2014 ANNUAL REPORT

RCC-M
RCC-E
CRITERIA
ETC-F
ETC-C
RCC-CW
RCC-C
RCC-MRx
RSE-M
PTAN

afcen

Shaping the rules for a sustainable nuclear technology

1 Organization and operation of AFCEN

2 Challenges and actions

3 Summary and outlook

Foreword by the President of AFCEN

AFCEN hereby presents its first complete activity report on behalf of all its 50 members, operators, manufacturers, equipment suppliers, organizations, consulting firms, training providers, and so on , who represent an accurate cross-section of the stakeholders actively involved in both the French and international nuclear industry. By becoming members of AFCEN, companies send out a clear message about their commitment and determination to join forces and work together in raising the bar on the quality, safety and competitive advantage of their nuclear projects and facilities.

Ever since its inception in 1978, AFCEN has been driven by a mission to establish a series of technical rules reflecting on-the-ground practices, feedback from industry and the latest knowledge in a bid to guarantee the superior level of quality and safety required for operating nuclear reactors. These objectives are also the values that guide the tremendous technical work of AFCEN's editorial groups, which currently feature over 470 experts.

AFCEN was initially founded by electric utility EDF and nuclear steam supply system manufacturer Framatome, now AREVA. AFCEN's name is often associated with the RCC-M construction code for mechanical components that it publishes. Since its creation, AFCEN has considerably broadened its scope of activities.

First of all, AFCEN extended the range of technical fields covered, with three codes for mechanical components: RCC-M (fabrication), RSE-M (in-service inspection) and RCC-MRx (high-temperature reactors, experimental reactors and fast-neutron reactors); one code for electricity and I&C systems (RCC-E); one code for nuclear fuel (RCC-C); one code for civil engineering works (RCC-CW), and one code for fire protection systems (RCC-F).

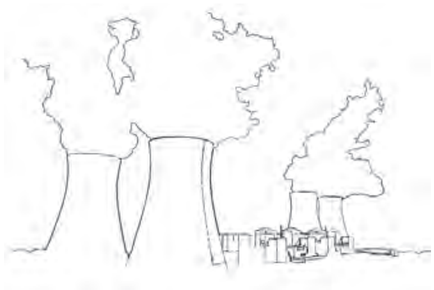
Furthermore, AFCEN clearly began setting its sights on increasing the association's international footprint in 2010 and opening its doors to a new audience other than its founder members, which raises new challenges when authoring technical rules that are regularly revised, updated and championed by larger expert focus groups, which in turn offers greater credibility in today's industrial environment. China has long been a hotspot for international deployment of AFCEN codes, which have served as the blueprint for 36 reactors, with 17 currently in operation and 19 under construction. The United Kingdom is the country boasting the second highest contribution with two EPRs slated for construction.

For the first time ever, the following report presents the entire organization, operation, challenges and initiatives spearheaded by AFCEN. Not only does it aim to highlight the importance of producing technical rules and developing training programs to support those rules, but also the quality of the design and construction codes published, as well as the initiatives that AFCEN is pursuing to continually improve the performance and quality assurance of its internal processes, and its outward-looking approach and international development strategies that clearly make users the main focus.

I wish you will enjoy reading!

CÉCILE LAUGIER
AFCEN President

1



Organization and operation of AFCEN

1.1 AFCEN's mission

AFCEN is an association whose primary purpose is to:

- Produce up-to-date codes offering accurate and practical rules for the design, construction and in-service inspection of components for use in industrial or experimental nuclear facilities (RCC codes).
- Ensure certified and readily-available training programs enabling code users to achieve a high level of expertise, knowledge and practical skills in using AFCEN codes.

AFCEN codes form a consistent set of rules that:

- Encompasses a broad spectrum of technical fields, including mechanical engineering, electricity and I&C systems, nuclear fuel, civil engineering works and fire protection systems.
- Has been evolving over the last 35 years to reflect changes in safety requirements, technological progress and international feedback based on users' practices.
- Offers an overarching approach to nuclear facility design and construction without specifically targeting a given type of project.
- Can adapt to the specific local regulations applicable in different countries.
- Helps unify and rally a country's entire nuclear industry around the same reference framework.

AFCEN CODES

Codes are continually updated to incorporate feedback from international industry best practices and changes to legislation, while striving to achieve harmonization with the other nuclear codes used around the world.

This ongoing activity is driven by an organizational and operational structure in response to AFCEN's Quality Management Policy, whose key goals are to:

- Prioritize the quality of its publications, which contribute to the safety and economic performance of sustainable nuclear facilities.
- Deliver a fast response to users' enquiries.
- Encourage members and customers to adopt a safety culture.
- Disseminate and promote uptake of the codes, especially through training and information systems.

AFCEN codes are published in English and French.

To improve distribution and uptake by industry in certain countries, editions of AFCEN codes have been translated into Chinese and Russian with AFCEN's consent.

The broad outline of AFCEN's organizational and operational structure is described hereinafter, along with the various bodies that were active during 2014.

TRANSLATION OF AFCEN CODES INTO CHINESE

THE CODE TRANSLATION CEREMONY IN 2011

1.2 Organization and operation

a) General organization

AFCEN is an international association.

Its members are companies from the nuclear or conventional energy sector (when operating in the nuclear sector), whose activities are related to the technical fields covered by AFCEN codes.

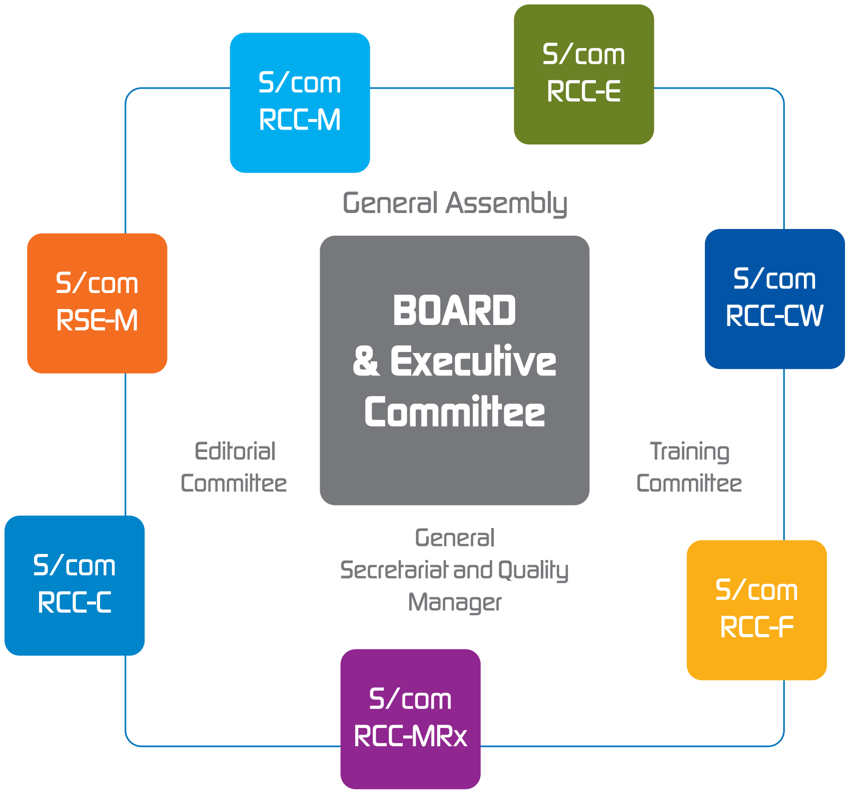
AFCEN organizes at least one General Meeting a year for its members, during which its general strategic directions and budget are approved.

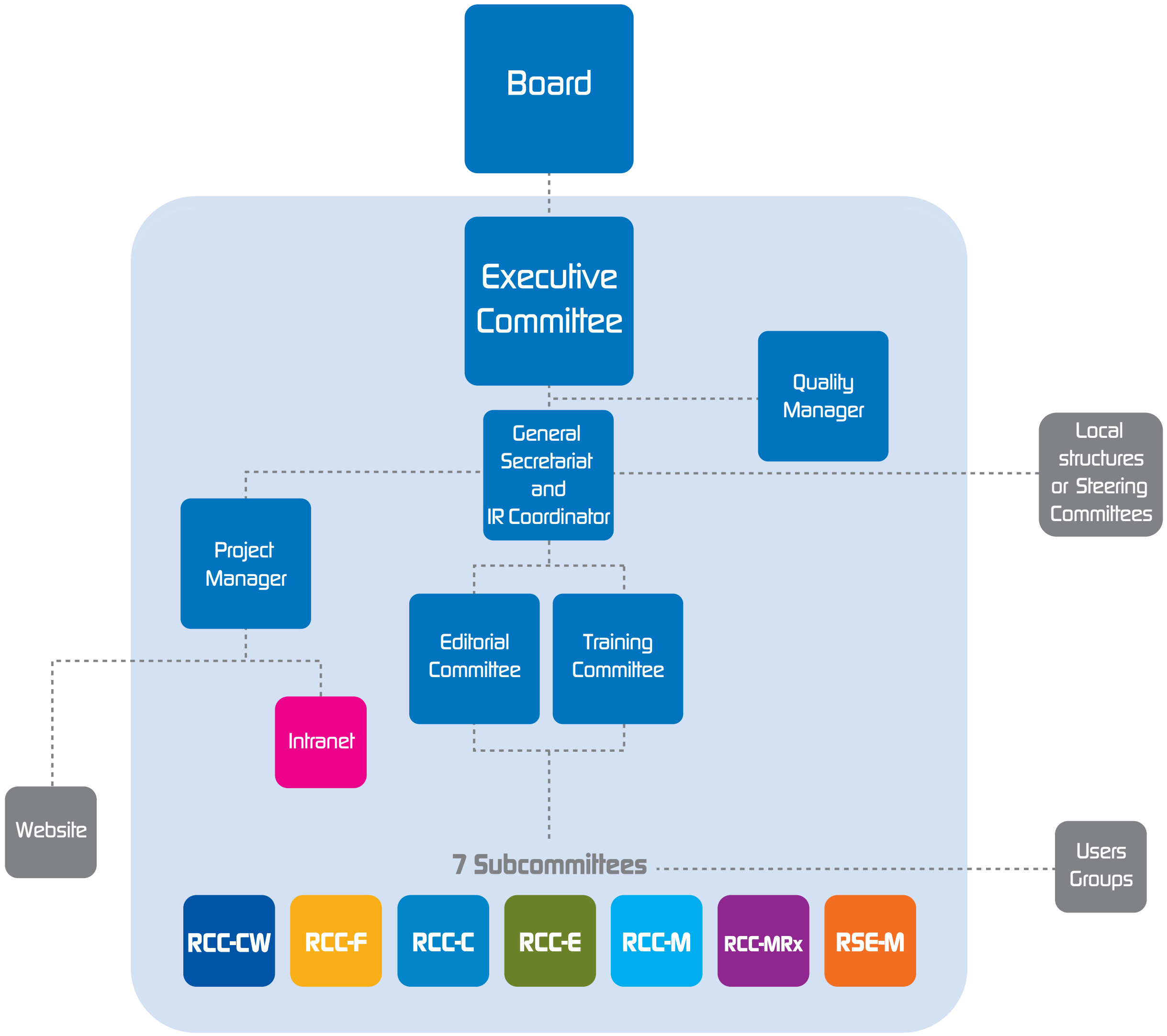
AFCEN is managed by a Board of Directors, which defines and ensures compliance with the association's strategic objectives and provisional budget once adopted by the General Meeting.

To achieve its work program, the Board is supported by an Executive Committee comprising designated members from the association. The Executive Committee is assisted by a General Secretariat, which is responsible for the general coordination of the association's activities, a Training Committee, an Editorial Committee and various Subcommittees, each of which covering a technical field associated with a specific code.

AFCEN does not have any regular employees. Its work is entrusted to experts who have been designated and made available by its members.

AFCEN'S ORGANIZATIONAL STRUCTURE





The organization and operation of AFCEN's different entities reflect this particular situation.

In some countries, such as China and the United Kingdom, AFCEN has set up local structures to help the Subcommittees more easily incorporate national issues into their work.

These local structures usually comprise Users Groups, which are not necessarily AFCEN members. Each Users Group is associated with a code.

Each Users Group is chaired by an AFCEN member as part of an agreement. In cases where a country has several Users Groups, a Steering Committee is created to coordinate their activities.

1.2 Organization and operation

b) General Meeting and Board of Directors

AFCEN is managed by a Board of Directors, whose members are elected according to its articles of association and which reports to members on its activities during the General Meeting.

AFCEN'S BOARD OF DIRECTORS

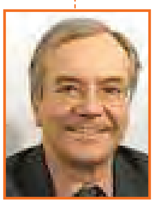
CÉCILE LAUGIER
AFCEN PRESIDENT

FRANÇOISE DE BOIS
VICE-PRESIDENT TREASURER

DIDIER LELIEVRE
CEA ADMINISTRATOR

ÉRIC PROUST
CEA ADMINISTRATOR

DENIS BUISINE
EDF ADMINISTRATOR



GÉRARD ITHURRALDE
EDF ADMINISTRATOR

MORELLO SPERANDIO
AREVA ADMINISTRATOR

PASCAL QUINOT
AREVA ADMINISTRATOR

The general activity of the Board of Directors and the General Meeting in 2014 is summarized in Box below.

Activity of the Board of Directors and the General Meeting in 2014

Both the Board of Directors and the Executive Committee held three meetings.

The General Meeting was held on 27 March 2014.

During the 2014 General Meeting, members approved the following:

- Continuation of AFCEN's internationalization policy and finalization of memoranda of understanding with China, the United Kingdom and the European Union.
- The 2014-2016 editorial program and continuation of the efforts made in 2013 to produce criteria for all codes.

