nuclear accident. Indeed, despite the long distance between France and Japan, the public was extremely concerned and requested information on radioactivity levels in France. ASN with the help of IRSN was able to quickly set up a dedicated website providing a map showing real-time radioactivity levels. This tool, called Criter, was an essential component of the information system set up by these two organisations during the Fukushima accident. Other actions taken were press conferences, dissemination of technical notes produced by IRSN (based on information gathered from Japan), and the creation of specific websites stocked with accessible, understandable information and updated as frequently as possible. The triple focus was on (a) the situation of the Fukushima-Daiichi reactors, (b) the impact on the French citizens living in Japan, and (c) the impact on French territory (on the mainland and abroad).

3.3 The role of the Local Information Committees (Commissions Locales d'Information or CLIs) in transparency

3.3.1 The CLIs

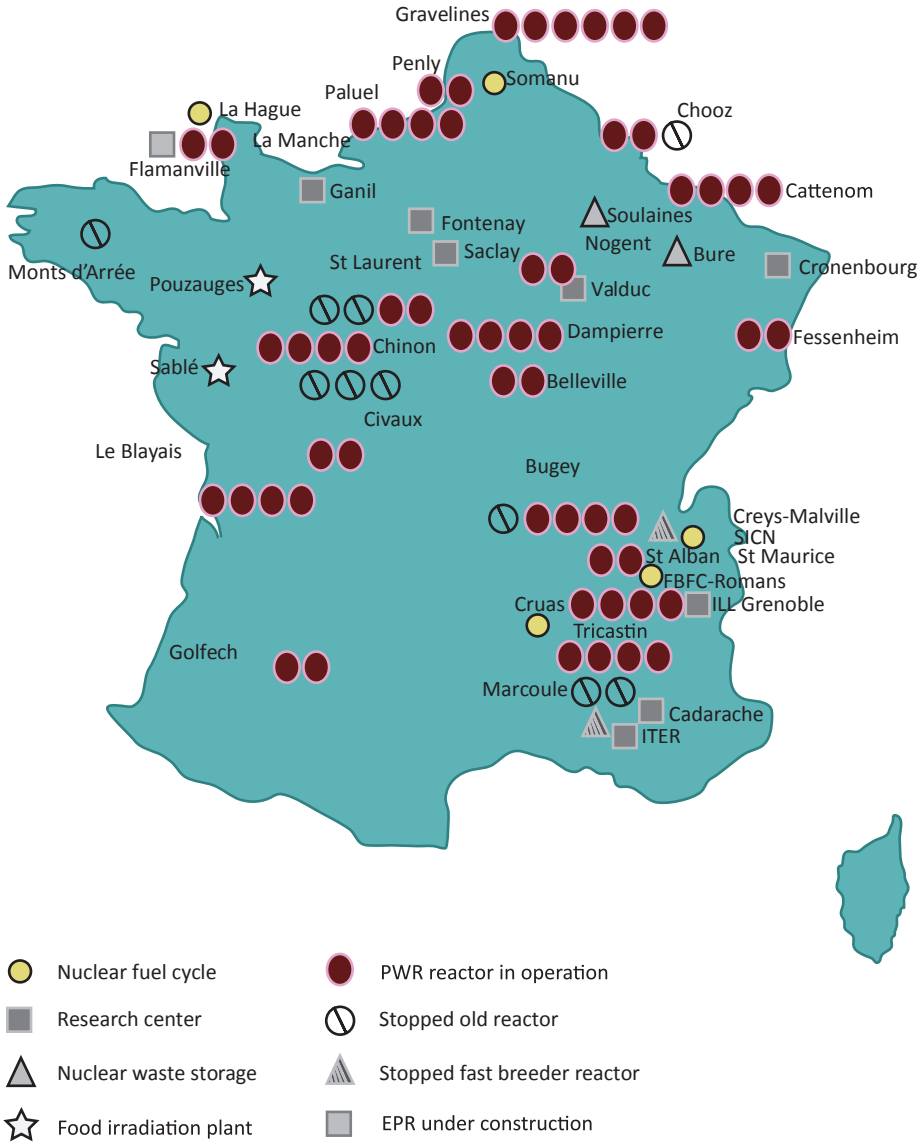
Local Information Committees (CLIs) are attached to each French nuclear installation, to monitor the installation and to keep the local population informed

The CLIs are mandatory pluralistic bodies (involving the public) attached to each French nuclear installation. Their role is to keep a watch over the installation and to inform the local population on nuclear safety and radiological protection matters. They can also conduct their own independent campaign of measurements in the environment. Such committees have existed in France since the late 1970s. At that time, however, the CLIs were neither official nor mandatory organisations; they were non-profit organisations. As a result, they emerged only when some energetic people decided to take matters into their own hands and establish such a committee.

CLIs are manned by independent volunteers following government guidelines

The CLIs have had an official existence since 1981. That year, the government decided to make their creation easier and provided some guidelines regarding the tasks and the composition of the committees, to be adapted to the local context. This move prompted the creation of several new CLIs. A renewed push came in 2006 with the TSN Act, which made it a requirement that a CLI be established next to each nuclear installation. As a consequence, there are today 37 CLIs in France. They are not only concerned with nuclear facilities linked to the production of electricity but also with research centres or irradiation facilities for sanitation or enhancement of food preservation (Figure 2).

Figure 2: Map of the French CLIs (including map of nuclear reactors)[16]



(All nuclear facilities possess a CLI. Some CLIs cover several operators)

The Act also harmonised the composition of the CLIs, which up to that year had been variable. All CLI members are volunteers. Only travelling expenses and accommodation are reimbursed. At least 50 per cent of members are drawn from the ranks of elected officials (the local deputy and senator; municipal, general and regional councillors — see Appendix 1) and at least 10 per cent from each of the three following categories (known as colleges): representatives of environmental protection NGOs (very often anti-nuclear associations), representatives from nuclear operators' labour unions, and 'qualified persons' (experts in the nuclear field, representatives of health organisations, Chambers of Agriculture, and Chambers of Trade and Industry).

CLIs are crucial for giving support and analysis of nuclear operations

As discussed below, the presence of experts in these committees is very important. They are in fact the only ones that can provide rigorous scientific support and analysis of the operations of such industrial operators. It is also up to them to provide information to the public. Some examples will be

given below. In addition, it is worth noting that these experts are independent in that they do not belong to any pro- or anti-nuclear organisation, and neither their salaries nor their career progressions depend on their critical analysis or their positions taken in such Committees. Indeed, they are often retired persons or are at the end of their careers.

The president of the CLI is the President of the General Council where the operator is. But he may delegate this function to a member of the Council. It is possible to nominate vice-presidents — in fact, it is usual in this case as the first vice-president is also a councillor and the second is then chosen from the experts (from the 'qualified persons' college). The financial support for establishing a CLI comes largely from the General Council's budget. ASN also contributes significantly to the budget, especially to fund any action to facilitate communication with the public. Other institutions can also provide financial assistance (e.g. rural and urban communities or regional councils).

CLIs are models where the right to information and transparency is put into practice

It is fair to say that the CLIs are models in the process of implementing the right to information and transparency. They are multidisciplinary institutions in which all points of view are expressed. Many members do not have the same opinion about nuclear energy but they agree to debate together, though sometimes the bodies give an opinion endorsed by all members. This is a structure that can be described as independent, which will be explored further.

A different type of local information commission is also set up for secret nuclear facilities relating to national defence. Their composition is somewhat different from other CLIs, and they are chaired by the Prefect.

3.3.2 ANCCLI: the National Federation of CLIs

The CLIs are federated in a national organisation (ANCCLI), which encourages the exchange of information and coordination

All CLIs are now federated in a national organisation called National Association of Local Information Commissions and Committees (*Association Nationale des Comités et Commissions Locales d'Information* or ANCCLI). This eases the exchange of information between CLI and provides a pool of expertise for all CLIs at the national level. It allows CLIs whose main interest is local intervention to coordinate their activities. ANCCLI has over the years developed in-house expertise through its scientific committee and three permanent groups on nuclear waste, nuclear safety and territorial/post-accidental issues.

ANCCLI is active both nationally and internationally, developing partnerships with IRSN and the EC

ANCCLI is a very active organisation. In 2011, its members participated in more than 20 national and international events, where they presented the actions of the CLIs as well as their positions on a number of issues.

Since 2003, ANCCLI has developed with IRSN a close partnership which is framed by a cooperation agreement. Many actions are conducted within that framework, which will be explained in greater detail later. In 2011, for instance, extensive work was conducted on the post-Fukushima stress tests. IRSN and ANCCLI

have also been working on the project OPAL, which aims to develop a tool designed to raise the public's awareness about post-accidental issues.

Finally, ANCCLI has also been developing international partnerships, including one with the European Commission (EC). Together, ANCCLI and the EC, with the support of IRSN and ASN, have led a series of international talks from 2009 to 2013 around the practical implementation of the Aarhus Convention in the nuclear field.

3.3.3 Some recent examples of citizen vigilance serving nuclear safety

The 'Cotentin' of Normandy is the most nuclearised region in France, with three CLIs

These examples are taken from actions by the CLIs located in the 'Cotentin'. This region of Normandy, located in the department called Manche, is the most nuclearised in France. Three nuclear operators are there: the Areva reprocessing plant for spent fuel (La Hague plant), the Nuclear Waste Storage Centre (Centre de Stockage de la Manche or CSM) managed by ANDRA, and the Flamanville nuclear plant with 2 PWR reactors (1,300MW) plus an EPR (Evolutionary Pressurised Reactor, a 3rd-generation 1,600 MW nuclear reactor) under construction. Therefore, three CLIs (CLI-Areva-la Hague, CLI-CSM and CLI-Flamanville) are devoted to their missions of monitoring, control and information.

The Committee of the 'La Hague plant' in this region was historically the model for CLIs

In fact, historically, the first committee created in France in the late 1970s was that of the La Hague plant, called Special Committee for Permanent Information (*Commission Spéciale et Permanente d'Information* or CSPI). Its composition and the distribution of its members in four categories were used as a model for creating all the CLIs by the TSN Act in 2006. These commissions then become mandatory near all nuclear centres, whatever their industrial mission is, and near the research centres.

These three CLIs share a president and vice-president

The three CLIs in Manche have a common president, a common member of the General Council (chosen by the President of the General Council), and each has a first vice-president, also a member of the General Council. However, the second vice-president is elected by the CLI's expert members. Since 2006, the vice-president has been the same for the three CLIs. He chairs the technical working groups on behalf of the president, who has delegated him these functions.

The CLIs are mainly concerned with keeping the public informed

Beyond the control of nuclear facilities, the task that seems most important is providing public information. This takes the form of newsletters distributed to more than 100,000 mailboxes, town halls, schools, pharmacies, doctors' offices, tourist offices and more. Conferences are held every two years on topics of public interest (e.g. on the health impact of nuclear facilities near them, on 'what is tritium?'[17] during a request to increase discharge licenses at Flamanville due to the start of a new reactor, etc.).

The CLIs wrote a brochure explaining basic information related to nuclear power, to reduce ignorance and fear among the public

Finally, the most difficult task was writing a brochure entitled *Man and Radioactivity*, distributed in public reception centres such as those described above. The brochure is designed to explain important information to people who do not know even what an atom is, what radioactivity is, the biological effects of various types of radiation, how a nuclear reactor works, and what the nuclear cycle is, and provides benchmarks for natural doses, allowing comparisons with industrial discharges.

This is very important when it is considered that people in Japan have been driven out of their homes due to a radiation level equal to 25 mSv (milliSieverts) per year. These evacuations led to major traumatic injuries and consequently to many indirect deaths (one evaluation of such non-radioactivity-induced deaths due to evacuation gives a number between 500 and 1,500 deaths). However, some populations, for example in India and Brazil, have lived for centuries without injury with a natural radiation level about 250 mSv/year! It is logical to conclude that ignorance has created unnecessary fear. Following the success of this brochure, its pages were put on the Internet as additional explanation[18].

The CLIs also have representatives from the UK Channel Islands

Another important characteristic of these CLIs is to have among their members representatives from the Channel Islands, which are close to the French coast but belong to the United Kingdom. These representatives take part in general meetings of the CLI, which are held four times a year on average; they speak French, which facilitates the exchange.

Four examples will be given below, each in various areas and under different circumstances, of how citizen vigilance can serve nuclear safety. The fourth and final example will illustrate common tasks following the accidents at Fukushima.

Study of groundwater and of tritium levels measured in the territory and outside the CSM

A working group studied the groundwater and tritium levels measured in the territory, in response to a request from environmental organisations

Within the framework of their missions, the CLIs have the opportunity to perform independent analyses or use their own expertise in their environments and to develop their own information for local populations. Diverse measurement campaigns in the environment have already been undertaken in the past by the CLI-Areva-La Hague, including both radiological and chemical measurements. The results have always been in line with those provided by operators, which is logical, but it is useful to be able to make comparisons independently. For this reason, the General Council via the CLI-CSM carried out a study on groundwater and on tritium levels measured in the territory and outside the CSM, to examine an eventual stratification of levels of tritium in piezometers, following a request from members of environmental organisations.

The working group collected its data differently than the operators regularly did, by taking measurements at different depths

A working group was established, including three members of the CLI proposed by the committee (two experts and a representative of Greenpeace, a member of the three local CLIs), a representative of ASN and IRSN and an operator's representative. From the three companies that had applied to conduct the study, the working group chose one according to specific criteria. The funding of this study, a total of about €25,000 (i.e. equivalent to HK$250,000), was provided by the General Council.

For many decades, ANDRA has analysed monthly samples of fluid in its piezometers to measure radioactivity at a single depth: 19 metres. The working group of the independent campaign decided to take samples from eight of these piezometers (chosen by the working group among 70 and with agreement of the operator) at four different heights, each quarter for one year. A further objective was to compare the CLI campaign's results with those of the operator.

The results of these 8 measurements, performed between November 2011 and August 2012, were detailed during a General Meeting of the CLI, held in November 2012. Measurements sometimes show large differences depending on the height of sampling; however, for 6 times upon the 8 measurements, the average of the four measurements gives a difference of less than five per cent (within the expected statistical difference for any measures of any kind) between the value given by the society making the action on behalf of ANDRA and these given by the CLI's society.

In the other two cases, the differences between the CLI/ANDRA measures were more significant; however, one result of the CLI testing was higher, and the other one was the opposite.

In general, then, there is solid agreement between all measurements made by different organisations. It can be considered that, if a set of measurements at several heights in each piezometer must provide more information, one single measure at 19 metres nevertheless gives a satisfying answer about possible radioactive pollution from a given point.

It is also clear, however, that two piezometers installed in the CSM (among the 70) showed radioactivity above the threshold for drinkable water containing tritium (10,000 becquerels per liter (Bq/L)). These piezometers, of course, should be supervised very carefully. However, outside the CSM, the measurements show very low values (maximum 200 Bq/L).

The operators have since adopted the CLI's procedure for radioactivity measurement

Following this independent campaign by the CLI, ANDRA has decided to continue to perform the measurements for some piezometers, sampling at four different heights and to involve the CLI for these measures. This project is underway. Another campaign, beginning in 2014, should include the radioactivity

measurements in the grass, plants and sediments in streams. It will be, like the first, funded independent of the operator. Its programme will be set in September 2013 by the independent scientific expert members of the CLI-CSM. The results will be compared to those of the operator.[19]

This example shows some pragmatic evolution of the operator's procedure concerning the radioactive impact measurements (or other control processes) through CLI action. It can be seen that there is no conflict between the CLI members and the operators but a cooperative (even if contradictory in objective) process.

Shutdown and decommissioning of the first reprocessing plant at La Hague: the CLI-Areva-La Hague's opinion

The first workshop at La Hague has been successfully shut down

The shutdown and decommissioning of old plants (MAD-DEM) are a part of plant life. At La Hague, the first workshop was dismantled in the 1980s and 1990s, and today it is possible to walk there and stay without taking special precautions.

The first spent fuel reprocessing plant in La Hague and its annex workshops have reached the end of their lives. As shown in Figure 1, the relevant CLI's opinion must be requested. In December 2008, the first opinion (positive but with many questions) was given for the decommissioning of the High Activity Oxide (HAO) workshop, the first workshop put into service at the end of 1960 to confirm the industrial feasibility of fuel reprocessing based on oxides.

The CLI responded positively to the request for decommissioning

The opinion given in October 2010 was the most important (see Appendix 3), since it concerned the first reprocessing plant and its annexed effluent treatment stations. There were many technical questions which illustrated the opinion. In the months following the opinion, the operator answered the CLI's questions.

The CLI responded positively despite opposition from some environmental groups

The CLI's opinion answered positively to the request for decommissioning, but it should be noted that the four anti-nuclear environmental groups voted against the opinion. However, they were in accordance with the sentiment expressed by the president of the CLI as to the exceptional quality of work that had been done by the working group.

For these environmental groups, as they have said in general meetings, it is not possible to promote the decommissioning of old plants, reactors or other facilities. They have to show to the public that nuclear energy leaves 'radioactive cathedrals' for future generations. Therefore, they do not want to repeat the first successful experience in decommissioning a nuclear plant.

The licensing procedures were finished by July 2013, and the CLI continues to monitor the work

In mid-July 2013, the CLI was interviewed by the ASN board on the drafting of decrees (the licensing procedures are finished; see Figure 1). Its remarks were included in the decree material submitted to the ministers. However, as indicated in the opinion (Appendix 3), the CLI remains highly invested in the smooth working of the process and wishes to stay involved, even if the works are carried on for decades.

Flamanville and its emergency diesels on the cliff!

Jacques Foos learned that Flamanville's emergency diesel engines would not be able to withstand a tsunami wave

The example here shows the possibility for an individual in France to influence the course of events and decisions. This is a first-hand experience of the lead author of this report, Jacque Foos, as Vice-President of CLI-Flamanville.

The author has generated a controversy by questioning the capacity of installations close to the future EPR in Flamanville to withstand nine-metre waves, like in Fukushima during the tsunami.

An official of EDF (the company that manages the EPR) was asked privately by the author if a nine-metre wave in Flamanville would, as in Fukushima, have submerged the diesel engines which are responsible for feeding the cooling systems. The answer was positive!

Meanwhile, politicians published falsely optimistic information about the diesels, hoping to reassure the public after Fukushima's incident

The next day, the author read the remarks made by a deputy in the corridors of the National Assembly, which proudly states that an EPR would have had no problem in Japan!

The sequence of reactions is curious: experts recognise in private that a nine-metre wave could submerge the engines; however, politicians think that this is the right time to extol the virtues of the French EPR reactor, which "would have had no problem in Japan"!

Fukushima's reactors survived the earthquake but experienced trouble after the tsunami, when the diesel generators were flooded and could not provide electricity for cooling

In Fukushima, at the time of the earthquake, the reactors stopped and were automatically put in a safe position. At the same time, the emergency diesel generators were started automatically to supply electricity to cool and eliminate the residual power. The problem was that, 55 minutes after, the tsunami arrived and the diesel generators stopped, flooded by the wave. In contrast, the Onagawa plant, much closer to the earthquake epicentre than Fukushima but located slightly higher above sea level, has not experienced the same 'disorders'.

When there is a cliff close to the power station, the simplest thing to do is to install engines up above, sheltered from the wave. In addition, it is necessary to install large water tanks on the cliff: the water will fall by gravity and will also provide cooling. This is called 'passive safety'.

The Press published Jacques Foos' doubts, influencing the politicians

The press has now taken hold of the remarks of the author and these doubts, especially since he was not known for his 'anti-nuclear' opinions![20] Eighteen hours after the first news, next day, ASN broadcast the following statement: "all the reactors in the world would be in the same difficulties as Fukushima in the same conditions".

A fortnight later, on 31 March 2011, the president of the Nuclear Safety Authority Andre-Claude Lacoste told the Parliamentary Assembly: "I shall give only one example: at Flamanville, for EPR, would it be better to set the diesels on top of the cliff rather than just down next to the reactor building, to

protect themselves from any huge wave? There is no need for years of consideration to take a position on that point."

As a result, the EDF has installed 58 generators, one for each reactor, in case of ultimate emergency

EDF will install generators for any 'ultimate emergency' for each nuclear reactor (*Groupe d'Ultime secours* or GUS). The goal is to allow cooling system pumps to operate under any and all circumstances. Similarly, extra water in additional tanks should be implemented for emergencies. Fifty-eight new diesel generators will be installed on all reactors by 2018 (one generator per reactor). The ultimate idea is to have a Nuclear Rapid Action Force (*Force d'Action rapide Nucléaire* or FARN), which can respond to any accident within 24 hours, implemented by EDF in 2013. This is another lesson learned following the Fukushima accidents: to intervene in less than 24 hours, whatever the accident situation.

The Press and the citizen's free expression of opinion made these improvements possible

Clearly, it is not the influence of one person, whatever that person may be, who may modify the equipment of 58 nuclear reactors. However, a sensible remark, taken up by a press which in this example has perfectly played its role of information dissemination from an ordinary citizen, has allowed the authorities to strengthen their project to enhance the safety of reactors placed in a critical situation never seen in France.

There is no doubt that this is a good example of citizen vigilance. It shows that the citizen can play an important role in this field. But, such citizen vigilance can be efficient if and only if all actors are in a non-conflicting, sociological relationship. To clarify, 'non-conflict' does not mean looking for consensus (for example, see the analysis from the Japanese regulatory body and TEPCO). It means respect for contradictory opinions and a common goal of improvement.

It is also necessary that these committees have among their members qualified scientific experts in these fields who are independent of the nuclear industry.

The Cotentin CLI's report on the safety of 'its' civilian nuclear facilities

After Fukushima, CLI of Contentin looked to reassure civilians living near nuclear facilities by answering their questions

It is clear that the Fukushima accidents have shocked the populations living around nuclear facilities. In particular, evacuation for a duration that cannot be estimated immediately is an idea that is unacceptable to them.

Thus it was the role of the CLIs of Cotentin, as explained above the most nuclearised region in France, to answer, or at least try to answer, questions from people. This is one of their missions. As a result of a special general meeting which gathered the three CLIs in April 2011, a Working Group (WG) of a dozen individuals was set up. Its membership closely followed that of CLIs (six elected and two members from each of three other categories), and it was chaired by the president of the three CLIs.

The CLIs compiled a list of 184 questions and consulted experts for answers

It was decided to establish a number of questions that had emerged from the Fukushima accidents and to request answers from the different authorities and operators. Safety reports were given to the WG members by operators. They were studied, as were the documents drafted by ASN and incident reports. Many meetings of this group led to the drafting of 100 questions.

120,000 copies of the brochure were distributed

Along with these meetings, the General Council of Manche department asked everyone in the department on their eventual questions via internet. The press, which regularly followed the work of the WG, relayed this internet process. Thus a total of 184 questions were collected, subdivided into different themes. The population was informed via a booklet, of which 120,000 copies were distributed.

Hearings were carried out by WG with operators, the prefecture, ASN, IRSN's and workers' committees in these nuclear facilities. Answers and comments from all participants make up a report of over 400 pages. There was no question of disseminating such a large report to all interested parties, but the report has been made available in full on the internet, so it is available to any interested citizen.

A report of 50 pages was drafted and submitted for agreement to all WG members, and 120,000 copies will be distributed. Its plan appears in Appendix 4; it shows the different themes covered in this study.

This important work, carried out by volunteer members of the 3 CLIs is unique in Europe

This important work, which spread over two years and has been performed by volunteer members of the three CLIs is unique in Europe. The three CLIs' president has submitted this work many times at various forums and even to the European Commission in Brussels.[21]

In many actions undertaken by CLIs in France, IRSN fully carries out its mission as a technical support organisation, especially when the CLI does not have independent and volunteer experts. This report includes an exemplary action taken by IRSN, the work Environment-Loire pilot action. This action is described in Appendix 5.

Finally, the major, national action in which all actors play their parts: the 900 MW reactors' decennial assessment review, is also described in Appendix 6.

Efforts made by operators of nuclear facilities since the TSN Act in 2006

The 2006 TSN Act increased citizen engagement in decisions about nuclear power

It is clear that the 2006 Nuclear Security and Transparency Act has compelled nuclear operators to work together with citizen commissions while keeping, where it was useful and/or necessary, a certain confidentiality (sometimes secret reports are available on request by CLI observers, provided they sign a confidentiality agreement).