Furthermore, specific enquiries were raised by members during the meeting and were dealt with during 2014 (see "customer focus" in the Box 8 in page 20).

c) General Secretariat

The General Secretariat oversees AFCEN's operation, proposes strategic directions to the Board of Directors and implements the actions chosen by the Board.

It organizes and coordinates all AFCEN activities deployed by the Editorial and Training Committees.

On an international level, the General Secretariat is supported by International Relations Coordinators and Liaison Officers.

The General Secretariat provides AFCEN's constituent entities and their members with a collaborative work tool called "AFCEN CORE".

This tool simplifies interaction between experts on a national and international level, while providing them with the data required for their work and enabling them to archive their work in accordance with the confidentiality rules associated with the protection of intellectual property.

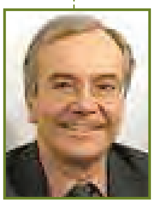
Access to this tool by members and their designated representatives is subject to AFCEN membership and compliance with such confidentiality rules.

For everyday communication with code users and more generally with the interested public, AFCEN offers a website **(www.afcen.com)** containing information on the codes and their environment, membership forms and the sale of its publications.

For the routine management of AFCEN's activities, the General Secretariat holds weekly meetings that are open to the Committee Chairs and the International Relations Coordinators. Such meetings are often in the form of a conference call.

AFCEN'S GENERAL SECRETARIAT

MORELLO SPERANDIO
GENERAL SECRETARY

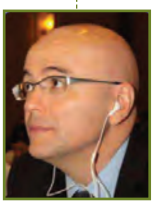


GÉRARD ITHURRALDE
DEPUTY GENERAL SECRETARY

ROMAIN GOY
PROJECT MANAGER

DAVY VUN
COMMUNICATION & PUBLIC RELATIONS

SYLVIE LAGADEC
SALES ADMINISTRATION



BRUNO MARQUIS
CHINA COORDINATOR INTERNATIONAL RELATIONS

DIDIER LELIEVRE
EUROPE COORDINATOR INTERNATIONAL RELATIONS

BADIA AMEKRAZ
POLAND COORDINATOR INTERNATIONAL RELATIONS

FRÉDÉRIC BEAUD
UK COORDINATOR INTERNATIONAL RELATIONS

1.2 Organization and operation

d) Editorial Committee

The Editorial Committee Chair is appointed by the Board of Directors.

The Editorial Committee comprises the Chairs from each Subcommittee, the Secretary-General and the Deputy Secretary-General.

The Editorial Committee is responsible for authoring and updating the codes published by AFCEN, as well as carrying out the associated technical studies. The committee defines AFCEN's editorial program, monitors and guides the work of the Subcommittees and approves the code editions and modifications prior to publication.

The Editorial Committee oversees the quality of AFCEN's publications. Superior quality contributes to the safety and availability of nuclear facilities and takes account of the economic aspect of building and operating such facilities by leveraging feedback from international industry best practices.

The editorial program is aimed at responding to the needs of AFCEN's members.

Standard practice is for members to formally express their needs by means of code Requests for Modification (RM) or Requests for Interpretation (RI). Such needs may also be

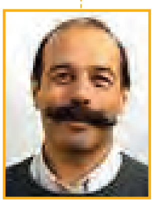
AFCEN'S EDITORIAL COMMITTEE

DENIS BUISINE
CHAIRMAN OF THE EDITORIAL COMMITTEE

CLAUDE DUVAL
DEPUTY

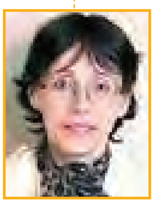
CLAUDE DUVAL
CHAIRMAN OF THE RCC-CW SUBCOMMITTEE

PATRICK JAMET
CHAIRMAN OF THE RCC-F SUBCOMMITTEE

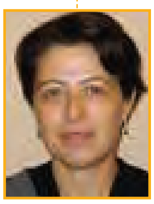


J. MICHEL HAURE
CHAIRMAN OF THE RCC-E SUBCOMMITTEE

PHILIPPE MALOUINES
CHAIRMAN OF THE RCC-M SUBCOMMITTEE



LUCE LOBGEOIS
CHAIRMAN OF THE RSE-M SUBCOMMITTEE



CÉCILE PETESCH
CHAIRMAN OF THE RCC-MRX SUBCOMMITTEE

MARC TON-THAT
CHAIRMAN OF THE RCC-C SUBCOMMITTEE

GENERAL SECRETARY
AND DEPUTY GENERAL SECRETARY

voiced during general meetings or any events organized by AFCEN. The various international schemes set up by AFCEN are ultimately intended to ascertain potential requirements.

As such, the Editorial Committee guides the work of each Subcommittee and proposes how all cross-functional tasks are to be distributed.

The Editorial Committee is also the preferred means for circulating information to and fro between the executive bodies and the experts.

The general activity of the Editorial Committee in 2014 is summarized in Box below.

General activity of the Editorial Committee in 2014

In 2014:

The Editorial Committee held four meetings, supplemented by regular conference calls. The main items addressed during the meetings were as follows:

a) Latest news (conferences, international activities, relations with safety authorities, feedback, and so on).

b) Changes in the organization and practices.

c) Cross-functional studies and commissioned studies.

d) Subcommittee reporting.

The Editorial Committee approved the publication of:

- Two 2014 code addenda (RSE-M and RCC-M).
- Two criteria (RCC-M and RSE-M).
- One report on the state of the art in seismic isolation bearings (RCC-CW).

Furthermore, the Editorial Committee launched 10 working groups to demonstrate how the RCC-M code can be used to meet the essential safety and radiation protection requirements stipulated in European and French regulations (PED Directive / France's Nuclear Pressure Equipment Regulation).

e) Training Committee

The Training Committee ensures that certified training is available in each field for AFCEN code users.

Training programs bearing the AFCEN hallmark guarantee a high level of service quality and thereby allow users to gain a clear insight, knowledge, uptake and proficiency in the requirements and practices for using the codes published by AFCEN.

The Training Committee assesses the ability of prospective providers to implement AFCEN courses and approves the training aids that they consequently need to use.

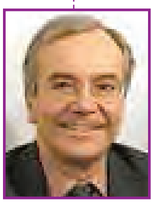
It establishes partnership agreements with training organizations and manages all the aspects specified in those agreements.

The Training Committee Chair is appointed by the Board of Directors.

The Training Committee includes a representative from each Subcommittee, called a "Subcommittee Training Officer".

AFCEN'S TRAINING COMMITTEE

MORELLO SPERANDIO
CHAIRMAN OF TRAINING COMMITTEE

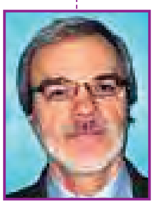


GÉRARD ITHURRALDE
DEPUTY

FRÉDÉRIC COPPEL
MANAGER FOR TRAININGS ON RCC-CW

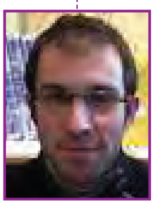
MICKAËL CESBRON
MANAGER FOR TRAININGS ON RCC-CF

MYRIAM CLAEYS
MANAGER FOR TRAININGS ON RCC-C



MICHEL VICENTE
MANAGER FOR TRAININGS ON RCC-M

LUCE LOBGEOIS
MANAGER FOR TRAININGS ON RSE-M



THIERRY LEBARBE
MANAGER FOR TRAININGS ON RCC-MRX

PIERRE DIAKONOFF
MANAGER FOR TRAININGS ON RCC-E

The general activity of the Training Committee is summarized in Box below:

General activity of the Training Committee in 2014

In 2014:

The Training Committee held three meetings.

The main items addressed during the meetings were as follows:

a) General information and latest news (conferences, international activities, organization and quality, etc.).

b) Certified training (review of all agreements signed and certifications pending).

c) Subcommittee reporting (certified training strategy, training programs currently undergoing follow-up audits, etc.).

The Training Committee approved 10 new training courses and issued 462 certificates of attendance for courses on AFCEN codes.

1.2 Organization and operation

f) Subcommittees

The Subcommittees are responsible for carrying out AFCEN's technical activities, with each Subcommittee covering a field associated with a given code (Box below):

In 2014, seven Subcommittees were active:

- **RCC-M:** Design and construction rules for PWR mechanical equipment
- **RCC-E:** Design and construction rules for electrical equipment
- **RCC-CW:** Design and construction rules for PWR civil engineering works
- **RCC-C:** Design and construction rules for PWR fuel assemblies
- **RCC-F:** Design and construction rules for PWR fire protection systems
- **RSE-M:** In-service inspection rules for mechanical components of PWR nuclear islands
- **RCC-MRx**: Design and construction rules for mechanical components in nuclear facilities subject to high-temperature structures and the ITER vacuum vessel

An eighth Subcommittee is due to be launched in 2016 for a deconstruction code (RCC-D).

The Subcommittees are responsible for:

- Working under the authority of the Editorial Committee and drafting the industry rules of practice corresponding to the field covered by the Subcommittee, and continuously updating those rules to reflect feedback from industry best practices and changes to international legislation
- Supporting the Training Committee with certifying training courses and selecting providers to deliver such courses.
- Supporting and interfacing with international Users Groups.

Changes to codes are initiated or prompted by Requests for Modification submitted by users.

Each Subcommittee comprises:

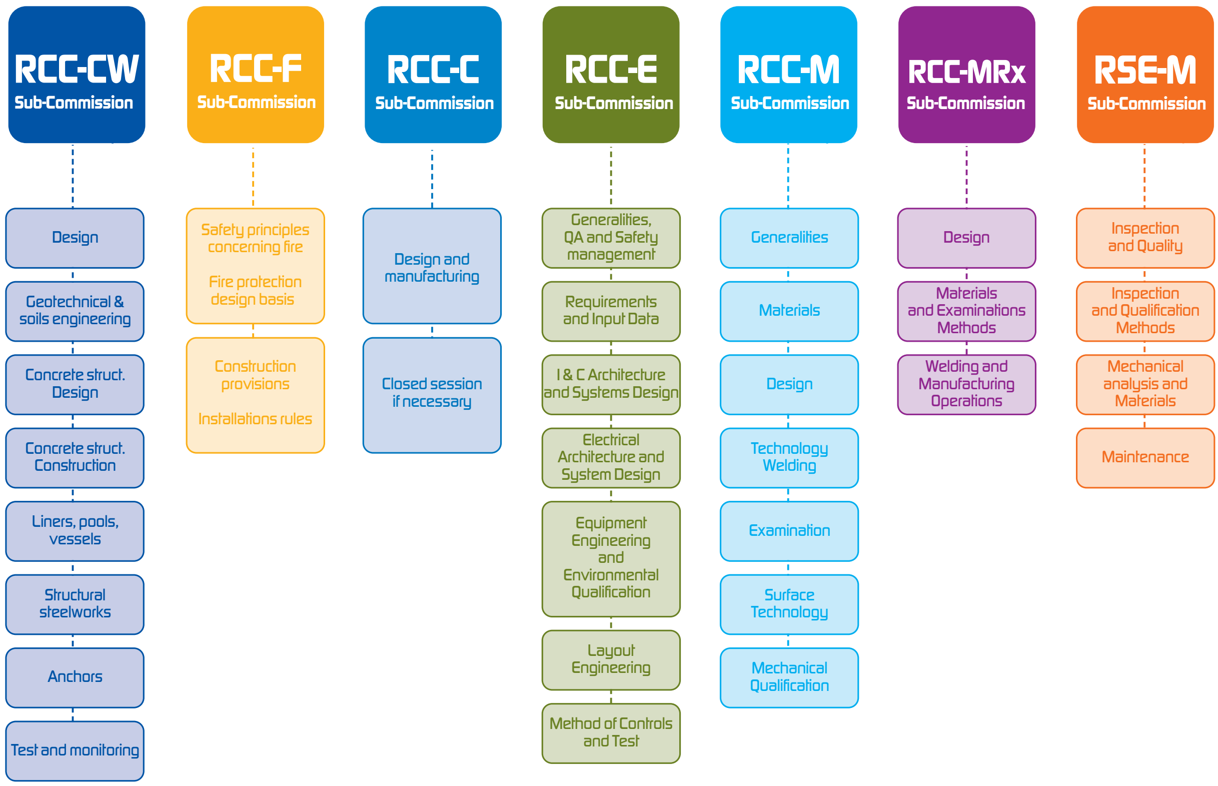
- A Subcommittee Board.
- Working groups.

The **Subcommittee Board** represents the Subcommittee's decision-making and arbitration body, and features a Chair, a Vice-Chair and a restricted number of experts elected by the Subcommittee Chair based on their skills. The Subcommittee Chair designates the working group leaders from the experts in the Subcommittee Board.

Working groups focus on one of the Subcommittee's sub-fields and are responsible for:

- Drafting and continually improving the parts of the code corresponding to the sub-fields.
- Investigating and responding to interpretation and Requests for Modification submitted by code users.

AFCEN'S SUBCOMMITTEES AND WORKING GROUPS



Working groups investigate Requests for Modification (RM) which, if necessary, are openly discussed during a Subcommittee plenary session attended by all representatives appointed by AFCEN members. Decisions are taken by the Subcommittee Board.

Texts approved by the Subcommittee Board are submitted to the Editorial Committee by the Subcommittee Chair.

General activity of the Subcommittees in 2014

In 2014:

33 working groups were active.

The Subcommittees held between five and ten plenary sessions a year, depending on the Subcommittee.

g) Users Groups

Users Groups are local structures that are responsible for coordinating local activities within the scope of the relevant Subcommittee.

Users Groups' missions involve:

- Pre-investigating interpretation and Requests for Modification submitted by local AFCEN code users.
- Informing users about the activities of AFCEN's Subcommittees and any changes to the corresponding codes.
- Sharing feedback from the country's nuclear industry.
- Facilitating adaptation of AFCEN codes to the local context (especially the country's regulations and industry best practices).
- Helping to provide training for the AFCEN code users in their country.
- Assisting with identifying communication needs (seminars, conferences, etc.) and their implementation in the country.
- Helping ensure consistency in the various multi-lingual versions of the codes.