Since 2006, dialogue has grown stronger in the aftermath of the Fukushima accident

The Fukushima accidents have, quite naturally, strengthened these dialogues. Thus, CLI observers (usually scientific experts) were invited by ASN to the 'stress tests' inspections set up after the accidents. These collaborations were quite new and taught important lessons, especially the need for these observers to be accepted by the operators.

France nuclear power management is moving in the right direction

Also, as mentioned above, during measurement campaigns carried out by the CLIs in their roles as environmental monitors, the operator opens its doors to independent experts and allows them to prospect where they want to do, without any obstacle from the operators.

All this has changed in France in the right direction!

3.4 Nuclear science teaching in France

3.4.1 The present situation

Nuclear science is overlooked in all levels of French education, especially amongst elementary students

It is curious to note that in the country where radioactivity was discovered and where the greater part of electricity production comes from nuclear fission, nuclear science teaching has been fully overlooked.

Nuclear sciences are not much taught in elementary schools (six to 11 years). Since the National Education Ministry was headed by a renowned scientific figure in the 1990s, Professor Claude Allegre, the teaching of radioactivity, nuclear energy and their applications have been added to the physics programmes in colleges and high schools (12-18 years). However, this teaching is left to the initiative and good will of teachers, meaning that the educational value for pupils is very diverse. Up to the 2000s, in universities or schools of engineering education, there was also a lack of nuclear sciences teaching. In the new century, the engineering schools have started to react by providing teaching modules applicable to the nuclear industry, particularly with the beginning of old nuclear plants' decommissioning, which offers new jobs.

Particle physics is taught at INSTN, but higher education teachers are still disconnected from the industry and expertise

In the 1970s and this lack of teaching, and considering the very high numbers of jobs in the industry, CEA created its Institute for Higher Education, the National Institute of Nuclear Science and Technology (*Institut National des Sciences et Techniques Nucléaires* or INSTN). Universities continue to teach particle physics, a course fully disconnected from the industry. It bears noting here that higher education teachers in France are very far from the world of industry and enterprise.

Moreover, it is clear that university professors create their courses starting from their research work. However, the nuclear industry is the only industry in France to have its own research centre, the CEA, because the beginnings of nuclear power were focused on military applications with a high level of secrecy. No research contracts were thus entrusted to the university

sector, which was deliberately kept far from this industry. The fundamental research therefore remained with the university sector, as did the teaching of fundamental physics.

'Learned society' found that younger children have great interest for learning about radioactivity

For younger children, this lack of education is harmful because the experiences of the 'learned society', mentioned below, show that children have a great interest in phenomena relating to radioactivity — as they do with any other scientific field, for that matter, as soon as one tries to interest them.

3.4.2 Learned society

'Learned society' gathers experts to promote education about nuclear sciences

Learned society gathers experts who, through their work and their thinking, promote knowledge in their activity area. Thus, all learned societies have information and training missions. In the nuclear sciences, these missions take several forms.

The society 'Save the Climate', which essentially gathers nuclear physicists, professors and researchers, including members of the French Academy of Sciences, acts as a think tank.

The French Society of Nuclear Energy (SFEN) provides nuclear science education through conferences for professionals, college lectures, programmes for younger pupils, and travelling exhibitions

Others such as the French Nuclear Energy Society (*Société Française d'Énergie Nucléaire* or SFEN) have reacted to this inadequacy in the education area. In addition to the organisation of many technical conferences for professionals in the nuclear field, SFEN plays an extremely important part in the school environment. This is enhanced by the division of the Society into regional groups, which allows for adjustment to the local teaching priorities. The relationships are close with many colleges; lectures are organised with the assistance of teachers and followed by easy experiments that make it easy for students to understand radioactivity (e.g. the difference in penetration into material of various radiation types, radioactive decay in time, etc.).

Again, regional focus and the resulting proximity to different intermediaries play a major role. Furthermore, stakeholders in schools are volunteers, generally retired people from the nuclear industry, and pupils like to see the 'seniors' come and talk about their work — clearly a passion since otherwise the seniors would not be among them! The talks are of great interest to young pupils. Regional groups also invite renowned lecturers from a list set by SFEN on a voluntary basis, in which the groups can select lecturers according to their expertise and their lecture themes.

At the national level, SFEN has organised two major travelling exhibitions. The first, in 1990-1995, called 'Atoms' Light' was a very large exhibition in which all nuclear-related activities were shown with practical work whenever possible. A particular place was reserved for the presentation of local nuclear activities. Schools, usually primary schools, were received by trained animators who had previously been in contact with teachers in order to prepare the visit. This exhibition required significant space, and only regional capitals could host it.

A successful SFEN exhibition was also tailored to the student audience

Due to the exhibition's success and its pedagogical aspect, as 1996 and the commemoration of the centennial of the discovery of radioactivity drew close, the French Academy of Sciences requested that the initiator the of first exhibition (also this report's lead author) conceive another exhibition, again for the school public, to evoke these discoveries. This was to be a more adjustable, smaller exhibition, easily installed in an educational establishment regardless of its surface. This was achieved, at first covering the three years from 1996 to 1998 (the latter being the centenary of discoveries of polonium and radium), again showing experiments and also showing, thanks to the permission of Curie Museum-Paris, the original radiation detector, designed by Pierre Curie and used by his wife Marie.

The great success of this exhibition has allowed it to be shown over many years (except for the Curies' apparatus) and even today it is possible to obtain it by calling on the SFEN regional group which holds it.

These individual actions are very important, but it is harmful to the cause that the National Education Ministry has never wanted to strongly adapt its programmes for French students to receive adequate teaching in nuclear sciences.

3.4.3 Lessons for other educational systems from the French system's failure

The French failure to provide education about nuclear science can serve as a lesson for other countries

As seen above, the French experience in this area has been a failure as far as the teaching of these natural phenomena of radioactivity is concerned. This is quite detrimental to society, and this failure can serve as a lesson for other countries. The teaching (like the parents' education), whatever is the level, must provide markers to following generations so that they can evolve to address any situation with a critical mind, which is salutary and essential.

This teaching must prepare the next generations in carrying out their mission of citizen vigilance. This suggests having trained teachers themselves to do this task. It is out of the question that nuclear energy will solve all problems — neither global demand for energy nor a perfectly safe energy source — but again, the effects of this energy's applications must be quantified compared to natural radioactivity's effects. This reference is missing currently in France, not only among the public but also among journalists and even teachers. The lack of such shared knowledge will hamper the building of individual perception on nuclear energy issues, even with the input of informed stakeholders – opponents, proponents and neutralists.

One can hope that this negative experience may be a lesson to other countries. If that was the case, fortunately, this would be a positive consequence.

3.5 Dialogue and public information to other countries

France sets an example for other countries in managing nuclear power production

Admittedly, France is ahead of other countries in the field of information and citizen vigilance, probably due to significant nuclear power production on the one hand, and also very well-organised and efficient anti-nuclear groups on the other hand. Thus, ANCCLI has successfully proposed the establishment of a European association, EUROCLI, which would include all national federations. The pre-requisite is however that these national federations exist in the first place. At the moment, many foreign officials (and not just from Europe) want to take a leave from France, and to see how French expertise could be transferred to their countries.

ANCCLI wishes to establish a European organisation, the 'Nuclear Transparency Watch', to enhance transparency in nuclear activities throughout Europe

In July 2012, ANCCLI initiated a consultation to support the establishment of a European civil society organisation that would enhance the transparency of nuclear activities (e.g. safety, environment, health, economy, etc.). The initial proposals of the participants in this consultation led to the creation of an organisation that might be called the 'Nuclear Transparency Watch' (NTW), which would be set up initially from a small group of institutions previously involved in transparency development in the nuclear sector.

Like the NGO Transparency International that is devoted to transparency and integrity in public and economic life, NTW aims to promote the conditions for democratic transparency and effective public participation in the field of nuclear activities.

The construction of Flamanville EPR has also motivated international dialogue

The construction of Flamanville EPR serves as a showcase for nuclear energy in the future, and CLI-Flamanville has been asked to exchange the French experience. Similarly, the two vice-presidents of the CLI were invited to participate in an international meeting in South Korea in November 2012 (the Kijang Forum for the safety and prosperity of nuclear installations). In May 2013, a Swedish delegation of 60 mayors of cities located near nuclear installations came to Flamanville. The exchanges were numerous and rewarding.

3.5.1 The Swedish experience

Swedes use a high amount of nuclear energy per capita

It should be mentioned that the Swedes, for some time, have been the number one user of nuclear energy in terms of nuclear kWh per capita (6,815 kWh/capita each year against 6,460 in France in second place; far behind in third is the US with 2,696).

The Swedes have an uncommon type of relationship with the nuclear industry. The Swedish nuclear programme began in the late 1950s with the construction of Ågesta nuclear plant. During the 1970s, following the oil crisis, the development of nuclear power in Sweden reached its peak with the construction of the country's main reactors (six between 1972 and 1977).

Despite an accident in 1980, followed by a referendum which did not turn out in favour of nuclear power, nuclear reactors now produce 50% of Sweden's electricity

However, in 1979, the nuclear accident at Three Mile Island put an end to this growth. In 1980, a referendum was held about the future of nuclear power in Sweden, with three options put to the vote.

While the third option (immediate shutdown of nuclear energy and deprogramming of future reactors) seemed at first to be favoured by public opinion, it was defeated by the second option (a shutdown over the medium term[22]) – 39.1 per cent for option two against 38.2 per cent for option three and 18.6 per cent for the first option (full implementation of the nuclear power plant programme).

The first result of this referendum was obviously the recognition by the politicians of a popular will against nuclear power. Indeed, even if option three did not come out ahead, it should nevertheless be noted that the most pro-nuclear line mustered only 18.6 per cent of the vote. Thus, the Swedish Parliament decided in 1980 to plan a total exit from nuclear power by 2010. This decision has never been applied.

Despite the referendum, six other reactors were put into service after 1980. The referendum tolerated reactor construction provided that they were dismantled by 2010 (set by Parliament and the end of the lifetime of the reactors, estimated at twenty-five years). In fact, the only reactors to have been stopped are those at Barsebäck, 20 km from Copenhagen, in 1999 and 2005. Today, 10 reactors are still operating in Sweden, providing almost half of the national electricity production.

The Swedish now consistently support nuclear energy as a clean and cheap source

Actually, the Swedish position with respect to nuclear energy has changed. Their major preoccupation now is global warming and reducing emissions of carbon dioxide. Many Swedes believe that nuclear energy is less harmful to the planet. Thus, 62 per cent of them are in favour of the construction of new plants, mostly because half of the electricity consumed in the country comes from nuclear power. It seems difficult in a period of crisis to live without this cheap electricity.

The referendum results from the 1980s do not inform the current course of action

The Swedish situation showed the difficulty of interpreting a referendum, and therefore the possible uncertainties of the choices being made. Although this consultation method may seem very democratic, the motivations of electors may be quite different and the answer may not be linked to the core of the matter. Some referendums held in France are illustrative of these limits and justify why the French politicians mistrust them. The question asked to Swedes about the future of nuclear power in their country, just after a major accident in the US on one of the same reactors that was operating in the country, pushed the citizens to vote against nuclear power. But reason eventually prevailed and the 'medium' solution was chosen. Now it is the application of the first solution which is favoured, because economic and ecological reasons require it. Everyone has come far from the referendum results.

However, these opinion reversals left traces in the nuclear industry. Currently a good example of the relationships between nuclear operators and the population can be found in the high-radioactivity waste storage project.

The Swedish law states that a plant can only be implemented if the operator demonstrates a reliable method to dispose nuclear waste

In the years 1970-1980, the management of radioactive waste was the subject of many proposals. In 1977, the 'conditional law' stated that implementing a nuclear plant was only possible if the reactor's operator was able to demonstrate that it had a reliable method of geological disposal.

In 1995, the Swedish Fund for Nuclear Waste Management was created to gather the necessary funds for obtaining the future costs of waste disposal. As in the US, the Fund is financed through a tax paid by the industry on each nuclear kilowatt-hour produced. Currently, its reserves amount to €4.5billion.

A new nuclear reactor is to be built in Forsmark

After years of persuasion campaigns and exploratory drilling, SKB (Swedish Company for Nuclear Fuel and Waste Management) chose the Forsmark site. If the paperwork proceeds as planned, the project will begin in 2013 and the site will become operational in about 2020.

The head of this project has switched tactics to emphasise gaining the local population's acceptance, communicating with the residents daily

The head of the Forsmark project has ensured that the industry has learned the lessons from the popular opposition in the 1980s and understood the need to make progress on listening. They admitted that in the 1980s, they were too focused on technology and thought it was enough to send just two or three engineers to the public to provide information. Now they realised that the implementation of site storage depends on two things: safety and acceptance by the local population.

This is why the industry has drastically switched tactics. Since 1995, in an area of 10 km around Forsmark, SKB has focused on providing citizens with information. This strategy was further intensified in 2000, when exploratory drilling was conducted. Project leaders have applied themselves to staying in daily contact with the residents, through a newsletter.

The strategy has succeeded beyond all expectations. The last survey found that 85 per cent of residents were in favour of implementing a storage centre at Forsmark. Over the whole municipality of Östhammar, near Forsmark, the result was 77 per cent in favour.

This tactic has successfully earned the approval of the local population

There is little difference between the information dissemination process in Sweden and that used by CLIs in France. The only major difference, however, lies in the fact that it is the operator who organised this information and not an independent committee whose composition and missions are set by the law.[23] It is understood that the mayors of municipalities around nuclear power plants or storage sites in Sweden are trying to learn about the functioning of CLIs in France.

3.5.2 The British experience

The United Kingdom (UK) provides a second case study defined by the evolution of public policy and a public consultation process facing an ageing electricity production fleet, climate change issues and demand increase.[24]

UK nuclear power reliance has been declining slowly since the late 1990s

The UK has 16 reactors generating about 18 per cent of its electricity, with full fuel cycle and reprocessing facilities. All but one of these reactors will be retired by 2023. In the late 1990s, nuclear power plants contributed about 25 per cent of electricity generation, but this has gradually declined as old plants have been shut down and age-related problems have affected plant availability.

However, over the next two decades, the UK may need to increase its nuclear power usage

Over the next two decades, the UK is likely to need around 25GW of new electricity generation capacity, expected to be low-carbon as much as possible. The UK Government believes that it must set the right regulatory and market framework to ensure that such a sustainable and efficient energy mix happens — providing electricity at affordable prices — but that it will be for the private sector to take decisions on what form this capacity should take. The Government considers that a balanced approach is needed: a greater role for renewables and other low-carbon sources, a strong focus on energy efficiency, and for nuclear 'a role to play alongside other low-carbon forms of generation'; however, it would be for the private sector to propose, construct, operate and decommission any nuclear power plant.

The Government has implemented several measures to streamline new nuclear builds

Some nuclear new builds are ready to be commenced in the UK in 2013. 16 to 19 GW of new nuclear capacity is expected to be online by 2030 in the UK.[25] The government is implementing several measures to streamline the build process, such as:

- Carrying out strategic siting assessment and strategic environmental assessment processes;
- Ensuring that regulators are equipped to pre-license designs for new build proposals;
- Reforming the electricity market to provide long-term sales contracts and a capacity market;
- Legislating to ensure that decommissioning and waste management liabilities are met; and
- Strengthening the EU Carbon Emissions Trading Scheme to build investor confidence in the long term.

EDF's successful offer for British Energy could lead to 40-50% of UK's 2050 energy mix coming from nuclear power

EDF successfully bid for British Energy in January 2009 (UK Government supports EDF's £12.5 billion offer for British Energy as the launch of a new era for low carbon nuclear power, BERR, 24 September 2008). Four EPR nuclear reactors are to be built by EDF Energy. The company applied for permission to construct and operate the first two (3,260 MW) at Hinkley Point in Somerset in October 2011, and plans to have the first one grid-connected in 2018. In March 2013, environmental permits were granted and planning permission was received. Discussions on the long-term electricity price are on-going:

> "If the relevant consents and regulatory approvals are granted, highlights of the next 12 months could include a multi-million pound investment by NNB GenCo in its proposed new nuclear development at Hinkley that at construction peak could support about 5,600 jobs."[26]

For its part, EDF Energy said in May 2012 that it "remain[s] committed" to building the Hinkley Point reactors and was working towards a final investment decision by the end of the year, which would depend on having "the correct market framework [to] allow an appropriate return on the massive investment required". This could possibly lead to a UK electricity mix containing 40 per cent to 50 per cent nuclear by 2050.

The new builds line up with a global long-term energy policy

New nuclear builds in the UK now appear clearly 'embedded' in a global long-term energy policy that takes into account electricity market reform, strong efforts on energy efficiency and a diversity of electricity production facilities:

> "These facts put the replacement of nuclear power stations, a big push on renewables and a step-change on energy efficiency, engaging both business and consumers, back on the agenda with a vengeance. If we don't take these long-term decisions now, we will be committing a serious dereliction of our duty to the future of this country."[27]

Public opinion about nuclear power is positive

Public opinion in the UK has remained positive regarding nuclear power, despite the Fukushima accident. A July 2012 YouGov survey found that 63 per cent of Britishs supported the use of nuclear power, and only 22 per cent opposed building new plants on brownfield sites. Twice as many supported electricity market reform as opposed it (35 per cent and 18 per cent respectively), and interest in global warming had decreased to 59 per cent compared with 72 per cent in 2008. A further YouGov survey in October 2012 found that 40 per cent of the 1,734 people polled felt that the UK Government should use more nuclear power than at present, up from 35 per cent in November 2011. Maintaining current levels was preferred by 21 per cent, while 20 per cent felt that there should be less nuclear power used than at present, down from 27 per cent in 2011. Fifty-four per cent of men, and only 26 per cent of women, felt that there should be more. Of women, 23 per cent supported the status quo, 25 per cent called for a reduction in nuclear and 25 per cent were unsure. Apart from nuclear, 72 per cent were in favour of increasing solar power usage, 55 per cent were in favour of more wind farms, and 45 per cent wanted less coal-fired power.

Further, over the three parliamentary terms from 1997 to 2010 that the Labour Party was in office, the Government went from opposing new nuclear power plants to being in favour of them.

In 2003, the Government published a white paper promising that a full public consultation would take place before expanding the use of nuclear power

The February 2003 energy white paper, *Our Energy Future – Creating a Low Carbon Economy*, stated that the Government had no current plans to expand the use of nuclear power, although it added, "But we will keep the option open".[28] The white paper went on to promise that, before any decision to proceed with nuclear new build was made, "there will need to be the fullest public consultation and the publication of a further white paper setting out our proposals".[29] The Energy Review was launched in November 2005 and its consultation process attracted more than 5,000 responses, including from Greenpeace. The Government published a large amount of information relating to energy policy issues and the potential role of nuclear power (including a peer-reviewed cost-benefit analysis of nuclear power, a model used to provide estimates of the relative costs of generation technologies, and a number of reports from consultations examining issues related to electricity generation and future investment).

By 2006, government policy had completely changed, with the report of its energy policy review published on 11 July 2006 stating that "We have concluded that new nuclear power stations would make a significant contribution to meeting our energy policy goals."[30]

In 2007, Greenpeace challenged the Government on the basis of not having fulfilled its prior promise of a full public consultation, but the consultation did not change the government's course of action

This conclusion was successfully challenged in the High Court in February 2007 by Greenpeace on the basis that the promise made in the 2003 white paper for "the fullest public consultation" had not been kept. Despite the fact that the White Paper was about more than just nuclear, including (amongst other things) energy efficiency and renewables, in his decision of February 2007, Mr Justice Sullivan concluded in favour of Greenpeace. The Government accepted the court's judgment and did not appeal it. Observing that this judgment was about the process of consultation, not the principle of nuclear power, the Government decided to consult further on nuclear and stated that no final decision was to be made until after that further consultation. In his Statement to the Parliament, the Trade and Industry Secretary said, "We continue to believe, subject of course to consultation, there is a case for having new nuclear power stations as one of the options companies should consider because of their potentially significant contribution to security of supply and reducing carbon emissions."[31]

In 2007, the Department of Trade and Industry published a white paper in favour of nuclear power, and then ran a consultation soon after

In May 2007, the Government's Department for Trade and Industry (DTI) published a new white paper titled *Meeting the Energy Challenge*, in which the Government stated its "preliminary view that it is in the public interest to give the private sector the option of investing in new nuclear power stations".[32] A new consultation on the future of nuclear power, as well as parallel technical consultations on a justification process and siting, was launched. This process led to the January 2008 publication of *Meeting the Energy Challenge — A White Paper on Nuclear Power*, the foreword (by Prime Minister Gordon Brown) of which stated, "The electricity industry should, from now on be allowed to build and operate new

nuclear power stations".[33] In contrast to the 2003 white paper, the foreword acknowledged, "Nuclear power can and will make a real contribution to meeting our commitments to limit damaging climate change".[34]

Between July and November 2008, a consultation was carried out on a proposed strategic siting assessment (SSA) process for identifying sites that are suitable for new nuclear power stations to be built by the end of 2025. Sites that have been found to be strategically suitable for new nuclear plants through the SSA would be listed in the Nuclear National Policy Statement (Nuclear NPS). A consultation on six draft National Policy Statements for energy infrastructure, including the draft Nuclear NPS, ran from November 2009 to February 2010.

In the 2000s, global policy for low carbon supported the UK Government's nuclear initiative

In parallel, the 'low-carbon' global policy went on. The target for reducing greenhouse gas emissions was increased to 80 per cent by 2050 (compared with 1990 levels) and made legally binding in the Climate Change Act 2008, which entered into force in November 2008. The legally binding targets for emissions reductions set out in the Climate Change Act have put nuclear at the centre of national energy strategy. In July 2009, the Government published a white paper setting out a 'low-carbon transition plan' designed to achieve the 34 per cent 2020 emissions reduction target. As one of the key steps, the plan reiterated the Government's policy of facilitating the building of new nuclear power stations. In July 2009 again, the Government set out its policy on nuclear power in a document titled *The Road to 2010: Addressing the Nuclear Question in the Twenty First Century*. It states that nuclear power is "an essential part of any global solution to the related and serious challenges of climate change and energy security" and that "Nuclear energy is therefore vital to the challenges of sustaining global growth, and tackling poverty."[35]

In 2011, more progress was made as the Government issued an Electricity Market Reform white paper and the Parliament approved new steps for builds

Since the May 2010 general election, which replaced the Labour Government with a coalition of the Conservatives and the Liberal Democrats, Government policy on nuclear power has remained largely unchanged. In July 2011, the Government issued an Electricity Market Reform (EMR) white paper. Its four main proposals were a carbon floor price; long-term contracts involving feed-in tariffs to stabilise financial returns from low-carbon power generation; a mechanism to ensure the provision of sufficient generating capacity nationwide; and an Emissions Performance Standard to prohibit construction of high-carbon generation. Following further public consultation, the next steps for nuclear new builds were approved by the Parliament in July 2011.

In 2012, a bill was written to attract £110 billion of new investment to low-carbon energy sources

On 29 November 2012, the Secretary of State for Energy and Climate Change confirmed the introduction of the Energy Bill to the House of Commons alongside the Annual Energy Statement. New nuclear capacity, renewables, and fossil fuels abated by carbon capture and storage (CCS) are recognised in the document as the three families of low-carbon generation with roles to play. The Bill places the interim Office for Nuclear Regulation (ONR) on a statutory footing as the body to regulate the safety and security of the next generation of nuclear power plants. The Bill was designed to attract investment to move from a fossil-fuel to a diverse low-carbon generation mix. The Government estimates that £110billion of new investment needs to be attracted in the next ten years.

4 Conclusion

France benefits from a sound nuclear control system

France benefits from a sound nuclear control system. With 58 operating nuclear power plants, among other installations, the absence of any major accident cannot be attributed to sheer luck alone.

Since 2006, the control system has enhanced its independence and transparency

The control system was revamped in 2006 to clarify and update the existing procedures. Two major outputs have been a growing independence of the nuclear safety authority from the government and a set of new institutional tools designed to enhance transparency and public participation. The creation of the HCTISN, as well as the normalisation of the CLI framework, constitutes a significant step towards public involvement.