General activity of the AFCEN code Users Groups in 2014

- The RCC-M Users Group in the United Kingdom held three meetings chaired by member TWI (The Welding Institute) and were attended by over 15 representatives from the UK's nuclear industry.
- The operating principles for the Chinese Users Groups were finalized (Steering Committee terms of reference), and the first six Chinese Users Groups concerning RCC-M, RSE-M, RCC-MRx, RCC-E, RCC-C and RCC-F will meet between 9 and 13 March 2015, chaired by CGN and CNNC. The civil engineering Users Group is due to be launched before the end of 2015.

h) Steering Committees

Steering Committees are local structures that are responsible for coordinating and prioritising the activities of all Users Groups according to the challenges specific to their country.

Steering Committees are governed by agreements with AFCEN. At the very least, Steering Committees comprise:

- One representative from AFCEN's General Secretariat: the designated International Relations Coordinator.
- The Chairs of each Users Group in the country.

General activity of the Steering Committees in 2014

The Steering Committees in the United Kingdom and China, chaired by NNB and CGN respectively, each held one meeting during the year. Preliminary meetings between AFCEN and the Steering Committee Chairs were held in the run-up to AFCEN's General Meeting in March 2014.

The detailed activity of the Steering Committees and Users Groups is presented in Sections 2.3.3 and 2.3.4 of the Activity Report.

1.3 AFCEN Quality Management

AFCEN has implemented a process-based management system that covers the main missions of the association's purpose and the internal activities supporting those missions.

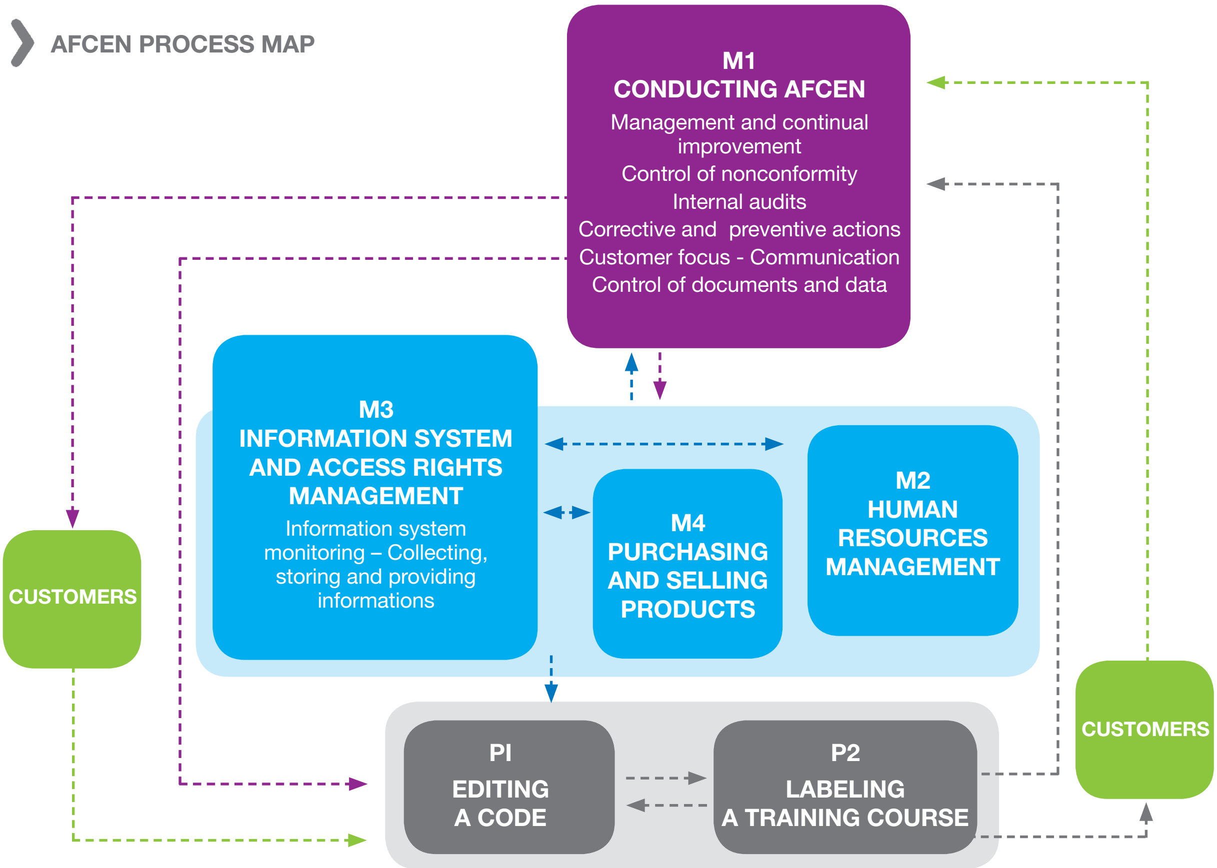
This process-based organization enables AFCEN to:

- look at AFCEN's operation from a cross-functional perspective,
- manage the interfaces and resources,
- clearly define the responsibilities.

This process-based organization is especially suited to the specific characteristics of managing an association that relies on the voluntary participation of its members. This organization also allows AFCEN to coordinate actions on an international level and create a framework geared towards the individual context in each country.

AFCEN's management system identifies two production processes and three support processes.

AFCEN PROCESS MAP



Management of AFCEN is described in process M1.

Production processes P1 and P2 refer to the processes of producing codes and approving / certifying the associated training programs.

The identified support processes concern AFCEN, skills management (M2), information system operation and access (M3), the purchase of services required by the production processes, and the sale of AFCEN's products (M4).

The Quality objectives associated with the processes are subject to periodic reviews in order to enable AFCEN to achieve its objectives and improve performance.

The Secretary-General acts as AFCEN's Quality Manager.

AFCEN was awarded ISO 9001 certification by Bureau Veritas in January 2014 (audit conducted late October 2013)

1.3 AFCEN Quality Management

AFCEN's general quality management activities in 2014 are summarized in Box below.

AFCEN's general quality management activities

AFCEN conducted two internal audits on 10 September 2014 and 18 December 2014 to determine the extent to which internationalization of AFCEN's operation had been incorporated into its processes.

AFCEN passed the first ISO 9001 certification follow-up audit on 14 October 2014: the auditor did not find any weaknesses or nonconformities; a few areas for improvement were identified in relation to the future ISO 9001:2015 standard, such as the need to implement a risk approach to give the management system greater overall consistency.

AFCEN's Management Review on 13/06/14 enabled the association to:

- fine-tune the Quality indicators of the production processes in alignment with the objectives of AFCEN's management policy,
- check the actions taken to resolve any identified deviations,
- monitor the associated corrective and preventive actions,
- check that the customer focus principle is correctly applied when dealing with requests from AFCEN Members, and the French and English safety authorities.

In response to the customer focus principle, AFCEN implemented the following actions or pursued the following objectives:

- creation of a Scientific Advisory Committee
- creation of a deconstruction code
- AFCEN's views on an AFCEN hallmark
- creation of criteria for each code
- AFCEN's analysis of the post-Fukushima consequences on the codes
- AFCEN's prospects in the field of the use of HDPE for buried pipes
- adaptation of Appendix 3.1 of the RSE-M code in response to the specifics of Chinese legislation
- faster responses to enquiries
- conformity of the RCC-M code with France's Nuclear Pressure Equipment Regulation

AFCEN launched all these actions and objectives in 2014, especially by commissioning specific studies; a description is provided in Sections 1.5 (Organizational Commissioned Studies) and 2.2 (Design Activity Review).

1.4 Resources (members, resources by Subcommittee)

AFCEN enlists the expertise of its members to realize the activities inherent in the association's purpose.

a) AFCEN Members in 2014

AIB VINCOTTE INTERNATIONAL (Belgium)	EDF	NUVIA PROTECTION (MECATISS)
ALSTOM	EFECTIS France	OGER INTERNATIONAL (SAUDI ARABIA / France)
AMEC (UK)	EGIS	ONET
APAVE	EIFFAGE TP	OXAND
AREVA NP	EMERSON PM (US)	PETERCEM
AREVA TA	ENDEL (Belgium)	ROLLS ROYCE FR (UK / France)
ASAP	ESS AB (Sweden)	ROLLS ROYCE (UK)
BOUYGUES TP	GDS	SAMT
BUREAU VERITAS	GIS MIC	SCK CEN (Belgium)
CEA	HILTI France (Liechtenstein)	SCHNEIDER ELECTRIC
CETIM	INSTITUT LAUE LANGEVIN	TRACTEBEL Engineering (Belgium)
CGN (China)	INTERCONTROLE	TWI LTD (UK)
CLYDE UNION (UK)	KSB (Germany)	VALINOX NUCLEAIRE
CNIM	LISEGA (Germany)	VELAN SAS
DAHER VANATOME	NFM TECHNOLOGIES (China)	VINCI CONSTRUCTION
DCNS	NNB (UK)	WESTINGHOUSE (US)
DOOSAN (Korea / UK)	NUCLEXPERT	

44
EUROPEAN GROUPS

- 31 FRANCE
- 5 UK
- 4 BELGIUM
- 1 SWEDEN
- 2 GERMANY
- 1 LIECHTENSTEIN

6
OTHER INTERNATIONAL GROUPS

- 3 ASIA
- 2 US
- 1 MIDDLE EAST

Membership applications were received late 2014 from international companies, including Vattenfall (Sweden) and the CNNC Group (China).

1.4 Resources (members, resources by Subcommittee)

b) Member involvement in the Subcommittees

In 2014, AFCEN members were involved in the Subcommittees as shown in Box below..

AFCEN member involvement in the Subcommittees in 2014

RCC-M
28 members: AMEC, APAVE, AREVA NP, AREVA TA, ASAP, BUREAU VERITAS, CEA, CETIM, CGN, CLYDE UNION, DAHER VANATOME, DCNS, DOOSAN, EDF, EMERSON, ENDEL, GIS-MIC, KSB, LISEGA, NNB, NUCLEXPERT, ONET, ROLLS ROYCE UK, TWI, VALINOX NUCLEAIRE, VELAN, AIB VINCOTTE, WESTINGHOUSE

RSE-M
16 members: APAVE, AREVA NP, AREVA TA, ASAP, BUREAU VERITAS, CEA, CETIM, CGN, DCNS, DOOSAN, EDF, ENDEL, INTERCONTROL, NNB, ONET, WESTINGHOUSE

RCC-E
13 members: ALSTOM, APAVE, AREVA NP, AREVA TA, CEA, CGN, EDF, EMERSON, HILTI, NNB, PETERCEM, ROLLS-ROYCE Meylan, SCHNEIDER ELECTRIC

RCC-CW
17 members: AMEC, AREVA NP, BOUYGUES, CEA, EDF, EGIS, EIFFAGE, GDS, HILTI, NFM, NNB, OGER International, OXAND, SAMT, TRACTEBEL Engineering, TWI, VINCI

RCC-F
6 members : AREVA NP, CEA, EDF, EFECTIS, NNB, NUVIA PROTECTION (MECATISS)

RCC-C
6 members: AREVA NP, BUREAU VERITAS, CEA, EDF, NNB, WESTINGHOUSE

RCC-MRx
16 members: APAVE, AREVA NP, AREVA TA, BUREAU VERITAS, CEA, CLYDE UNION, CNIM, EDF, ESS AB, ENDEL, INSTITUT LAUE LANGEVIN, ONET, SCK CEN, TWI, VALINOX NUCLEAIRE, AIB VINCOTTE

Highlights include Westinghouse's joining the RCC-C Subcommittee mid-2014.

c) Participation of member-appointed experts in AFCEN's work

AFCEN members were actively involved in the work of the Subcommittees (working groups and plenary sessions), as can be seen by the number of experts made available by the members (see Box below):

Experts' participation in the work of AFCEN's Subcommittees

In 2014, over 470 experts contributed to AFCEN's work as follows:

RCC-M	RSE-M	RCC-E	RCC-CW	RCC-F	RCC-C	RCC-MRX
129	80	69	146	18	16	60

TOTAL 518*

(some experts are involved in several Subcommittees)

The detailed activity of the Subcommittees is presented in Section 2.2 of the Activity Report.

d) Oversight of AFCEN resources

AFCEN's resources and skills are managed according to processes M1 and M2.

Within each Subcommittee, the experts in the Subcommittee Board are elected by the Subcommittee Chair based on their skills. Justification for each appointment is compiled in a skills record.

The resources corresponding to AFCEN's senior managers (Committee and Subcommittee Chairs, International Coordinators, etc.) are generally subject to an annual people review and are continually monitored by the Board of Directors to anticipate any movements and replacements without disrupting AFCEN's operation.

Furthermore, in the event of a difficulty, the Subcommittees' resource requirements are escalated to the Board of Directors by the Chairs of the relevant Committees when such requirements cannot be satisfied by the members participating in the Subcommittees.

1.5 "Organizational" commissioned studies

AFCEN launched two "organizational" commissioned studies in 2014:

a) Commissioned study into the prospect of an "AFCEN hallmark"

An initial study in 2012 showed that a hallmark certifying "a product's conformity to an AFCEN code" was not conceivable by AFCEN.

Late 2014, AFCEN decided to commission a second study to take an in-depth look at the prospect of a process for issuing a certificate to confirm that "a manufacturer is capable of supplying an AFCEN product".

This second study will be launched in 2015. It will mainly apply to China, a country where AFCEN codes enjoy benchmark status, which lends every credibility to the opportunity of implementing this type of process in the country.

b) Commissioned study into the prospect of a deconstruction code "RCC-D"

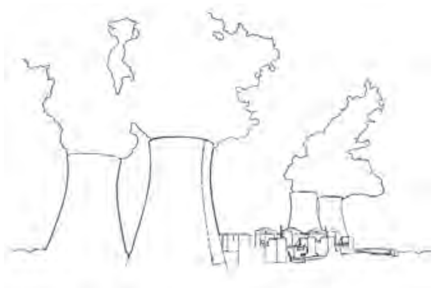
In 2014, AFCEN's Board of Directors commissioned one of its members to investigate the prospect of producing a deconstruction code.