The official public participation procedures, namely Public Inquiries and Public Debates, work towards the same goal. Much remains to be done in that regard, however, to have them involve the public in a meaningful way.

Public involvement is key for building trust in the long run

Among the main lessons is the fact that to be efficient, public involvement must be implemented as a long-term endeavour. This is the only way with which sufficient trust can be established between partners: trust in the motivations of the partners and trust in the data submitted. Establishing a good rapport is a necessary starting point when it comes to public involvement.

France has made progress in access to information and public participation, especially in the nuclear field

Of course, more practical issues must also be considered. The public being by essence non-specialist and volunteer, it must have enough time and funding to participate in public discussions. It must also have access to pertinent, understandable and trustworthy information on any topic it chooses to investigate. This brings about the question of access to information, which has always been a sensitive matter in the nuclear field. Much progress has been made on that front lately in France, especially regarding environmental information.

To conclude, significant achievements have been made over the past few years regarding public participation as a whole in France. Much has been done specific to the nuclear field. The new laws that have been enacted must now make headway in daily practice. It is now up to each and every actor in the nuclear field to adapt to this new framework and reach out to the public. It is also up to the public to answer the call.

In response, an increasing number of the French are in favour of nuclear power

This engagement seems to be working, since the last survey commissioned by Greenpeace from CSA Institute shows that 58 per cent of the French are in favour of nuclear power. This figure was only 33 per cent in 2009, long before the Fukushima accident.[36] This barometre, revealed by the French news magazine L'Express in its issue of 22 May 2013 (No. 3229) is very instructive: the major NGOs such as Greenpeace (which is very well known in France) until then had recorded a declining confidence.

Appendices

Appendix 1: Political Institutions in France

The Presidency of the Republic

Elected by universal vote, the President of the French Republic holds the highest position in the executive branch of the Republic. The president is the head of state, the chief of the military and the guardian of the Constitution of the Fifth French Republic. He leads diplomacy. He nominates the Prime Minister. He leads the Board of Ministers, which sets the executive agenda and oversees the work. The President promulgates laws within fifteen days following their adoption by the Parliament; he signs ordinances and decrees deliberated upon in the Council of Ministers.

The government

The government determines and conducts the policy of the nation. It is accountable to the National Assembly. It features the administration and the armed forces. The Prime Minister plays a strong role in the design and leadership of government policies, and coordinates the activities of members of the government; it leads the government's policy programme in the National Assembly.

The Parliament[37]

The Parliament of the French Republic comprises the National Assembly and the Senate.

The National Assembly

The National Assembly's main role is to debate, amend and vote on laws. This institution, unlike the Senate, has the power to overthrow the government. As of 2013, the National Assembly has 577 members called 'Deputies', elected or re-elected in the 2012 parliamentary elections by universal suffrage for a term of 5 years.

a) The Senate

The Senate is the 'High Court' of the French Parliament. It holds the legislative power along with the National Assembly. And with the National Assembly, it is the representative of the local authorities and of the French abroad.

It should be noted that, during the adoption of a law, where divergent positions occur between the Senate and the National Assembly, the Prime Minister may give the final decision to the National Assembly. Therefore, the National Assembly cannot legislate without the agreement of the Senate or the Prime Minister.

As of 2013, the Senate has 348 members. Senators are elected by a peculiar electoral college called Grands electeurs for a term of six years, renewable by half every three years. The Electoral College consists of approximately 144,500 electors: the Deputies (577), the regional councillors (see below, about 1,900), the general councillors (see below, about 4,000), delegates of municipal councils (see below, about 138,000) and representatives of the French people abroad.

The 190 members of the Assembly of French abroad elect 12 senators representing French people outside France.

The local administration

The local government may seem very cumbersome in its organisation due to the large number of communities. Indeed, these include 36,681 municipalities grouped in 4,055 cantons found in 342 districts, themselves gathered in 101 departments gathered in 27 regions. A profound change in the organisation, for the purpose of simplification, is expected within the coming years.

a) The municipality (la commune)

By law in France, the municipality is the basic level of administrative division of the territory. It is administered by a municipal council with a mayor and, if appropriate, one or more vice-mayors. The municipality is the depository for Civil Status and Land Registry records. The number of municipalities, 36,681, is significantly higher than in most European countries. They are managed by approximately 500,000 councillors (including mayors); some of them belong to the peculiar electoral college electing senators.

b) The canton

The canton is an electoral district for the election members of the General Council of a department (see below). As of 2013, there are 4,055 cantons in France and thus, as many councillors elected by universal suffrage for six years. Canton elections are held every three years and so renew half of the county council in order to allow continuity.

c) The district (l'arrondissement)

The arrondissement is an administrative district, a subdivision of the department. It therefore includes several cantons. The administration of a district is entrusted to a deputy-prefect, who assists the prefect of the department. Prefects and deputy-prefects are civil administrators, nominated by the President of the Republic. As of 2013, there are 342 districts in France.

d) The department

The department is an administrative division of France, and is both a local authority and a decentralised administrative and electoral constituency. Departments form the second level of territorial division of the French Republic after the administrative regions, which are groupings of departments.

France is divided into 101 departments. Each department has an administrative city that gathers its institutions. This capital is usually the largest city in the department. The department is an administrative district headed by the prefect of the department. The department is also a decentralised local community headed by the General Council; the councillors are elected at the canton as above. At the head of the council, a president is elected by all councillors.

e) The region

The most important national division, the 27 French regions are the real local authorities of the French Republic. Headed by a regional prefect, himself nominated by the President of the French Republic, and with a regional council, the regions have administrative power in an extremely wide field of action. They act primarily in education management (schools of all levels, including vocational training and apprenticeship), in public research (including university), economic development, and regional territory and infrastructure planning.

The 1,875 regional councillors are directly elected every six years. They may be re-elected. They are elected from lists composed at the departmental level. At the head of the Regional Council, the elected president holds executive power, but under the control of the Regional Prefect.

Figure 1.1: Illustrated Explanation of Political Institutions in France

Executive Power
President of French Republic (elected by universal vote)
Government

Legislative Power		
Parliament	National Assembly	577 Deputies (elected by universal vote)
	Senate	348 Senators (elected by Grands Électeurs **(GE)**)

Legislative Power			
	Administration	Management	
Regions (27)	Regional Prefect	Regional Council	Regional Councillors **(GE)**
Departments (101)	Prefect	General Council	General Councillors **(GE)**
Districts (342) (Arrondissements)	Deputy Prefect		
Cantons (4,055)	Elect the General Councillors		
Municipalities (36,681)	Mayor	Municipal Council	Municipal Councillors **(GE)**

Appendix 2: Lessons Learned from IRSN's Public Perception Studies

For more than 30 years, IRSN has been tracking French perceptions of nuclear risks. Opinion polls have been conducted on this issue since 1977. Since 1990, the annual Baromètre IRSN (Barometre) has been providing a yearly insight on risk perception in France. The careful framing of the questionnaire used to prepare the Barometre has preserved consistency in the questions; therefore, most results can be compared over time. Moreover, the Barometre always positions the nuclear risk in comparison with other types of risks such as air pollution, AIDS, car accidents and unemployment. Indeed, the perception of nuclear risks cannot be studied or understood while making abstraction of other risks, the notion of risk being by essence extremely relative. That being said, the focus of the Barometre has been on the French perception of nuclear power plants, radioactive waste and the public risk management framework.

The first lesson drawn from 30 years of studies is that the overall perception of nuclear risk in France has been fairly stable over time. The hierarchy of perceived risks has remained mostly unchanged, with two exceptions: first, car accidents have become less of a preoccupation as the confidence in public action in that area has risen; second, the Chernobyl radioactive fallout consequences in France have become a growing point of defiance by the public against the authorities, despite the passing of time.

A second lesson is that the risk hierarchy as perceived by the public is mostly rational. Economic concerns such as unemployment, exclusion and poverty have always come above any other risk or concern (2011 being the single exception, due to the Fukushima accident). The remaining risks and their management usually are perceived in the following order:

1. Risks linked to individual behaviours, such as AIDS, obesity, alcoholism, drugs and tobacco are considered to carry a high risk. However, the public believes that these are dealt with soundly by the authorities;

2. Risks of diffuse pollution such as Chernobyl radioactive fallout in France, radioactivity, pesticides, air or water pollution and GMO are perceived as carrying a medium to high risk. The public action regarding their management records very low trust rates, as does the information given on these by the authorities;

3. Technological risks attached to particular sites like chemical plants, radioactive or chemical waste, nuclear power plants and incinerators of domestic waste come in third. Their management also suffers from poor trust on the part of the public. Nuclear plants are an exception in that regard, since the management of the risk they carry is deemed more trustworthy than that of the others; and

4. Non-industrial risks such as heat waves, domestic accidents, floods and noise are considered relatively low, and their management by the public authorities carries a higher than average trust.

The third lesson is that the public believes that risk management must rely on transparency, pluralism and independence of expertise: 90 per cent of the French favour the development of pluralistic structures gathering elected officials, scientific experts, operators, NGOs and citizens to contribute to risk assessment and management. They also believe that it is natural for scientific experts to disagree on issues, as long as the reasons for the disagreements are explained.

The fourth lesson is related to the Fukushima nuclear accident, which shocked the public and provoked a rise of fears related to nuclear plants. In the Barometre published in 2012, for which the polls had been conducted in autumn 2011, the perception of nuclear risks jumped in comparison to the others, sometimes to a historic high. In September 2011, 55 per cent of French people deemed the risk of nuclear plants to be significant, a historic high. At the same time, 24 per cent trusted the authorities to manage that risk, a historic low. The only marker that was not affected was the one regarding the credibility of the information given by the authorities, which was already low: only 15 per cent of the public trusts the official information regarding nuclear plant risks.

Figure 2.1: Evolution of the most preoccupying issues for the public (1998-2011)[38]

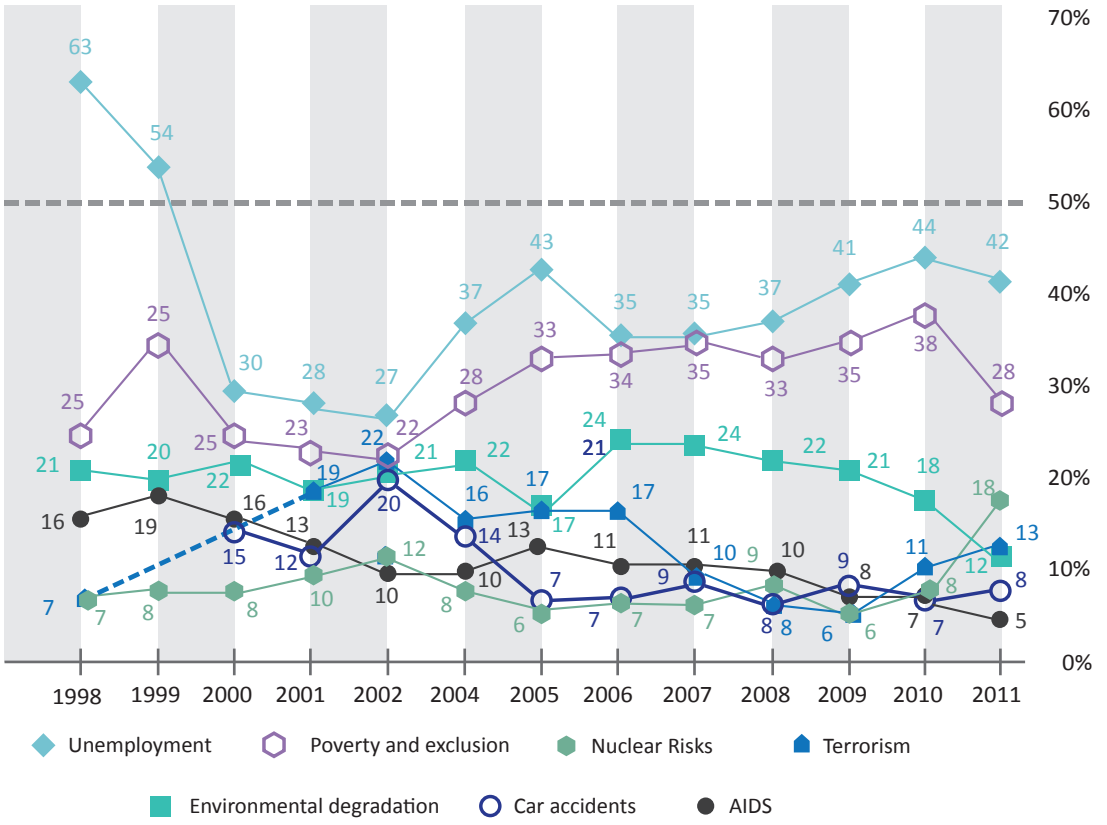


Figure 2.2: "Should new power plants be built?" Social categories react differently[39]