Following the study, the Board of Directors decided to produce a deconstruction code during its October 2014 session.

The scope of the code will be broadened to encompass all nuclear facilities.

The terms for producing this code are presented in Section 2.2.9.

2



Challenges and actions

2.1 Use of AFCEN codes around the world

AFCEN codes represent the benchmark for nuclear components in over 100 power plants currently in operation (79), under construction (26) or in the planning stages (1) around the world.

Since 1980, AFCEN codes have served as the blueprint for the design and fabrication of specific mechanical and electrical components, as well as the construction of nuclear civil engineering works in South Africa (Koeberg), Korea (Ulchin) and China (Daya Bay and Ling Ao). These reactors actually represent the first applications of AFCEN's codes.

Table hereinafter summarises how the different AFCEN codes are used around the world during the planning, design, construction and operation of the reactors concerned. In addition to these formal applications of the codes and given their reputation, AFCEN codes have also served as inspiration in France for designing many other nuclear research facilities and equipment, despite not being official standards.

Examples include:

- The design of certain mechanical components and specific civil engineering works in nuclear research facilities: ITER, RJH, Institut Laue-Langevin, Laser Mega Joule and European Synchrotron Radiation Facility.
- The design of nuclear steam supply systems for marine propulsion.

Summary of the use of AFCEN codes around the world

USE OF AFCEN CODES AROUND THE WORLD (AT THE END OF 2014)

Project	Country	States of the reactors			Number of reactors	Number of reactors using or have used AFCEN codes for		Codes used						
		P	C	E		design and/or construction	operation	RCC-M	RCC-CW	RCC-E	RCC-C	RCC-F	RSE-M	RCC-MRx
Nuclear Park	France			58	58	16	58	C, O	C, O	C, O	C, O		O	
M310	South Africa			2	2	2		C	C					
	Korea			2	2	2		C	C					
	China			4	4	4	4	C, O	C	C, O			O	
CPR 1000	China		15	9	24	24	24	C, O	C	C, O			O	
CPR 600	China		2	4	6	6	6	C, O	C	C, O			O	
EPR	Finland		1		1	1		C						
	France		1		1	1	1	C, O	C	C	C	C	O	
	China		2		2	2	2	C, O	C	C		C	O	
	UK		2		2	2	2	C, O	C	C		C	O	
PFBR	India		1		1	1								C
RJH	France		1		1	1								C
ITER	France		1		1	1								C
ASTRID	France	1			1	1								P
		1	26	79	106	64	97							

P: IN PROJECT
C: CONSTRUCTION
O: OPERATION

2.1.1 Use of AFCEN codes in France

Nuclear infrastructure

AFCEN codes have gradually been used by France's nuclear industry with 1,300 MWe reactors - Cattenom 2 (first vessel manufactured with RCC-M) and Flamanville 2 (first steam generator and first pressuriser manufactured with RCC-M).

The RCC-C, RCC-E, RCC-M and RSE-M codes are used for the operation of all of France's nuclear power plants.

EPR

AFCEN codes serve as a benchmark for licensing of the EPR project in France.

Jules Horowitz Reactor

For the Jules Horowitz research reactor currently undergoing construction at the Cadarache site, the RCC-Mx code (predecessor to RCC-MRx) was chosen for designing and manufacturing the mechanical components that fall within the code's scope, i.e.:

- mechanical equipment with a sealing, partitioning, securing or supporting role,
- mechanical equipment that may contain or allow the circulation of fluids (vessels, tanks, pumps, exchangers, etc.) and their supporting structures.

In terms of experimental devices, application of the RCC-Mx code is recommended, but not mandatory.

ITER

ITER used the 2007 version of the RCC-MR code as a roadmap for its vacuum vessel and blanket cooling pipes. This code was chosen for the vacuum vessel on both technical grounds (the equipment and technology are covered by the code) and regulatory grounds (the code is adapted to French legislation).

Other uses of AFCEN codes

Nuclear marine propulsion

The construction of nuclear marine propulsion equipment, which is the responsibility of the DCNS Group (generally concerning the key equipment for the main primary and secondary systems), is based on a specific technical standard that refers to the RCC-M code for design, standardization and fabrication conforming to internal rules, which are technically highly similar to those of the RCC-M code.

This specific organization is related to the history of nuclear propulsion: the expertise of the marine propulsion industry was long ago documented as a series of instructions and procedures, which have gradually been improved through feedback and external standardization. In particular, when the RCC-M code was published, the DCNS Group endeavored to bring its own rules into alignment with the code, and ensure overall consistency in terms of the design and fabrication process, while maintaining the specific features of marine propulsion equipment (dimensions, accessibility and dismantling difficulties, stress resistance requirements for equipment in "military"-type applications, radiation protection requirements due to the crew's constant proximity, ...).

2.1.2 Use of AFCEN codes in China

AFCEN codes are widely used in China for the design, construction, preliminary inspection and in-service inspection of Chinese Generation II+ nuclear power plants (based on developments in the M310 generation technology introduced from France) and Generation III reactors (especially EPR units).

The decision to use AFCEN codes for Generation II+ nuclear projects in China is itself regulated by a decision taken by NNSA in 2007 (NNSA Decision no. 28).

By the end of 2014, 36 of the 48 units in operation or under construction in China were modeled on AFCEN codes, with 17 in operation and 19 under construction. These units correspond to the M310, CPR-1000, CPR-600 and EPR projects highlighted in yellow in table below.

GLOBAL LIST OF REACTORS CURRENTLY UNDER CONSTRUCTION OR IN OPERATION IN CHINA AS OF LATE 2014

Type of reactor	Units in operation (No.)	Units under construction (No.)	Total number
300 MWe	Qinshan I (1)		1
M310	Dayabay (2) Ling'Ao (2)		4
CPR1000	Ling'Ao (2) Hongyanhe (2) Ningde (2) Yangjiang (1) Fuqing (1) Fangjiashan (1)	Hongyanhe (2) Ningde (2) Yangjiang (5) Fangchenggang (2) Fuqing (3) Fangjiashan (1)	24
CPR600	Qinshan II (4)	Changjiang (2)	6
CANDU 6	Qinshan III (2)		2
AP1000		Sanmen (2) Haiyang (2)	4
EPR		Taishan (2)	2
AES—91	Tianwan (2)	Tianwan (2)	4
HTR-PM		Shidaowan (1)	1
Total number	**22**	**26**	**48**

(REACTORS USING AFCEN CODES ARE HIGHLIGHTED IN ORANGE)

Note that according to a recent presentation by NSC (the technical support of the Chinese nuclear safety authority), the Hualong project, which features proprietary Generation III technology developed by Chinese designers (CNNC and CGN), also uses AFCEN codes.

Over the last two years:

- 7 reactors, all of which designed according to AFCEN codes, have been commissioned.
- Work has started on the construction of 5 new reactors: 2 CPR-1000s (using AFCEN codes), 2 VVERs and 1 HTGR.

2.1.3 Use of AFCEN codes in India

PFBR and FBR

The 2002 edition of the RCC-MR code is being used to design and fabricate the major components of India's PFBR reactor. The 2007 edition of the code is serving as a baseline for the FBR 1 and 2 projects. Feedback from the construction of the PFBR reactor is being incorporated into subsequent versions of the code and the RCC-MRx code, which replaces RCC-MR.

INDIAN PFBR

2.1.4 Use of AFCEN codes in United Kingdom

AFCEN's ambitions for the United Kingdom are tied to the development of EPR projects in England, starting with the two reactors at the Hinkley Point C site (HPC).

Use of AFCEN codes for the design and construction of the EPR in the UK was incorporated into the Generic Design Assessment process (GDA) conducted by the ONR (Office for Nuclear Regulation).

The licensing process is still in progress between the licensee (NNB, Nuclear New Build) and the ONR.

The codes concerned are as follows:

- RCC-M 2007 edition + addenda
- RSE-M 1997 edition (only Appendix 5.4 supplementing RCC-M) + 2005 addenda
- RCC-E 2005 edition
- ETC-C 2010 edition
- ETC-F 2012 edition

In terms of monitoring mechanical components, operator NNB is presently looking into an in-service approach and the role that could potentially be played by the RSE-M code.

2.1.5 Use of AFCEN codes in Finland

For Finland's Olkiluoto 3 project, mechanical equipment from the highest safety classes (classes 1 and 2) are being designed and manufactured according to one of the three nuclear codes (RCC-M, ASME Section III and KTA). The RCC-M code was chosen as the benchmark for designing and fabricating the main mechanical components, such as the vessel, pressurizer, steam generators, primary circuits, pressure relief valves and serious accident valves.

2.1.6 Use of AFCEN codes in South Africa

The first AFCEN codes were drafted to support licensing of the M310 project (based on the CP2 design for 900 MWe class PWRs in France). The first M310 was built in Koeberg, South Africa. However, use of AFCEN codes in South Africa for mechanical and electrical components has been extremely limited. The same cannot be said of civil engineering works, where the 1980 edition of the RCC-G code has been used for containment acceptance testing.

2.2 Design activity review

AFCEN codes

AFCEN's construction codes are generally prefixed with RCC-, while the in-service code is prefixed with RSE-.

In some cases, codes can only be used (provisionally) on the EPR design, in which case the code is prefixed with ETC-. This prefix is likely to be superseded by RCC-.

AFCEN currently publishes seven codes, including four RCC- codes, one RSE- code and two ETC-codes.

THE AFCEN 7 CODES
AVAILABLE EDITIONS

DESIGN AND CONSTRUCTION RULES FOR PWR REACTORS

IN SERVICE INSPECTION OF PWR REACTORS

DESIGN AND CONSTRUCTION RULES FOR HIGH TEMPERATURE, EXPERIMENTAL AND FUSION REACTORS

RCC-M	RCC-C	RCC-E	ETC-C/ RCC-CW	ETC-F/RCC-F	RSE-M	RCC-MRX
MECHANICAL COMPONENTS	FUEL ASSEMBLIES	ELECTRICAL AND I&C SYSTEMS	CIVIL WORKS STRUCTURES	FIRE PROTECTION	IN-SERVICE INSPECTION RULES	MECHANICAL COMPONENTS

AN EIGHTH CODE FEATURING THE RCC-D
WILL BE PUBLISHED IN 2017

This is the future code for the "deconstruction of nuclear facilities":

RCC-D: Deconstruction of nuclear facilities

General presentation of AFCEN's design activities

AFCEN's design activities involve authoring and updating codes.

In a number of cases, preliminary studies are required before codes can be revised. Such studies are performed as part of a collaborative effort.

Finally, AFCEN produces code-related documents, including criteria (which present the reasons for the choices in the code) and the associated publications (PTAN: Technical PublicaTions of AFCEN).

Code updates

There are several reasons for updating AFCEN codes: the need to incorporate feedback, R&D work, changes to legislation and standards, and following an extension to the subject matter covered by the codes.

1) Incorporating feedback is a major reason for updating codes. Several examples will be provided in the following sections which describe each of the codes, but one notable example is the change to the "Anchor and Liner" chapters in the future RCC-CW code to reflect feedback from the Flamanville 3 plant.

2) New developments, scientific breakthroughs and R&D work also represent major reasons for updating the codes.

   Of the many examples featured in the following sections, of specific note are the future changes to the RCC-M code with respect to the use of radiographic testing with low-energy sources (Selenium 75) under specific conditions, as well as consideration of the environmental effects on components' fatigue behaviour.

   To drive the code improvement process, AFCEN has created a preliminary focus group on a European level for three codes (RCC-M, RCC-MRx and RCC-CW), whose mission is to submit proposals for Gen II-III mechanical engineering, Gen IV mechanical engineering and civil engineering (see Section 2.4.3).

3) Changes to legislation in the various countries in which the code is used also represent a major reason for updating the codes.

   Depending on the type of change, the modification is either introduced into the body of the text or as an appendix specific to the country in question.

   For instance, AFCEN's work on France's Nuclear Pressure Equipment Regulation will either lead to modifications in the code (such as the toughness of low-thickness materials) or the creation of a French appendix.

4) AFCEN codes are based on standards. ISO standards are the first port of call when available, otherwise EN standards are used.

   The Subcommittees occasionally analyze the standards to determine whether any revisions have been made and they update the codes accordingly (see Section 2.4.4).

   For example, RCC-M has been updated to introduce the new ISO 9712 standard for the qualification of non-destructive testing personnel.

5) AFCEN extends the field covered by its codes.

   The first example includes a study that was launched in anticipation of adding a chapter to RCC-M to cover the qualification of mechanical components under accidental conditions.

   By way of another example, RSE-M was updated in China to ensure that the code was better adapted to specific Chinese designs.

   The last example is AFCEN's plan to create a code dealing with the deconstruction of nuclear facilities.

2.2 Design activity review

AFCEN's studies, criteria and technical publications (PTAN)

The studies spearheaded by AFCEN are either code-specific and will therefore be described in the following sections, or apply to several codes.

Overarching studies may address how codes in general are drafted, such as establishing guidelines for preparing AFCEN codes or producing French and English translations of AFCEN codes.

Studies may also zero in on topics of a more technical nature, such as updating AFCEN codes in the wake of the Fukushima accident, introducing IAEA GS-R-3 safety requirements into AFCEN's codes, and introducing the qualification of mechanical components under accidental conditions into RCC-M in line with RCC-E..

AFCEN publishes criteria as part of its strong determination to explain the key reasons underlying the choices in its codes.

Each AFCEN Subcommittee is positively acting in this way. To date, criteria have been published for the RCC-M code, and part of the criteria for the RSE-M code has also been published (for Appendix 5.5).

Finally, AFCEN produces technical publications aimed at shedding light on specific points.

These publications may have various objectives, as is the case with the technical publication for civil engineering: "French practice and experience of seismically isolated nuclear facilities". Technical publications may also be produced in response to a specific area of legislation, such as the future "guidelines for analyzing nuclear pressure equipment risks".

AFCEN's technical publications in 2014

In 2014, AFCEN released the following publications:

- **RCC-M criteria:** "Background and revisions to the RCC-M code, from the original version through to the 2007 edition"
- **RSE-M criteria:** "Principles of and background to the formulation of the criteria in Appendix 5.5 of RSE-M"
- **PTAN RCC-CW "French experience and practice of seismically isolated nuclear facilities"**

2.2.1 AFCEN's editorial situation

AFCEN's editorial activities in 2014 were mainly marked by the following events:

- Publication in 2014 of addenda to the RCC-M and RSE-M codes
- Drafting of criteria for the RCC-M code and Appendix 5.5 of the RSE-M code
- Launch of 10 working groups in response to the application of France's Nuclear Pressure Equipment Regulation
- Preparation of the 2015 edition of the RCC-MRx code
- Overhaul of the RCC-E code, with publication scheduled for late 2016
- Preparation of the 2015 edition of the RCC-CW code
- Release of an RCC-CW technical publication on French practice of seismic isolation bearings
- Preparation of the 2015 edition of the RCC-F code
- Introduction of a second fuel supplier in the RCC-C Subcommittee, which prompted a reorganisation in the Subcommittee's operation in order to maintain a confidential work environment
- The decision to launch a draft code for the deconstruction of nuclear facilities.

Table below summarises AFCEN's editorial situation and program as of late 2014.

AFCEN'S EDITORIAL SITUATION AND PROGRAM AS OF LATE 2014

CODE		The 31/12/2013	The 31/12/2014	EDITORIAL OBJECTIVE
RCC-M	Mechanical Components of PWR	2012 Edition, addendum 2013	2012 Edition, addendum 2013 + addendum 2014 + criteria RCC-M + start of 10 UGs ESPN + start of UG "Q volume"	addendum 2015 with "Q volume" 3 PTAN 2016 Edition
RSE-M	Inspection for Mechanical Components of PWR	2010 Edition, addendum 2012 + 2013	2010 Edition, addendum 2012 + 2013 + addendum 2014 + criteria RSE-M (appendix 5.5)	addendum 2015 2017 Edition
RCC-MRx	Mechanical Components of Fast-neutron reactor & experimental reactors	2012 Edition	2012 Edition, addendum 2013 (published in 2014)	2015 Edition
RCC-E	EI&C	2012 Edition	2012 Edition	2016 Edition
RCC-C	Fuel	2005 Edition, addendum 2011	Entry of Westinghouse to the sub-committee	2015 Edition
RCC-CW	Civil Works	2010 Editions then 2012 (ETC-C)	2012 Edition (ETC-C) + PTAN "French Experience and Practice of Seismically Isolated Nuclear Facilities"	2015 Edition (RCC-CW) cessation of ETC-C version
RCC-F	Fire Protection	2010 Edition then 2013 (ETC-F)	2013 Edition (ETC-F)	2015 Edition (RCC-F)
RCC-D	Dismantling		Start of RCC-D draft	2017 Edition (RCC-D)

2.2.2 Mechanical field for PWR: RCC-M

RCC-M

RCC-M Design and Construction Rules for Mechanical Components of PWR Nuclear Islands

a) Purpose and scope

AFCEN's RCC-M code concerns the mechanical components designed and manufactured for pressurised water reactors (PWR).

It applies to pressure equipment in nuclear islands in safety classes 1, 2 and 3, and certain non-pressure components, such as vessel internals, supporting structures for safety class components, storage tanks and containment penetrations.

RCC-M covers the following technical subjects:

- Sizing and design rating
- Choice of materials and terms of procurement
- Fabrication and control, including:
  - Associated qualification requirements (procedures, welders and operators, etc.)
  - Control methods to be implemented
  - Acceptance criteria for detected defects.
- Documentation associated with the different activities covered, and quality assurance.

The design, fabrication and inspection rules defined in RCC-M leverage the results of the research and development work pioneered in France, Europe and worldwide, and which have been successfully used by industry to design and build PWR nuclear islands. AFCEN's rules incorporate the resulting feedback.

b) Use

The RCC-M code has been used or served as a baseline for the design and/or fabrication of certain Class 1 components (internal vessel, steam generator, primary motor pump, primary valves and fittings, etc.), as well as Class 2 and 3 components for:

- France's last 16 nuclear units (P'4 and N4)
- Four M310 reactors in South Africa (2) and Korea (2).
- 36 M310 (4), CPR-1000 (24), CPR-600 (6), EPR (2) reactors in service or undergoing construction in China.
- Four EPR reactors in Finland (1), France (1) and the UK (2).

c) Background

AFCEN drafted the first edition of the code in January 1980 in for application to France's second set of four-loop reactors with a power rating of 1,300 MWe (P'4).

Export requirements (Korea, China and South Africa) and the need to simplify contractual relations between operators and building contractors quickly prompted the code to be translated and used in English, followed by Chinese and Russian.

Subsequently, the code was thoroughly updated and modified to reflect feedback from France's nuclear industry, as well as regular interactions with international stakeholders. Six editions ensued (1981, 1983, 1985, 1988, 1993 and 2000) with a number of addenda between each edition.

The 2007 edition took account of changes to European and French regulations (Pressure Equipment Directive 97/23/EC and France's Nuclear Pressure Equipment Regulation), with the harmonised European standards that were subsequently released.

To date, the 2007 edition is widely used in France and China for EPR projects and replacement steam generators.

d) Edition available as of 1 January 2015

2012 edition, with two addenda in 2013 and 2014

The 2012 edition is supplemented by two addenda (2013 and 2014).

Revisions of the code are aimed at integrating tried-and-tested international approaches as far as possible and allowing for the possibility of alternatives to the code's basic rules.

Contents of the 2012 edition of the RCC-M code

SECTION I - NUCLEAR ISLAND COMPONENT

- SUBSECTION "A": GENERAL RULES
- SUBSECTION "B": CLASS 1 COMPONENTS
- SUBSECTION "C": CLASS 2 COMPONENTS
- SUBSECTION "D": CLASS 3 COMPONENTS
- SUBSECTION "E": SMALL COMPONENTS
- SUBSECTION "G": CORE SUPPORT STRUCTURES
- SUBSECTION "H": SUPPORTS
- SUBSECTION "J": LOW PRESSURE OR ATMOSPHERIC STORAGE TANKS
- SUBSECTION "P" : CONTAINMENT PENETRATION
- SUBSECTION "Z" : TECHNICAL APPENDICES
- ZI, ZII, ZIII, ZIV, ZV, ZVI: MANDATORY APPENDICES
- ZA, ZD, ZE, ZF, ZG, ZH, ZM, ZS, ZY, ZZ: NON MANDATORY APPENDICES

SECTION II - "M": MATERIALS

SECTION III - "MC: EXAMINATION METHODS

SECTION IV - "S": WELDING

SECTION V - "F": FABRICATION

SECTION VI - "RPP": PROBATIONARY PHASE RULES

RPP-1: NUCLEAR MANAGEMENT SYSTEM

2013 addendum

This addendum features the addition of a sixth section, entitled Probationary Phase Rules (RPP), in addition to the existing sections, which are divided into subsections, including general rules, components, design, examination methods, welding and fabrication.

As an alternative to the ISO 9001-based quality assurance requirements in Chapter A 5000, the first RPP introduces IAEA GS-R-3 safety requirements for nuclear management systems.

2014 addenda

In 2014, the RCC-M Subcommittee published the French version of the 06/2014 addendum in September and the English version in November. It integrates 31 modification files covering every part of the code.

This addendum introduces several changes to European and international standards, thereby aligning the code with applicable standards and the latest tried-and-tested technologies. Changes include:

- ISO 9712: 2012 for the qualification of non-destructive testing personnel.
- The introduction of sub-size specimens for destructive testing.
- The introduction of requirements for qualifying design methods in the chapter relating to quality management systems for manufacturers.

2.2.2 Mechanical field for PWR: RCC-M

e) Outlook and the future 2016 edition

2015 addendum

The 2015 addendum currently being drafted will include over 40 modification files and will be published in June 2015 (French version).

As an example of the different fields, this addendum incorporates:

- The introduction of radiographic testing with Selenium 75.
- The requirement for pendulum impact tests, including for low-thickness materials.
- Design of finished elements for Class 2 valves and fittings.

Furthermore, after initially testing the code against the essential requirements of France's Nuclear Pressure Equipment Regulation, the first changes were made to the components (permissible stress values, destructive testing requirements for low thicknesses and density examination requirements).

2016 edition

A new edition to supplement the code is scheduled for 2016. It will cover between 50 and 60 modification files.

In addition to the routine activity of incorporating feedback on the code's use in current projects (EPR UK, TSN, FA 3, GV R) and reflecting new work (qualification of active mechanical components), the new 2016 edition of the code will draw significantly on the results of the studies being monitored by ASN and international groups (UK, China, Europe and MDEP).

f) RCC-M criteria

RCC-M criteria

The RCC-M criteria, prepared by Jean-Marie Grandemange and approved by the Subcommittee members, were published late 2014.

This 550-page document, produced in both English and French, takes a look back at the code's background since the decision was taken for its creation.

The technical origins of the code and the changes made to the recommendations until publication of the 2007 edition are explained from the point of view of an engineer who was required to draft a design specification in alignment with the RCC-M code.

g) Other work in progress

Qualification of active mechanical components

In 2014, a new editorial group was created within the RCC-M Subcommittee to address active mechanical components (valves and pumps).

Their work will form the basis of the new "Q" subsection in the RCC-M code, which is scheduled for late 2015 and which is being drafted in close liaison with the RCC-E Subcommittee.

The code will broaden its scope, which is currently restricted to the integrity of pressure-bearing structures, to encompass the operability and operation of so-called "active" equipment, namely pumps and valves.

Preparation of PTAN (AFCEN Technical Publications)

In 2015, AFCEN is planning to publish:

- A radiation protection guide for the design of nuclear pressure components in PWR plants in France.
- A practical guide to applying the probationary rule for "Nuclear management systems".
- Recommendations for qualifying the tools used to calculate and model physical phenomena as part of the studies carried out according to RCC-M.

Technical studies to prove conformity with the PED Directive / France's Nuclear Pressure Equipment Regulation

La Commission de Rédaction a lancé 10 The Editorial Committee has launched 10 working groups to demonstrate how the RCC-M code can be used to meet the essential safety and radiation protection requirements stipulated in France's Nuclear Pressure Equipment Regulation and the European PED Directive.

These groups have the following missions:

- Risk analysis, uncertainties and margins.
- Specific evaluations for nuclear components.
- Unacceptable defects (including defects beneath the cladding and sequential penetration.
- Toughness of low-thickness materials.
- Inspectability.
- Vulnerability criteria.
- The dimensions required to ensure conformity with requirements.
- Qualification of design methods.
- Proof of compliance with essential safety and radiation protection requirements.

A significant amount of work has culminated in studies that will be released as PTAN technical publications in 2015 (for example, a comparison between harmonized European standards and the requirements of RCC-M 2007) and which may lead to a revision of the code in 2015 and 2016.

The aim is to finalise such work in 2015, allowing for a few exceptions if testing and/or in-depth rating investigations need to be carried out.

RCC-M is the only AFCEN code with the objective of proving compliance with the essential safety requirements stipulated in European (PED Directive 97/23/EC) and French legislation (Class 1 essential safety and radiation protection requirements of the Nuclear Pressure Equipment Regulation).

Work progress reports are shared with ASN approximately every three months.

The objectives and detailed progress of this programme are presented in page 38.

2.2.2 Mechanical field for PWR: RCC-M

Detailed progress of the program to prove conformity with the PED Directive / France's Nuclear Pressure Equipment Regulation

WORK ON THE RCC-M CODE IN RELATION TO THE NUCLEAR PRESSURE EQUIPMENT REGULATION (ESPN)

- **Risk analysis according to ESPN:** the ESPN Regulation requires a risk analysis to be carried out prior to design and fabrication. Work is focusing on producing guidelines for carrying out ESPN risk analyses. An initial draft was produced and submitted to ASN. This study is being supplemented by an investigation into vulnerability. The purpose of this new investigation is to define the appropriate course of action when the analysis identifies a risk and the area in question is not available for inspection.
- **Uncertainties and safety factors:** this study involves checking that the safety factors in the RCC-M code conform to the requirements of the ESPN Regulation and proving that application of the RCC-M code satisfies the requirement of taking uncertainties into account in the sizing and safety factors. In respect of the first point, the study shows that the safety factors generally conform to the requirements of the regulation. The second point is being examined by comparing the requirements of the RCC-M code against harmonized standards, since the uncertainty requirement is stipulated in European Directive 97/23/EC. Therefore, if the RCC-M code offers dimensional requirements for vessels at least equivalent to EN 13445 and piping at least equivalent to EN 13480 (harmonized standards), the requirement will be satisfied. In addition to this ongoing study, two special investigations have been launched, one of which into the dimensional control of components and the other into fatigue damage.
- **Inspectability:** this study is aimed at producing a guide on how to write the inspectability report. It is based on an analysis of two test cases: the first is where the analysis identifies a risk without any possible remedy and where inspectability is absolutely necessary (in the example, the steam generator tubes need to be inspected), and the second is where only the inspectability requirement is necessary without any risks detected during the analysis (in the example, steam is escaping from a steam generator).
- **Specific evaluation for nuclear materials:** note that this evaluation is intended to explain the reasons for which a given material was chosen for a given application. The study involves documenting test cases for performing a specific evaluation on the materials used in a steam generator, which can then be used as an example.