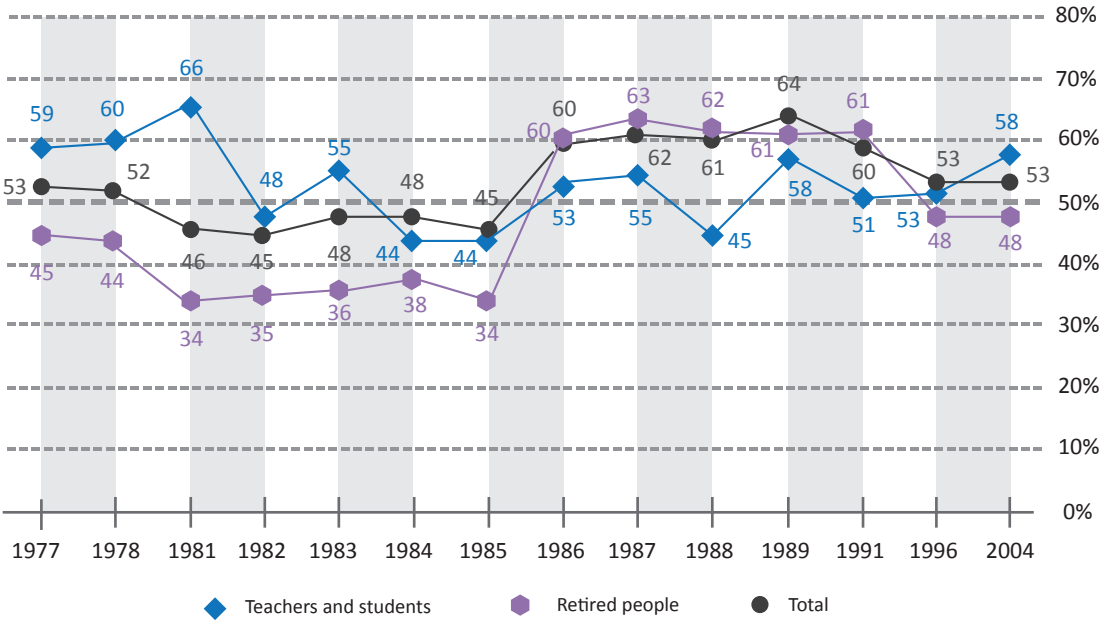


Figure 2.3: The strongest argument against nuclear power[40]

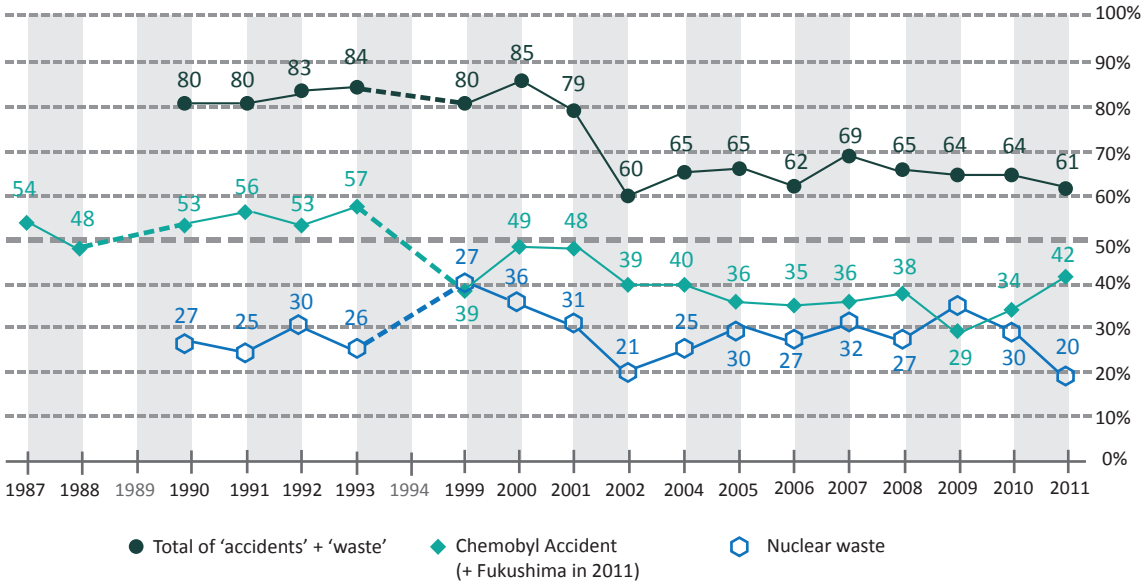


Figure 2.4: The strongest argument in favour of nuclear power[41]

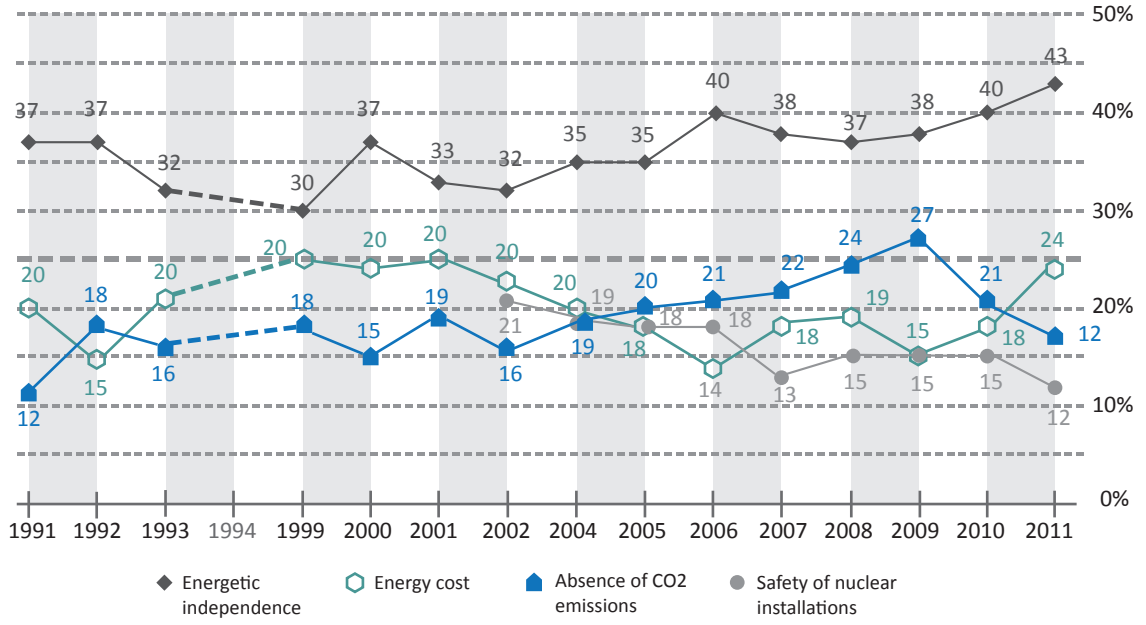
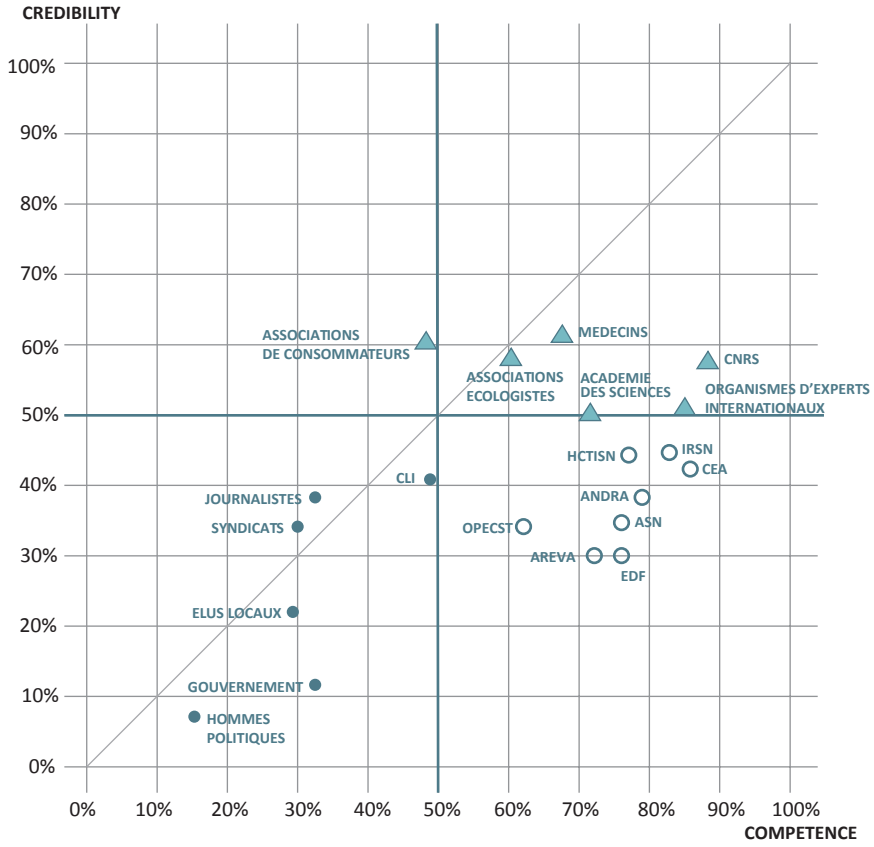


Figure 2.5: Perception of the competence and credibility of all the actors in the nuclear field (2012)[42]



Appendix 3: Public Inquiry for the Shutdown and Decommissioning of Three Facilities: CLI Areva-La Hague Opinion

The Report

Documents submitted to public inquiries on the three nuclear installations (INB) nos. 33, 38 (the reprocessing plant UP2-400 and its effluent treatment stations) and 47 (a workshop to refine caesium-137) were made available to the area CLI by Areva on 30 April (on CD) and 17 May 2010 (on paper). A Working Group of 11 CLI members was set up at the General Assembly of CLI on 17 June 2010.

On 26 August 2010, the prefect of Manche department opened three joint public hearings between September 27 and October 27 2010 on applications for final shutdown and dismantling of three INB operated by Areva in La Hague. He required from the CLI president to provide an opinion before 10 November 2010 on the documents submitted in the three public inquiries, in accordance with Article 13-III of Decree No. 2007-1557 of 2 November 2007. The Working Group reported its work to the CLI at the General Assembly Meeting of 13 October 2010

a) General note

The documents are difficult to study because of their volume and their on-screen nature. However, the group recognises that great progress occurs by the operator making them available for use in a public inquiry and for home consultation.

b) Questions raised by the CLI

About INB 33 and 38:

The CLI's questions concern only these two INB mainly because the radioactive effluent releases associated with their decommissioning are responsible for 64 per cent and 31 per cent respectively of the dosimetric impact of the dismantling of UP2-400, including:

1. What are the forecast calculation methods for radioactive effluent releases related to decommissioning?

2. The CLI requests a separate accounting of radioactive effluent induced by dismantling, especially alpha-emitters (documents subject to investigations provide estimates of releases, but we do not know if releases will be checked).

3. In the same way, the CLI requests a separate accounting of chemicals to be released via liquid effluent associated with dismantling (documents give estimated releases, but we do not know if releases will be checked).

4. In order to appreciate the creation of bioavailable compounds, what are the physicochemical forms and characteristics of radionuclides contained in liquid effluent induced by dismantling?

5. What treatments are planned for recycling or disposal of reagents that do not belong to the range of products used in the process?