  Toughness of low-thickness materials: The ESPN Regulation requires fast fracture resistance guarantees, irrespective of the material's thickness. The study involves defining a method for measuring the resilience of products with a thickness between 5 and 10 mm and demonstrating that the resilience measurement is negligible for austenitic products whose dimensions are less than 5 mm.
- **Unacceptable defects:** the ESPN Regulation specifies that non-destructive testing must be capable of detecting defects of concern. In this particular case, a distinction is made between defects of concern in terms of construction quality (a discrepancy in the manufacturing process) and defects of concern in terms of the structure's mechanical integrity. In 2010, AFCEN released an initial document addressing the first point. The study currently in progress is aimed at verifying that the non-destructive tests in the code are capable of detecting defects of concern relating to the equipment's mechanical integrity. The study is initially focusing on nine test cases.
- **Verification that the RCC-M satisfies the different essential safety requirements:** : the purpose of this study is to produce documents that examine all the requirements in the ESPN Regulation, determine whether the requirements in the code satisfy the ESPN's requirements (either directly or by using the other AFCEN studies above) and propose amendments to the code if such is not the case. To date, an initial document covering the fabrication of vessels and piping has been completed and submitted to ASN.
- **Qualification of the mechanical design methods in RCC-M:** Methods for qualifying mechanical design methods were introduced into the RCC-M code following an examination by ASN.

All of these studies have already generated many dozens of suggested amendments to the RCC-M code, which are currently being investigated or have already been introduced into the code

Continuation and finalisation of studies into the technical qualification of components

In 2013, the RCC-M Subcommittee created a working group and a committee to validate the risk analyses carried out when preparing materials in order to identify the risks of any inconsistencies.

The group is being monitored by ASN's Nuclear Pressure Equipment Department (DEP) and will finalise some 43 risk analyses for the material families in the code mid-2015, and those analyses will be vetted by a validation committee featuring experts from outside AFCEN.

The technical qualification methods will then be incorporated into the reference technical specifications for the materials in the code, including the new demonstration tests identified in the risk analyses.

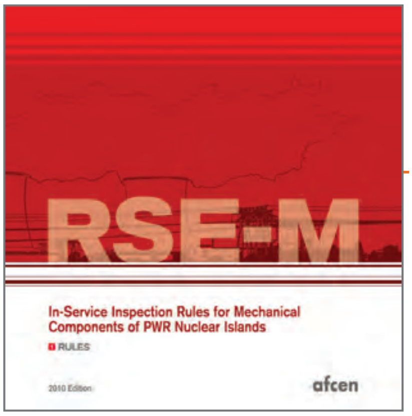
Continued activities to address international challenges

In 2014, the RCC-M Subcommittee:

- Organized three meetings for the UK Users Group (February, July and November) led by AFCEN member TWI.
- Followed up the activities of the "Group for the Convergence of Mechanical Codes and Nuclear Coding Organizations" organized by ASME ST LLC, following MDEP's actions for Codes and Standards (see Section 2.4.1).
- Held two kick-off meetings for the European Prospective Group CEN WS 64 - Phase 2 - PG 1 (see Section 2.4.3).

Meetings for Users Groups in China are scheduled for March 2015.

2.2.3 Field of In-service inspection: RSE-M



RSE-M

In-Service Inspection Rules For Mechanical Components Of PWR Nuclear Islands

a) Purpose and scope

The RSE-M code defines in-service inspection operations.

It applies to pressure equipment used in PWR plants, as well as spare parts for such equipment.

The RSE-M code does not apply to equipment made from materials other than metal.

It is based on the RCC-M code for requirements relating to the design of mechanical components.

b) Use

The inspection rules specified in the RSE-M code describe the standard requirements of best practice within the French nuclear industry, based on its own feedback from operating several nuclear units and partly supplemented with requirements stipulated by French legislation.

To date:

- The 58 units in France's nuclear infrastructure enforce the in-service inspection rules of the RSE-M code.
- Operation of the 17 commissioned units in China's nuclear infrastructure, corresponding to the M310, CPR-1000 and CPR-600 reactors, is based on the RSE-M code (since 2007, use of AFCEN codes has been required by NNSA for Generation II+ reactors).

c) Background

AFCEN drafted and published the first edition in July 1990.

This initial edition served as a draft for preparing the 1997 edition, which extended the code's scope to encompass elementary systems and supporting structures for the mechanical components concerned.

This edition was updated on a number of occasions (in 2000 and 2005) before undergoing a complete overhaul in 2010.

d) Edition available as of 1 January 2015

2010 edition, with addenda in 2012, 2013 and 2014

In particular, the 2010 edition modifies the way in which pressure equipment is divided into different subsections to reflect the new French regulation governing pressure equipment.

The 2010 edition was supplemented by the following three addenda.

2012 addendum:

- For the section on "Implementation of a maintenance operation", elements were included from the inter-operator professional guide for classifying modifications or repairs to nuclear pressure equipment subject to Appendix 5 of France's ESPN Regulation.

Contents of the 2010 edition of the RSE-M code

BINDER 1: 4 SECTIONS

SECTION A
GENERAL RULES

SECTION B
RULES FOR RSE-M CLASS 1 COMPONENTS

SECTION C
RULES FOR RSE-M CLASSES 2 AND 3 COMPONENTS

SECTION D
RULES FOR OTHER COMPONENTS

BINDER 2: APPENDICES

APPENDICES 1: IN RELATION WITH CHAPTERS 1000

APPENDIX 2: PROTECTION DURING HYDRAULIC PROOF TEST

APPENDICES 4: NDE METHODS AND QUALIFICATION

APPENDICES 5: INDICATIONS AND MATERIALS

APPENDICES 8: CORRECTIVE MAINTENANCE

BINDER 3: PROPOSAL OF INSPECTION PROGRAMS

- Additional information on test coupons.

Further details about pre-service inspections.

2013 addendum:

- Incorporation of changes to requirements and practices for qualifying NDT applications.
- Further details about fatigue analysis methods.
- Clarification concerning the terms for applying RSE-M: company qualification and use of a test coupon.

2014 addendum

- Updating of the zones subject to examination in case of magnetic particle testing.
- Definition of the requirements for qualifying design and modeling tools.
- Further details concerning regulated pressure equipment, including the small lines in the main primary and secondary systems.
- Modification to the standard deviation value to be taken into account for the upper envelope and the predicted upper envelope for embrittlement under the effects of irradiation for monitoring the effects of neutron radiation on the containment vessel materials.
- Integration of tapped screw holes not involved in pressure resistance.
- Description of the maintenance operation file, by identifying the necessary elements according to applicable regulations (Appendix 1.6).
- Revision of the inspection tables and associated figures for RSE-M Class 1 components (Appendix 3.1.1).
- Further details concerning the analytical methods for calculating stress intensity factors and J integral (Appendix 5.4).

e) Outlook and the future 2017 edition

AFCEN is aiming to prioritize development of the RSE-M code in the following directions:

- Incorporate future developments in technology and legislation.
- Factor in the constraints facing operators-partners.
- Deliver support for all international practices.

The next edition of the code is scheduled for late 2017 and will be preceded by an addendum in 2015.

2.2.3 Field of In-service inspection: RSE-M

The 2017 edition is in keeping with the work that has been pursued since the 2010 edition by:

- Continuing to update the existing version to reflect the latest changes in technology and legislation.
- Incorporating EPR aspects into the entire code by enhancing the components and practices specific to Flamanville 3.
- Taking account of the components that have been built according to the requirements of the RCC-M code other than those used in France's nuclear infrastructure (especially in China).

f) AFCEN criteria and technical publication for RSE-M

Sizing components, checking their fitness for service and analysing the impact of a defect detected during operation are generally based on mechanical analysis methods and criteria involving safety factors that are chosen to reach a fixed severity level.

The publication entitled "Principles of and background to the formulation of the criteria in Appendix 5.5 of RSE-M" , relating to the fast fracture resistance of pressure equipment presenting an operational planar defect, describes the basic principles and background to the process of defining the criteria for Appendix 5.5 of the RSE-M code, especially the characteristic values of the main variables and the partial safety factors

This document was published in 2014.

2.2.4 Field of I&C and electrical systems: RCC-E

RCC-E

Design and construction rules for electrical equipment of PWR nuclear islands

a) Purpose and scope

RCC-E describes the rules for designing and building electrical assemblies and I&C systems for pressurised water reactors.

The code was drafted in partnership with industry, engineering firms, manufacturers, building control firms and operators, and represents a collection of best practices in accordance with IAEA requirements.

The code's scope covers:

- Architecture and the associated systems.
- Materials engineering and the qualification procedure for normal and accidental environmental conditions.
- Facility engineering and management of common cause failures (CCFs) (electrical and I&C) and electromagnetic interference.
- Practices for testing and inspecting electrical characteristics.
- Quality assurance requirements supplementing ISO 9001.

b) Use

RCC-E has been used to build the following power plants:

- France's last 12 nuclear units [1,300 MWe (8) and 1,450 MWe (4)].
- Two M310 reactors in Korea (2).
- 36 M310 (4), CPR-1000 (24), CPR-600 (6) and EPR (2) reactors in service or undergoing construction in China.
- One EPR reactors in France (1).

RCC-E is used for maintenance operations in French power plants (58 units).

RCC-E has been chosen for the construction of the EPR plants in Hinkley Point, UK.

Users include:

- Equipment suppliers.
- Engineering firms responsible for designing, building and installing equipment and systems.
- Control and inspection organisations.
- Safety authorities.

c) Background

The editions published between 1981 and 2002 address Generation II reactors.

The 2005 edition incorporated the requirements stipulated in the design codes specific to the EPR project - ETC-I and ETC-E, which focus on I&C and electrical systems respectively (ETC: EPR Technical Code Instrumentation and Electrical).

The 2005 and 2012 editions concern Generation II and III reactors. As from the 2005 edition, project specifications must be written to supplement and implement the rules in RCC-E and allow the code to be used in the project.

The various editions of the code have been published in French and English.

The 2005 edition was translated into Chinese.

2.2.4 Field of I&C and electrical systems: RCC-E

d) Edition available as of 1 January 2015

The 2012 edition is the most recent version.

Contents of the 2012 edition of the RCC-E code

PART A: GENERAL REQUIREMENTS AND QUALITY

PART B: QUALIFICATION AND APPROVAL

- RULES GOVERNING THE ENVIRONMENTAL QUALIFICATION PROCESS,
- ENVIRONMENTAL QUALIFICATION PROCEDURES DEALING WITH MILD, RADIATED, HARSH AND SEVERE ACCIDENTS CONDITIONS,
- RECOMMENDED PRACTICE FOR TYPE TESTING

PART C: FUNCTIONAL ASSEMBLY DESIGN

- ELECTRICAL SYSTEMS FUNCTIONAL DESIGN
- AVAILABILITY OF SAFETY EQUIPMENT IN OPERATION
- EQUIPMENT INTERCHANGEABILITY
- PROGRAMMABLE SYSTEMS
- I&C ARCHITECTURE AND HUMAN-MACHINE INTERFACE

PART D: INSTALLATION

- CONDITIONS IMPOSED BY THE ENVIRONMENT
- EARTHING AND, EMI RULES AND DESIGN
- ELECTRICAL AND FUNCTIONAL SEPARATION

PART E: EQUIPMENT COMPONENTS

PART MC: INSPECTION AND TESTS METHOD

APPENDICES ZA:
BOOK OF PROJECT DATA CONTENT,
RPP-1 : NUCLEAR MANAGEMENT SYSTEM
CODE CASE

e) Outlook and the future 2016 edition

The following sources are used when revising the code:

- Feedback from facilities under construction and in operation.
- The safety authorities' investigation process.
- User enquiries.
- Changes to the standards used or IAEA's requirements.
- Changes to industry's maturity.

The 2016 edition will:

- Represent a departure from previous editions, which have been updates instead of overhauls.
- Address Generation II, III and IV reactors, research reactors and naval reactors.
- Organize requirements into four key areas for easier identification and greater clarity: monitoring, systems, equipment, and component and systems installation. Each key area will cover all the activities in the lifecycle.
- Ensure conformity with IAEA requirements.
- Clearly define the supplements to the requirements in the chosen IEC standards for I&C systems.

Reasons for overhauling the code include:

- Changes to IAEA requirements SSR-2/1, GSR Parts 2 and 4, and recommendations for designing and building electrical and I&C systems (SSG 34 and DS 431), which are used as inputs to the drafting process.
- The WENRA handbook on the design of new reactors.
- Changes to IEC standards relating to the SC 45 Technical Committee and IEC industry standards.
- Feedback from current projects: EPR, ITER, RJH and ASTRID.




- Lessons learned following the British safety authorities' investigation into the UK's EPR as part of the generic design assessment into the electrical and I&C systems.
- Feedback following Fukushima.

Requirements are adapted so that they can be applied to nuclear projects other than pressurized water reactors, and harmonized and coordinated with the requirements of the relevant IEC international standards.

The structure of the code will feature seven chapters:

- Safety, quality and inspection management.
- General requirements.
- Architecture of:
  - I&C systems.
  - Electrical systems.
- Materials engineering.
- Installation.
- Inspection and test methods.

f) Technical publication of the RCC-E Subcommittee

AFCEN has published a document that compares the 2012 and 2005 editions of the code entitled:

"Nuclear Codes & Standards: RCC-E 2012 Gap analysis with the RCC-E 2005"

2.2.5 Field of Civil Works: RCC-CW

RCC-CW

Design and construction rules for civil works in PWR nuclear islands

THE ETC-C VERSION OF THE RCC-CW CODE FOR EPR PROJECTS

a) Purpose and scope

RCC-CW describes the rules for designing, building and testing civil engineering works in PWR reactors.

It explains the principles and requirements for the safety, serviceability and durability of concrete and metal frame structures, based on Eurocode design principles (European standards for the structural design of construction works) combined with specific measures for safety-class buildings.

The code is produced as part of the RCC-CW Subcommittee, which includes all the parties involved in civil engineering works in the nuclear sector: clients, contractors, general and specialized firms, consultancies and inspection offices.

The code covers the following areas relating to the design and construction of civil engineering works that play an important safety role:

- Geotechnical aspects.
- Reinforced concrete structures and galleries.
- Prestressed containments with metal liner
- Metal containment and pool liners.
- Metal frames.
- Anchors.
- Concrete cylinder pipes.
- Containment leak tests.

The RCC-CW code is available as an ETC-C version specifically for EPR projects (European pressurized reactor).

b) Background and use

AFCEN published the first civil engineering code (RCC-G) in 1980.

This edition included feedback from France's 900 MWe nuclear reactors and mainly drew inspiration from the French BAEL regulation (limit state design of reinforced concrete) and BPEL regulation (limit state design of prestressed concrete). It has been used for the M310 projects in Korea and China.

AFCEN updated the edition in 1985 and again in 1988 to reflect the latest developments in civil engineering technology.

In particular, the 1988 edition served as a roadmap for France's 1,450 MWe PWRs.

In April 2006 in response to the specific needs of its Flamanville 3 EPR project in France, EDF published a reference document called ETC-C for the design and construction of civil engineering works.

The reasons that prompted the development of the ETC-C code are as follows:

- Cover both French and German legislative requirements and practices.
- Consider new load cases to represent severe accident conditions or events of a more serious nature.
- Integrate application of Eurocodes into the design of nuclear structures.
- Take account of the latest feedback on the operation of in-service nuclear power plants and updated requirements for safety analyses.
- Incorporate the latest knowledge on the behaviour of materials and structures (obtained through laboratory and model testing).

The EDF document was not published by AFCEN, but acted as a blueprint for a civil engineering code that AFCEN produced in 2009 as part of the RCC-CW Subcommittee, which led to:

- Initially, the publication of a specific code for EPR projects: ETC-C edition 2010, followed by ETC-C edition 2012.
- Subsequently, the publication of a generic civil engineering code, called RCC-CW, that is not specific to any given project.

The ETC-C 2010 edition, which was the first version prepared and published by AFCEN, was used for the generic design assessment of the EPR project in the United Kingdom.

c) Edition available as of 1 January 2015

The ETC-C 2012 is the most recent version.

The ETC-C 2012 edition is the most recent version of the civil engineering code published by AFCEN. This edition adheres to the EPR project.

ETC-C 2012 includes all the relevant proposals based on the experience acquired during current projects:

- Technical discussions concerning the licensing process for Flamanville 3 and the generic design assessment of the EPR project in the United Kingdom.

Contents of the 2012 edition of the ETC-C code

PART 0: GENERAL

PART 1: DESIGN

ACTIONS AND COMBINATIONS OF ACTIONS,

CONCRETE STRUCTURES (CRITERIA FROM EC2 + COMPLEMENTS),

METAL PARTS CONTRIBUTING TO LEAK-TIGHTNESS (CONTAINMENT LINER AND PENETRATIONS, POOL LINERS),

STEELWORK AND PLATE ANCHORAGES,

ANNEXES: SEISMIC ANALYSIS, SHRINKAGE & CREEP,

ENGINEERING METHODS FOR IMPACT (MILITARY AIRCRAFT)

AND PERFORATION CALCULATIONS.

PART 2: CONSTRUCTION

MATERIALS: SOIL, CONCRETE, FORMWORK, REBARS, PRESTRESSING, PRECAST

PENETRATIONS, LINERS FOR CONTAINMENT & POOLS, STEELWORK,

TOLERANCES FOR PROCUREMENT, CONSTRUCTION.

PART 3: INSTRUMENTATION (MONITORING) & TESTS

LEAK TIGHTNESS TESTS,

INSTRUMENTATION AND MECHANICAL RESISTANCE TESTS.

2.2.5 Field of Civil Works: RCC-CW

- The experience acquired by members through their participation in the Olkiluoto, Flamanville and Taishan projects.

d) Next edition: RCC-CW 2015

Publication of the RCC-CW 2015 code early 2015 is the first edition that AFCEN has prepared and published of a generic civil engineering code that does not relate to any specific project.

It takes account of the latest changes in European standards.

It includes technological possibilities and improvements:

- Bonded prestressing has been supplemented with unbonded prestressing.
- The code covers the design and development of seismic isolation devices.
- The section on external hazards has been updated to include tornadoes.

The design approach has been expanded to provide greater focus on the design extension situations in the complementary field.

e) Outlook

As already initiated by AFCEN in preparing the RCC-CW code, development of the civil engineering code is continuing in the following directions:

- Integrate feedback from projects currently under development or construction.
- Broaden the scope of robust technologies covered by the code (anchors, metal liners, and so on).
- Encourage application of the code in the European and international arena by offering greater coverage of the latest international standards and promote the code as a civil engineering benchmark for the Prospective Groups that CEN set up to prepare the future nuclear codes.
- According to AFCEN's requirements and development objectives, develop appendices and addenda specifically addressing how the code can be adapted to the countries targeted by AFCEN.

f) Technical publication on seismic isolation

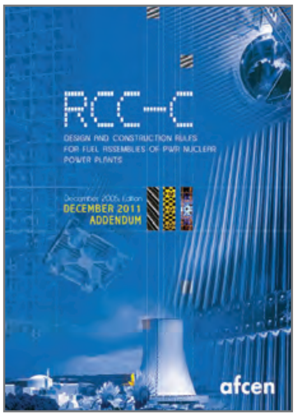
Technical publication "PTAN - French practice and experience of seismically isolated nuclear facilities" was released in 2014.

It presents the best practices and experience of French industry resulting from the last 30 years in designing and installing seismic isolation systems beneath nuclear facilities.

This publication enables European industry to:

- Codify the industrial design and construction practices according to AFCEN: in this respect, RCC-CW 2015 would include a section on seismic isolation.
- Showcase its experience within international organizations and bodies (IAEA, OECD, WENRA ...).

2.2.6 Field of Fuel: RCC-C



RCC-C

Design and construction rules for fuel assemblies of PWR nuclear power plants

a) Purpose and scope

The RCC-C code contains all the requirements for the design, fabrication and inspection of nuclear fuel assemblies and the different types of core components (rod cluster control assemblies, burnable poison rod assemblies, primary and secondary source assemblies and thimble plug assemblies).

The design, fabrication and inspection rules defined in RCC-C leverage the results of the research and development work pioneered in France, Europe and worldwide, and which have been successfully used by industry to design and build nuclear fuel assemblies and incorporate the resulting feedback.

The code's scope covers:

- Product and part characteristics: bars, flat products, tubes (cladding, instrumentation and burnable poison), pellets and castings.
- Fabrication and related testing and inspection (pelletizing, welding, brazing, cleanliness, shipment, handling and storage).
- General inspection methods and specific methods for fuel rods, fuel pellet stacks and fuel pellet hydrogen content.
- Fuel system design, especially for the fuel rod, assemblies and associated core components.

b) Use

The RCC-C code is used by the operator of the PWR nuclear power plant in France as a benchmark when sourcing fuel from the world's top two suppliers in the PWR market, given that the French operator is the world's largest buyer of PWR fuel.

In 2011, AFCEN authorized the 2005 version of the RCC-C code to be translated into Chinese.

c) Background

The first edition of the AFCEN code was published in 1981 and mainly covers fabrication requirements.

The second edition of the code was released in 1986 and supplemented the first edition by including design requirements for the fuel system.

This structure remains unchanged, and the updated edition released in 2005 prioritises the fabrication aspects.

However, the RCC-C Subcommittee has spent the last two years overhauling the code with specific emphasis on the structure and content, in order to produce a 2015 edition.

2.2.6 Field of Fuel: RCC-C

d) Edition available as of 1 January 2015

2005 edition, with the 2011 addenda

The 2005 edition was amended in December 2011 to incorporate 19 modification files.

Contents of the 2005 edition of the RCC-C code with the 2011 addenda

CHAPTER 1: GENERAL PROVISIONS

CHAPTER 2: PRODUCTS AND PART CHARACTERISTICS

- GENERAL REQUIREMENTS, PURPOSE, QUALIFICATION OF PRODUCTS OR PARTS,
- PRODUCTS (FOR EX ZIRCONIUM ALLOY FLAT PRODUCTS),
- PARTS (FOR EX ZIRCONIUM ALLOY CLADDING TUBES),
- BORON CARBIDE PELLETS

CHAPTER 3: MANUFACTURING AND RELATED TESTING AND INSPECTION

- GENERAL REQUIREMENTS, PELLETIZING, WELDING, BRAZING, CLEANLINESS

CHAPTER 4: TABLES OF INSPECTION REQUIREMENTS

- SCOPE,TABLES, FUEL ASSEMBLIES WITH CORE COMPONENTS

CHAPTER 5: INSPECTION METHODS

- RADIOGRAPHIC INSPECTION, ULTRASONIC INSPECTION,
- LIQUID PENETRANT INSPECTION, LEAK TESTING, FUEL ROD INSPECTION,
- FUEL PELLET STACK INSPECTION,FUEL PELLET HYDROGEN CONTENT INSPECTION,
- STATISTICAL INSPECTION

CHAPTER 6: FUEL SYSTEM DESIGN

- DESCRIPTION OF FUEL SYSTEM,
- IN-REACTOR OPERATING ENVIRONMENT OF THE FUEL SYSTEM,
- SUMMARY OF THE GENERAL DESIGN AND SAFETY BASES OF THE REACTOR FUEL SYSTEM,
- FUEL ASSEMBLY SPECIFIC DESIGN BASES,
- FUEL ROD SPECIFIC DESIGN BASES,
- CORE COMPONENTS SPECIFIC DESIGN BASES,
- DESIGN JUSTIFICATION METHODS

e) Outlook and preparation of the 2015 edition

As part of the new 2015 edition, amendments have been made based on the 2005 edition and the 2011 addenda.

Following users' feedback about the document, the 2015 edition of the code will be restructured as shown in table below, the aim being for the plan of the 2015 edition to more closely mirror industry practices.

CHANGES TO THE PLAN OF THE RCC-C CODE, FROM THE 1981 EDITION TO THE 2015 EDITION

Code outline 1981	Code outline 1986 - 2005	Code outline 2015
1 - Generalities 2 - Product and part characteristics 3 - Manufacturing and related testing and inspection 4 - Tables of inspection requirements 5 - Inspection methods Appendix	1 - Generalities 2 - Product and part characteristics 3 - Manufacturing and related testing and inspection 4 - Tables of inspection requirements 5 - Inspection methods 6 - Design Appendix	1 - Generalities 2 - Description of fuel 3 - Design 4 - Manufacturing 5 - Handling and Storage

These amendments are intended to update the code and improve the level of requirements from both a quality assurance and technical point of view, as well as produce a document offering greater overall consistency and allowing for better application of the code.

In terms of the general requirements and description:

- Quality assurance requirements have been improved compared to previous requirements by including the text of AFCEN RPP-1, which itself is based on the IAEA GS-R-3 standard.
- The definitions used for fuel assemblies have been enhanced.
- The procedure for managing nonconformities has been described.
- The fuel description has been updated.

In terms of design:

- The design chapter has been updated to reflect comments from the French safety authority in 2009 following discussions about the prospect of a draft fuel regulation. The paragraph has been restructured for improved clarity. Changes have been introduced to factor in ASN's observations in 2009 (the enthalpy value considered obsolete was removed) and take into consideration the findings of the French Group Permanent on Loss-of-Coolant Accident (further details concerning the dependence of the ECR value on hydrogen). A paragraph covering Class 2 pellet-cladding interaction studies has been incorporated.
- The statement of functional requirements for assemblies and core components has been improved.
- Paragraphs on thermal hydraulics and neuron transport have been added.

In terms of fabrication:

- The paragraphs in the code covering zirconium alloy have been updated to include commercial alloys other than Zircaloy 4.
- The chapter on materials has been structured according to the same plan as that used for zirconium alloys. The paragraphs covering absorbents and fuel pellets have been improved.
- The code includes requirements for the following inspection and fabrication processes: automatic sorting of pellet diameters, tube expanding, lost-wax casting, component marking, thermal treatment and surface treatment.
- The following assemblies are defined, as well as their qualification requirements: assemblies, skeleton assemblies, grids, fuel rods, bottom end fittings, rod cluster control assemblies and absorber rods.

The RCC-C Subcommittee is continuing its work in 2015, with the focus on:

- Developing the English version of the code.
- Managing Requests for Modification that could not be included in the work on the new 2015 edition.

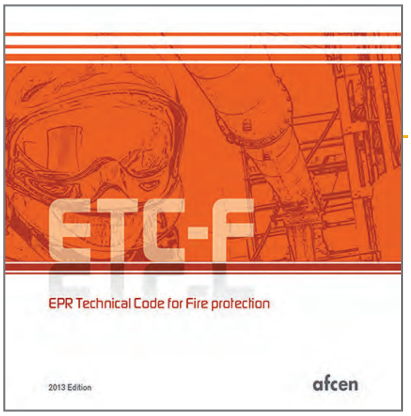
f) Code supporting documents: technical publications and criteria

The RCC-C code currently does not have any criteria.

The supporting documents are used to describe the risks that need to be controlled, explain the demonstration objectives and clarify the methods. They will be beneficial to fuel-related matters.

A work program to establish the criteria will be defined in 2015 based on an analysis of the technical criteria used.

2.2.7 Field of Fire: RCC-F



RCC-F

Design and construction rules for PWR fire protection systems

THE ETC-T VERSION OF THE RCC-F CODE APPLICABLE TO EPR PROJECTS

a) Purpose and scope

The RCC-F code defines the rules for designing, building and installing the fire protection systems used to manage the nuclear hazards inherent in the outbreak of a fire inside the facility and thereby control the fundamental nuclear functions.

This code's target readership is therefore:

- Suppliers of fire protection equipment.
- Engineering firms responsible for designing, building and installing fire protection systems.
- Laboratories carrying out qualification testing of fire protection equipment.
- Nuclear safety authorities responsible for approving the safety demonstration.