6. What treatments are planned for recycling or disposal of nuclear material that it is not currently possible to vitrify, or whose cold crucible vitrification has to be demonstrated

(Uranium-Molybdenum waste, for example)?

7. What precisely are the alpha-emitters that the operator plans to dispose of in the sea? Although their dosimetric impact is about one hundredth of one mSv, how can the paradox of their most important contribution to Digulleville's reference population (46 per cent of the dose due to the overall dismantling) compared with that to Goury's fishermen (43 per cent) be explained? [Ref: EP-BNI 33, Volume 2, Part 7, Chapter 3, page 51]. (Note: There are two reference populations near La Hague plant: the Digulleville village for its farmers and Goury village for its fishermen).

8. Is the current knowledge level of the contents of silo 130 sufficient to develop a scenario for recovery and conditioning of waste in compliance with nuclear safety protocols?

9. What is an alternative solution permitting avoidance of the need for packaging in special containers? [Ref: EP-BNI 38, Volume 1, Part 3, pages 40-41]

c) Opinion

After studying the public inquiry documents, the Working Group set up by the CLI Areva-La Hague proposed to the CLI members to issue **a favourable opinion** on the request for a definitive shutdown and the decommissioning of INB 33, 38 and 47.

The Working Group is fully aware that decommissioning works have exceptional importance considering the issue's duration and the constraints in terms of releases and impacts on the environment, taking into account the specific nature of material involved in the INB during reprocessing operations that took place there.

In addition, the CLI attaches special importance to the **social aspect** of the decommissioning project. For example, it is clear that, during all these operations of shutdown and decommissioning, methods of waste treatment will be led in different ways; some of them may benefit from the results of research and development in progress. In addition, materials and waste involved in these operations will perhaps be different from those that were employed in the field of classical process applied today.

That is why CLI Areva-La Hague, in conformity with its mission, wishes to create a consultation cell with the operator, for the long term, throughout all the operations of shutdown and decommissioning for the 3 INB.

Further, taking into account the decommissioning time, the CLI will make an annual update on the work progress at a general meeting, covering each aspect of the project (social, environmental, economic). In addition to continuous monitoring of the decommissioning procedure, this approach will also permit discussion with the operator and ASN of any issues that might arise from developments in the project.

Deliberation

a) Context

The quorum being gathered (21 full members, the minimum being 15), this opinion was under discussion and subject to amendments before voting.

b) Voting

This Report was agreed to by a majority of 16 votes in favour, four against and one abstention.

c) It became the official opinion of CLI Areva

Further, in addition to being the official CLI opinion sent to the Prefect of Manche department, the questions in this paper will also be raised through a public inquiry process.

Appendix 4: Plan of the Synthesis Book on Inter-CLI Work

Part 1 — The role of Local information Committees: *A better understanding of nuclear activities at the population's service*

Chapter 1: CLI actions in understanding the nuclear activity sites in Cotentin

A) Information about the Areva-La Hague site
B) The nuclear power plant EDF Flamanville-1, 2 and 3, and its CLI
C) ANDRA storage centre: follow-up of the surveillance phase by CLI
D) Joint operations for the three CLI

Chapter 2: Accessible technical reports under certain conditions

A) Communication of safety reports from operators to CLI members
B) Documents drafted by Nuclear Safety Authority
C) Incident reports

Part 2 — The Working Group approach

Chapter 1: Methods of approach

A) 184 questions
B) Communication tools
C) The strong points of the work

Chapter 2: Process objectives

A) A detailed safety analysis
B) Strengthen the facilities' safety
C) At the heart of our priorities
D) Recognition by the European Community

Chapter 3: Questions and answers

Part 3 — Accident prevention

Chapter 1: Technological risks

A) Storage pools of EDF and Areva-La Hague sites
B) Zirconium
C) Storage of highly radioactive products

Chapter 2: Actions taken by operators against natural risks

A) Protection against extreme weather events
B) Seismic and magnetic risks and global warming

Chapter 3: Protection of nuclear sites against external aggression

A) Protection against plane crashes and fires
B) Hacking
C) Internal and external malevolence

Chapter 4: Other safety conditions

A) Social, organisational and human factors
B) Subcontracting
C) Facilities at stop
D) Controls for public health and the environment

Part 4 — Crisis Management

Chapter 1: Emergency organisation

A) The Internal Emergency Plan (Plan d'Urgence Interne: PUI)
B) The peculiar intervention plan (Plan Particulier d'Intervention: PPI) and emergency organisation plan (ORganisation des SECours: ORSEC)

Chapter 2: Organisation of public authorities

A) Delivery means of iodine tablets against radioactive iodine
B) Estimation of radioactivity dose
C) Evacuation

Part 5 — Post-accident actions and discussions

Chapter 1: Post-accident

A) Transparency of accident analysis
B) Post-accident zoning and surveillance of deposited radioactivity
C) Post-accident monitoring towards populations
D) Management of radioactive waste:
    1) The management of waste products according to their nature
    2) The problem of water
    3) The future of contaminated land
E) Financial compensation for concerned populations

Chapter 2: The Post-Fukushima approach

A) Additional safety assessments
B) The requirements of the Nuclear Safety Authority
C) Development of security tools
D) The timetable

Part 6 — Hearings Synthesis: the view of each college

A) College of elected members
B) College of environmental associations' representatives
C) College of operators' unions
D) College of experts

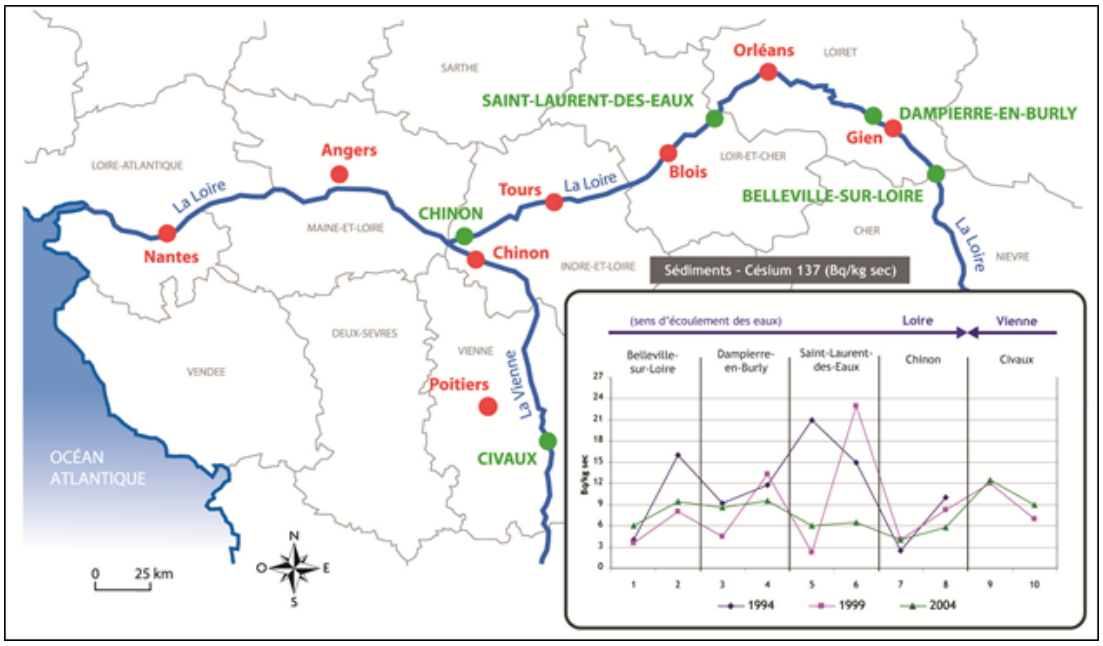
Appendix 5: The Environment-Loire Pilot Action (APEL: Action Pilote Environnement Loire)

Implementation

In France, IRSN is responsible for measuring the amount of radionuclides in the environment and for making the results available to the public. The problem with the second part of the mission is that the results are not easy to understand for neophytes. This fact led IRSN to question three CLIs so as to gather their expectations regarding nuclear facilities' discharge monitoring and surveillance of radioactivity levels in the environment. Once the results were known, in 2004, IRSN proposed to ANCLI (which later became ANCCLI) and the CLI from the Loire Valley to launch a partnership to study this issue. The aim was to build together, on a river basin scale, a practical way to communicate environment monitoring data in order to provide local actors with understandable information and to make follow-up monitoring easier for them.

The work was organised in four phases, from 2006 to 2008:

- **Phase 1** — Presentation of the method to the Loire Valley CLI and identification of willing partners among them
- **Phase 2** — Inventory by IRSN of the available data and of the participants in measurement processes in the Loire Valley
- **Phase 3** — APEL Report: Levels of radioactivity in the environment within the Loire Valley
- **Phase 4** — National seminar (sharing the results, improvement of this model of data output), with 80 persons coming from a dozen CLIs. The report which resulted from the initiative was grounded on two objectives: selecting pertinent data given the public's expectations and contextualising the data geographically as well as historically, and improving the readability of the graphics. It was written by a pluralistic taskforce. Three themes were selected by the taskforce:
  - The atmosphere
  - Rain water and continental water
  - The food chain



We can observe[43]:

- The labelling of Cesium-137 radioactive sediment
- Fluctuation along the river
- An absence of cumulative effect
- Difficulties in tracing the origin

This way of representing data makes them easier to read and allows identification of a potential cumulative effect.

Conclusions

As a process, the APEL showed the difficulties in CLIs remaining mobilised for several years, mainly because their members are volunteers, participating in their own time and sometimes on their own dime. They have limited time and financial resources available for such 'extracurricular' activities. Some of them (if not many) may be retired, but others work, which makes it difficult to find time to get and stay involved. These practical constraints are a strong hindrance when it comes to building competence, and one which needs to be addressed.

The APEL also required a major effort from IRSN to collect data and explain the methodology as well as the results to the CLI members. Nevertheless, it proved valuable for both IRSN and the participating CLIs. The CLI members were able to build competence and engage in environmental monitoring, they achieved their mission of transparency and information provision to the public, and they took part in a project along with neighbouring CLIs and expressed a series of recommendations pertaining to environment surveillance. IRSN succeeded in gathering local actors' expectations on the objectives of surveillance and the output of the results, gained material for reflection regarding the setup of the National Measurements Network mentioned above, consolidated a good relationship with CLI and ANCLI, and gave an operational meaning to its official openness strategy.

Appendix 6: The 900 MW Reactors' Decennial Assessment Review

Context and purpose of the initiative

Safety reviews are mandatory in France, and take place every 10 years. Their aim is to make sure that the installations meet the initial safety requirements (conformity studies), but also to re-evaluate these requirements in order to make the installations even safer (re-evaluation studies). The third decennial safety review (VD3[44]) of the 34 French 900 MW nuclear reactors is being carried out in two phases: first, a 'generic studies' phase focusing on the conception of the 900 MW reactors as a whole, which took place from 2002 to 2008; and second, a specific study of each reactor's safety, which analyses the actual status of every single reactor and continues from 2009 to 2020.

When the initiative with ANCCLI and the CLIs was launched, the first phase had concluded. This allowed for discussion of all the conclusions regarding the state of the 900 MW reactors as a whole. At the same time, it left the door open for further perspectives, since the VD of each of the thirty-four 900 MW reactors remained to be done, starting with Tricastin and Fessenheim. Not to mention that the next VD of the 1,300 MW reactors, which are different from the 900 MW but share many attributes, are to take place in a few years as well. Therefore, much valuable technical and methodological information could be drawn from this experiment. This would be useful to the public in preparing to study the coming cases. It responded to the ultimate goal of helping stakeholders build competence to analyse a technical safety case and use it in future study on the generic aspects of specific reactors.

The VD3 action was in part national and in part local, which prompted a search for different stakeholders. Indeed, as explained above, the first part of the VD3 is a generic exercise on the 900 MW reactors as a whole while the second part addresses the status of each reactor. ANCCLI's role as a pool of expertise, and the fact that it has a permanent group working on nuclear safety, made it an interesting stakeholder in discussions of this topic. Not only was the association qualified to discuss the issues, but it would also be able to relay whatever came out of the discussions to all the affiliated CLIs. However, since there was a definite local component in the VD3 exercise, it was felt important to include local stakeholders as well, with a preference for those who would be concerned by a VD in the near future. Those considerations led to the formation a group with representatives from ANCCLI and the CLIs of Gravelines, Fessenheim[45], Dampierre and Le Blayais[46]. Let us note that CLI-Fessenheim had obtained third-party expertise for the VD1 and the VD2, that CLI-Le Blayais had obtained the same for the VD2, and that both did for the VD3. Therefore, it was felt important to include them among the participants.

Finally, contact was initiated with the operator (EDF) and ASN. EDF already had given access to its documents to the CLIs' experts, and participated in the final meeting. ASN was kept informed of the discussions, and took an active part in the public meeting that closed the VD3 process.

Implementation phase

The inaugural working meeting was held in April 2009. IRSN presented the proposed scheme and discussed it with the CLI members. The proposal comprised two steps. First, IRSN and the stakeholders would hold discussions about the safety case and the way they could interact on such cases, trying at the same time to build capacity and find solutions to the

challenges involved. Second, they would hold a public meeting on the safety case, allowing IRSN, the operator and the stakeholders to express their positions on the case, before opening the floor to discussion.

The question of access to documents was a major part of the interactions on the VD3 case. To begin with, IRSN's relevant expertise report was transmitted to GSIEN[47], which was mandated by CLI-Fessenheim to monitor the VD3 process for its local plant. This report was not public, and its transmission was therefore not a mere formality. Nevertheless, discussions between IRSN and ASN led to both agreeing to communicate the full report to GSIEN, after GSIEN agreed to a confidentiality clause. The report was transmitted in May 2009. Then, in March 2010, IRSN published and presented in detail to the VD3 working group (including CLI members and IRSN experts) a 30-page long report prepared for the public, designed to explain the VD3 process and give a summary of IRSN's position.

Meanwhile, from December 2009 to September 2010, the working group met several times to discuss the VD3 issues and determine which among those issues were the most important for the stakeholders. The selected issues were internal and external hazards, severe accidents, ageing, human and organisational factors. Once the issues were selected, the working group decided, as had initially been planned, to hold a public meeting in Paris to present the VD3 process along with the issues that had been singled out. The meeting took place in November 2010, gathering about 35 people from 10 different CLIs. ASN presented the context of the VD3, EDF presented the stakes as seen by an operator, IRSN made presentations on all the selected topics, and the four CLI that had been part of the working group presented their own works or questions regarding these issues. All this put together produced a lively and successful meeting. Several CLI members who participated in this meeting left with ideas to develop actions on this topic in their regions. Some implemented these ideas, launching actions to monitor the VD3 on their site, such as holding public meetings and obtaining independent expertise.

Lessons learned

The main lesson learned from the case is probably that despite the rules and practices that have existed and still exist in France, it is possible to give stakeholders representing the public access to a safety case. It may be achieved indirectly by giving access to an independent expert the stakeholders have mandated to bring third-party expertise to a specific case. It may also be achieved, in the case of sensitive information, by demanding that the stakeholders preserve the confidentiality of the documents or by striking out the confidential parts and giving access to the remainder of the documents. Whatever the way, there are several ways to enhance stakeholders' access to safety cases, hence allowing better involvement in the nuclear safety process.

Besides mere access to information, giving the stakeholders access to IRSN experts allowed a rich dialogue to take place. This contributed significantly to the stakeholders' capacity building. As it had been envisioned beforehand, the CLI members were able to use everything they had learned from the IRSN report as well as their interactions with the experts. They used it to plan the local steps of the periodical review, which were still to come. The dialogue also contributed to a mutual gain: through the interaction, IRSN experts who are not used to interacting with the public learned about the stakeholders' preoccupations and saw some topics in a new light, getting a broader understanding of their field in the process. In the process, IRSN's culture of openness progressed. Indeed, this even changed the view IRSN's experts had of the work that could be done with society and the input the stakeholders could provide. The initiative proved that access to information could be arranged and that interactions could produce a mutual gain.

Endnote

1. In France, operators are given 10 years to operate a reactor, and can be renewed after comprehensive inspections that last for many months (see Appendix 6). It is the responsibility of the operator, Électricité de France (EDF), to decide if the investments required by ASN for 10 more years of operation of the plant are economically justified.
2. There is perhaps one other example that illustrates similar rigor in terms of independence. The Rights Defender is responsible in France for defending the rights of citizens against the government (like an ombudsman), and the Rights Defender is nominated by the President of the Republic for a period of six years, also not renewable.
3. The annual "*IRSN Barometers*" from 1999 can be found on IRSN's website at http://www.irsn.fr/FR/IRSN/publications/barometre/Pages/default.aspx. See also Appendix 2.
4. In the case of the Fessenheim plant mentioned above, if EDF decides to shut down the plant, the technical and regulatory process with ASN may take several years.
5. The Aarhus Convention governs access to information, public participation in decision-making and access to justice in environmental matters.
6. It can be found online at http://www.mesure-radioactivite.fr/public.
7. *Institut de Veille Sanitaire* (Sanitary Surveillance Institute).
8. Agence Nationale de Sécurité sanitaire de l'alimentation, de l'environnement et du travail (Agency for Food, Environmental and Occupational Health & Safety).
9. *Électricité de France* (Electricity of France).
10. A government-owned energy corporation
11. *Association pour le Contrôle de la Radioactivité dans l'Ouest* (Association for the Control of Radioactivity in the West).
12. *Groupement de Scientifiques pour l'Information sur l'Énergie Nucléaire* (Association of Scientists for Information on Nuclear Energy).
13. *Association pour la Surveillance et l'étude de la Pollution atmosphérique en Alsace* (Association for the Supervision and Study of Atmospheric Pollution in Alsace).
14. *Bureau national de normalisation des équipements nucléaires* (National Bureau of Standards for Nuclear Equipment).
15. *Institut Pluridisciplinaire Hubert Curien* (Hubert Curien Multidisciplinary Institute).
16. This map is compiled from engineering courses on the nuclear fuel cycle by J. FOOS.
17. Tritium is the radioactive isotope of hydrogen.
18. These documents can be found at http://www.cli-areva.fr/documents/L_HOMME_ET_LA_RADIOACTIVITE/Pages/HR_1.htm.
19. Details are available at http://www.Andra.fr/Andra-manche.
20. AFP 2011, *Flamanville: un scientifique évoque un scénario identique à Fukushima*, 17 March 2011.
21. All works by Cotentin's CLIs can be found on the website http://www.climanche.fr.
22. Option 2: Complete construction of the planned nuclear facilities; however, with a provision for exit under many conditions (energy saving, development of new forms of energy, and preservation of national industry and local economy).
23. That is, for instance, what the NGO MKG (nuclear waste comptroller) said. From its general secretary: "SKB has managed to take hold in these municipalities and has run a very active campaign to spread opinions. Many still think that SKB is an independent public body, which is completely wrong because it is a company linked to Vattenfall [the principal Swedish electricity company] and E. ON [the country's second-largest energy company]".
24. For more information, please refer to UK, Department for Business, Enterprise and Regulatory Reform, various press releases. UK, Department of Energy and Climate Change (2012), *Annual Energy Statement 2012*, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/65633/7086-annual-energy-statement-2012.pdf. *Société Française de l'Energie Nucléaire* workshops. Le Billon, V (2013), *Nucléaire: Londres affiche un discours volontariste* (Nuclear: London declares a proactive policy), *Les Echos*, 27 March 2013, http://www.lesechos.fr/27/03/2013/LesEchos/21405-085-ECH_nucleaire---londres-affiche-un-discours-volontariste.htm, and others from French media.
25. Given that the Scottish Government "is clear that new nuclear power is not wanted or needed in Scotland". It can be found from World Nuclear Association website. http://www.world-nuclear.org/info/Country-Profiles/Countries-T-Z/United-Kingdom/#.UjfEbMZmhcY.
26. UK, Department of Energy and Climate Change (2012), *Annual Energy Statement 2012*, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/65633/7086-annual-energy-statement-2012.pdf. *Société Française de l'Energie Nucléaire* workshops.
27. Tony Blair's speech in CBI Annual Dinner on 16 May 2006.
28. UK, Department for Trade and Industry (2003), *Our Energy Future-Creating a Low Carbon Economy*, http://webarchive.nationalarchives.gov.uk/+/http://www.berr.gov.uk/files/file10719.pdf.
29. See note 28.
30. UK, Department of Trade and Industry (2006), *The Energy Challenge Energy Review Report 2006*, http://www.dti.gov.uk/files/file31890.pdf, Crown copyright.
31. Statement to the Parliament.
32. UK, Department of Trade and Industry (2007), *Meeting the Energy Challenge,* http://www.berr.gov.uk/files/file39387.pdf.
33. UK, Department of Business, Enterprise & Regulatory Reform (2008), *Meeting the Energy Challenge-A White Paper on Nuclear Power,* http://webarchive.nationalarchives.gov.uk/+/http://www.berr.gov.uk/files/file43006.pdf

34. See note 28.
35. The Prime Minister (2009), *The Road to 2010: Addressing the Nuclear Question in the Twenty First Century*, http://www.official-documents.gov.uk/document/cm76/7675/7675.pdf
36. It must also be said that the article "Prevented Mortality and Greenhouse Gas Emissions from Historical and Projected Nuclear Power" from the scientific journal *Environmental Science & Technology* of 7 May 2013, http://pubs.acs.org/doi/full/10.1021/es3051197. It has raised a great stir. This article says that the use of nuclear energy has saved 1.84 million lives from 1971 to 2009. Based on the IAEA's scenarios for the years 2010-2050, scientists estimate that there will be between 4.39 and 7.04 million more deaths than if the current-equivalent energy level produced by nuclear power was produced by coal. If this energy was produced via natural gas, the deaths prevented by using nuclear instead would be between 420,000 and 680,000.
37. The Parliament creates a Parliamentary Office for Scientific and Technological Evaluation (*Office Parlementaire d'Évaluation des Choix Scientifiques et Tehnologiques:* OPECST). OPECST's mission is to inform French Parliament about the consequences of scientific and technological choices in order to clarify its decisions. For this purpose, it gathers information, implements study programmes and carries out evaluations. Set between the political world and the world of research, it acts as a partner acknowledged by all the scientific community.
    OPECST comprises 18 deputies and 18 senators appointed to ensure a proportional representation of political groups. It has a Scientific Council with 24 high-level officers, chosen for their expertise in scientific and technological matters.
    The areas covered by OPECST are divided into five themes: energy; environment and natural risks; new technologies; the life sciences and biotechnology; and research policy and the interface between science and society.
38. IRSN (2013), *Plus de 30 ans d'opinion des Français sur les risques nucléaire*s (More than 30 years of opinion from the French on nuclear risks), special edition of the Baromètre IRSN 2012, Graphic 1.2, p. 9.
39. IIRSN (2013), *Plus de 30 ans d'opinion des Français sur les risques nucléaires* (More than 30 years of opinion from the French on nuclear risks), special edition of the Baromètre IRSN 2012, Graphic 2.1, p. 19.
40. IRSN (2013), *Plus de 30 ans d'opinion des Français sur les risques nucléaires* (More than 30 years of opinion from the French on nuclear risks), special edition of the Baromètre IRSN 2012, Graphic 2.2, p. 20.
41. IRSN (2013), *Plus de 30 ans d'opinion des Français sur les risques nucléaires* (More than 30 years of opinion from the French on nuclear risks), special edition of the Baromètre IRSN 2012, Graphic 2.3, p. 21.
42. IRSN (2013), *Plus de 30 ans d'opinion des Français sur les risques nucléaires* (More than 30 years of opinion from the French on nuclear risks), special edition of the Baromètre IRSN 2012, Graphic 4.2, p. 50.
43. The graphic extracted from the report *Surveillance de la Radioactivité dans l'environnement dans le Bassin de la Loire,* June 2007.
44. *Visite Décennale 3*: 3rd ten-year general inspection.
45. The Fessenheim CLI calls itself CLIS (the 's' stands for suivi, which means monitoring), which was its name before the 2006 TSN Act that made the CLIs mandatory. It managed to keep its name.
46. The CLI of Le Blayais calls itself CLIN (the 'n' stands for 'nuclear'), which was its name before the 2006 TSN Act that made the CLIs mandatory. It managed to keep its name.
47. See note 12.

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