The code defines fire protection systems within a finite scope of service buildings in a light water nuclear power plant.

If any one of the requirements in the code is unenforceable due to specific difficulties, a design may nevertheless be implemented provided that justification is duly documented.

The code provides fire protection recommendations in terms of:

- The industrial risk (loss of assets and/or operation).
- Personnel safety.
- The environment.

The code is divided into five main sections:

- General
- Design safety principles
- Fire protection design bases
- Construction provisions
- Rules for installing the fire protection components and equipment

The RCC-F code is available as an ETC-F version specifically for EPR projects (European pressurised reactor).

b) Background and use

In response to the needs of its Flamanville 3 EPR project in France, EDF published a reference document called ETC-F for the design of fire protection systems.

The EDF document was not published by AFCEN, but acted as a blueprint for a fire protection code that AFCEN produced in 2009 as part of the RCC-F Subcommittee, which led to:

- Initially, the publication of the 2010 edition of the ETC-F code for EPR projects, followed by the 2013 edition, which gave less focus to the specifics of EPR projects but which still addresses the main EPR safety principles.

- Subsequently, the publication of a generic fire protection code, called RCC-F, that is not specific to any given project and which promotes the code's application on an international level.

The 2013 edition is compatible with British requirements and is intended for the EPR plants in Hinkley Point, UK.

c) Edition available as of 1 January 2015

ETC-F 2013 edition

Contents of the 2013 edition of the ETC-F code

PART 1. OBJECTIVE OF THE ETC-F

PART 2. VALIDITY OF THE ETC-F

PART 3. DEFINITIONS

PART 4. DESIGN SAFETY PRINCIPLES

- MAIN SAFETY OBJECTIVES
- DESIGN SAFETY REQUIREMENTS AND ANALYSIS RULES
- APPLICATION OF RANDOM FAILURE PRINCIPLE
- FIRE AND EVENTS

PART 5. FIRE PROTECTION DESIGN BASES

- PREVENTION
- FIRE CONTAINING
- FIRE CONTROL (DETECTION AND FIRE-FIGHTING)
- PREVENTION OF EXPLOSIONS

PART 6. CONSTRUCTION PROVISIONS

- PREVENTION
- FIRE CONTAINING
- PROVISIONS FOR PERSONNEL SAFETY
- SMOKE PROTECTION, CONTROL AND EXHAUST SYSTEM

PART 7. RULES FOR INSTALLING THE FIRE PROTECTION COMPONENTS AND EQUIPMENT

- PRODUCTION COMPONENTS AND EQUIPMENT
- FIRE PROTECTION EQUIPMENT
- EXPLOSION PROTECTION REQUIREMENTS

The 2013 edition of the ETC-F code incorporated two major changes:

- Removal of the code's adherence to the specifics of EPR projects.
- Inclusion of British regulations, which prompted a significant overhaul to the body of the text, as well as the creation of an appendix specifically addressing such regulations and designed to improve understanding thereof.

This exercise in anglicizing the code gave AFCEN hands-on experience in updating the code to reflect foreign regulations (in terms of the time, processes and skills required).

It also served as the ideal opportunity to integrate British practices.

d) Outlook and the RCC-F edition

Outlook

AFCEN is aiming to develop the code in the following directions:

- Integrate feedback from projects currently under development or construction.
- Initially drive the code's application on a European and international level by including international standards and regulations. According to requirements, this will prompt AFCEN to develop appendices and addenda specifically addressing how the code can be adapted to the target countries (refer to the exercise already carried out for the United Kingdom).

RCC-F 2016 edition

AFCEN's aim is to produce an RCC-F code that can be used for any project, irrespective of the applicable safety rules.

The initial 2010 version of the ETC-F code included two types of adherence:

- EPR adherence (specific characteristics of EPRs, mainly semantics (PCC, F2, etc.)).
- Safety adherence, which is also contained in all other EDF fire codes (RCC-I, fire directives, etc.) used on France's other power plants.

2.2.7 Field of Fire: RCC-F

The 2013 version of ETC-F has treated the adherence to specific characteristics of the EPR process existing in the 2010 version of ETC-F, but it still needs to address adherence to EPR safety.

The code must therefore be formatted and revised to identify the impact of safety principles on the content of the design, construction and installation rules defined within the code.

The work to be carried out is organized according to the following five subject areas:

Subject area 1: Analysis of adherence to safety principles (sizing and stresses)

The aim is to analyze adherence to safety principles, which involves identifying the safety criteria and principles in the code by examining any given principle (aggravating event, fire combined with thermal-hydraulic transients, combined stresses, fire outbreak following an earthquake, and so on) and how it is addressed by the code.

The analysis of adherence to safety principles may be documented in a safety principle appendix featuring two objectives: improve the code's legibility to better understand the links with nuclear safety principles and provide elements to ensure that the code can be tailored to the safety principles chosen within a specific context.

Subject area 2: Improved traceability of requirements

The purpose of this subject area is to satisfy users' need to easily identify the source of the requirements that led to the rules defined within the code.

Subject area 3: Development of requirements on conventional islands

The idea with this subject area is to inject greater flexibility into the rules for designing fire protection systems by adapting and therefore clarifying the rules applied to nuclear islands to reflect the risks relating to the conventional component (challenge of protecting the facility's production assets).

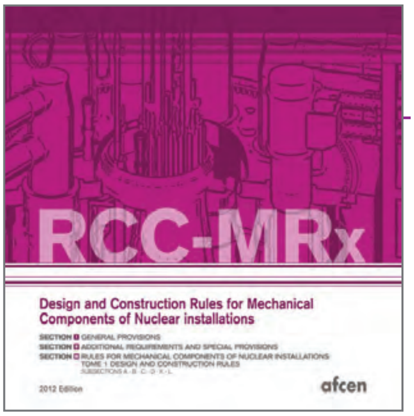
Subject area 4: Clarification of human intervention

The aim is to clarify human intervention within the code, even though such intervention is not evaluated in respect of demonstrating safety. However, human intervention can be used (evaluated) in the safety analyses. The specific prerequisites arising from international practice will need to be integrated.

Subject area 5: Position in relation to international codes and guides

This subject area aims to identify the different codes and/or guides (WENRA, IAEA, NFPA, WANO, EUR, etc.) and subsequently pinpoint the differences or similarities with the draft RCC-F code.

2.2.8 Mechanical field for research, fusion and experimental reactors: RCC-MRx



RCC-MRx

Design and construction rules for mechanical components in high-temperature structures, experimental reactors and fusion reactors

a) Purpose and scope

The RCC-MRx code was developed for sodium-cooled fast reactors (SFR), research reactors (RR) and fusion reactors (FR-ITER).

It describes the rules for designing and building mechanical components involved in areas subject to significant creep and/or significant irradiation. In particular, it incorporates an extensive range of materials (aluminium and zirconium alloys in response to the need for transparency to neutrons), sizing rules for thin shells and box structures, and new modern welding processes: electron beam, laser beam, diffusion and brazing.

b) Background and use

Since 2009, the RCC-MRx code created by AFCEN's RCC-MRx Subcommittee has been an amalgamation of two documents:

- The RCC-MR code, drafted by AFCEN's RCC-MR Subcommittee together with the Tripartite Committee formed on 16 March 1978 by the Commissariat à l'Energie Atomique (CEA), Electricité de France and Novatome, to establish the applicable rules for designing components working at high temperatures. AFCEN published four editions of RCC-MR in 1985, 1993, 2002 and 2007.
- The RCC-MX code, drafted by the RCC-MX Approval Committee formed on 31 March 1998 by the Commissariat à l'Energie Atomique, AREVA-TA and AREVA-NP for the specific needs of the RJH project (Jules Horowitz reactor). This code applies to the design and construction of experimental reactors, auxiliary systems and associated experimental devices. It can also be used for the design and construction of components and systems for existing facilities. CEA published two editions of RCC-MX in 2005 and 2008.

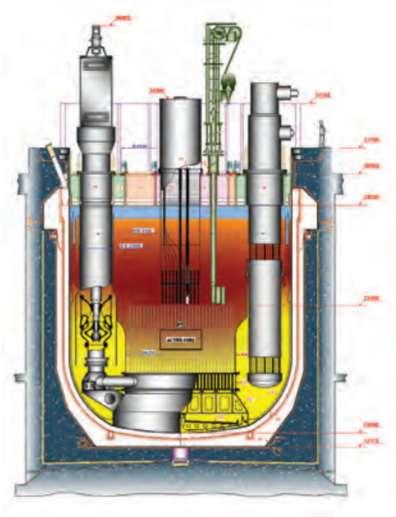
An unpublished preliminary version of RCC-MRx created in 2010 by AFCEN was chosen as the baseline for the CEN CWA European Workshop (entitled "CEN-WS-MRx, Design and Construction Code for mechanical equipment of innovative nuclear installations"), which was intended to familiarize European partners with the RCC-MRx 2010 code and propose modifications to satisfy the needs of their projects. The results of the workshop were incorporated into the 2012 edition of RCC-MRx published by AFCEN.

2.2.8 Mechanical field for research, fusion and experimental reactors: RCC-MRx

The RCC-MR code was used to design and build the Prototype Fast Breeder Reactor (PFBR) developed by IGCAR in India.

The RCC-Mx code is being used in the current construction of the RJH experimental reactor (Jules Horowitz reactor).

The RCC-MRx code is being used for the design and construction of ITER and the design of the ASTRID project (Advanced Sodium Technological Reactor for Industrial Demonstration).



c) Edition available as of 1 January 2015

2012 edition, with the 2013 addenda.

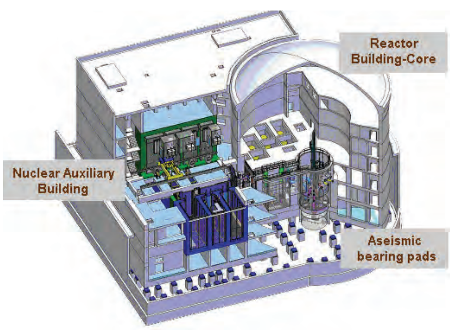
An addendum to the RCC-MRx code was produced in 2013, incorporating 48 modification files to reflect feedback on the 2012 edition.

d) Outlook and preparation of RCC-MRx 2015

The focus in 2014 was preparing and producing English and French versions of the code for December 2015.

Building on the previous edition and the 2013 addenda, AFCEN will publish a new edition of the RCC-MRx code in 2015. It will include feedback from current projects, mainly the Jules Horowitz reactor and the Astrid project (Advanced Sodium Technological Reactor for Industrial Demonstration), as well as additional information about the Eurofer material used by the fusion community.

The 2015 edition will also feature the results of the initiatives aimed at harmonizing the code with other standards (harmonized standards, RCC-M).



e) Technological commissioned studies

The RCC-MRx Subcommittee launched two commissioned studies in 2014:

- Improvement to the rules to take account of irradiation when levels become significant. This commissioned study is aimed at assessing the rules currently featured in the code with a view to their improvement. The first Requests for Modification from the brainstorming process into the rules and material data should be published in 2015.
- Terms for introducing a new material into RCC-MRx, in keeping with what had already been introduced into the code (concept of a material record). The aim of this commissioned study is to produce a methodological guide that will be released as an AFCEN technical publication. The purpose of this guide is to explain, when introducing a non-coded material into RCC-MRx, the definition of the methods for obtaining the characteristics in Appendices A3-A9 (expected / possible tests, meaning of the data), the requirements for fabrication and welding in relation to the material properties and positioning of the characteristics codified against probabilistic analyses.

Contents of the 2012 edition of the RCC-MRx code

PART 1: DESIGN

- INTRODUCTION OF METHODS OF SIZING OF THE DIAPHRAGMS OF LEVEL 1 AND 2 PIPINGS
- COMPLEMENT OF AN EXISTING RULE: INTRODUCTION OF THE SMC2 RULE FOR TYPE S DAMAGES (IN PROBATIONARY PHASE RULE)

PART 2: MATERIALS AND PROCUREMENT

- INTRODUCTION OF A REFERENCE PROCUREMENT SPECIFICATION (RPS) FOR NUTS IN STAINLESS STEELS X12CR13 GRADE
- INTRODUCTION OF AN APPENDIX DEDICATED TO 800H ALLOY (IN PROBATIONARY PHASE RULE),

PART 3: TESTS AND EXAMINATION METHODS

- KV IMPACT TESTS : CONSISTENCY WITH REGULATION (CLAP INTERPRETATION SHEET REFERENCE 292) FOR THIN COMPONENTS (10X10 SAMPLES NOT FEASIBLE)
- APPENDIX A20 HAS BEEN COMPLETED TO CLARIFY HOW TO TAKE INTO ACCOUNT EXAMINATION IN THE DESIGN STAGE

PART 4: WELDING

- HARMONIZATION RCC-M / RCC-MRX
- INTEGRATION OF THE FEEDBACK ON THE SPECIFIC ALLOYS (ZIRCONIUM, AAUMINIUM) WHICH BENEFIT OF THE ACTIVITIES ON RESEARCH REACTORS

PART 5: MANUFACTURING OPERATIONS

- INTRODUCTION OF SPECIFIC REQUIREMENTS CONCERNING THE USE OF ZIRCONIUM AND ALUMINUM (6061-T6), DEALING WITH THE FORMING AND ALSO ASSOCIATED QUALIFICATION TESTS.

PART 6: PROBATIONARY PHASE RULES

- QUALITY MANAGEMENT ACCORDING THE AIEA GRSR3 RECOMMENDATIONS
- INTRODUCTION OF DATUM CONCEPT ACCORDING ISO 5459 IN APPENDIX A16
- 9%CR DEVELOPMENTS
- EUROFER
- REQUIREMENT SPECIFICATION FOR CORE HOUSING STRUCTURE AND ULTRASONIC ALUMINUM EXAMINATION

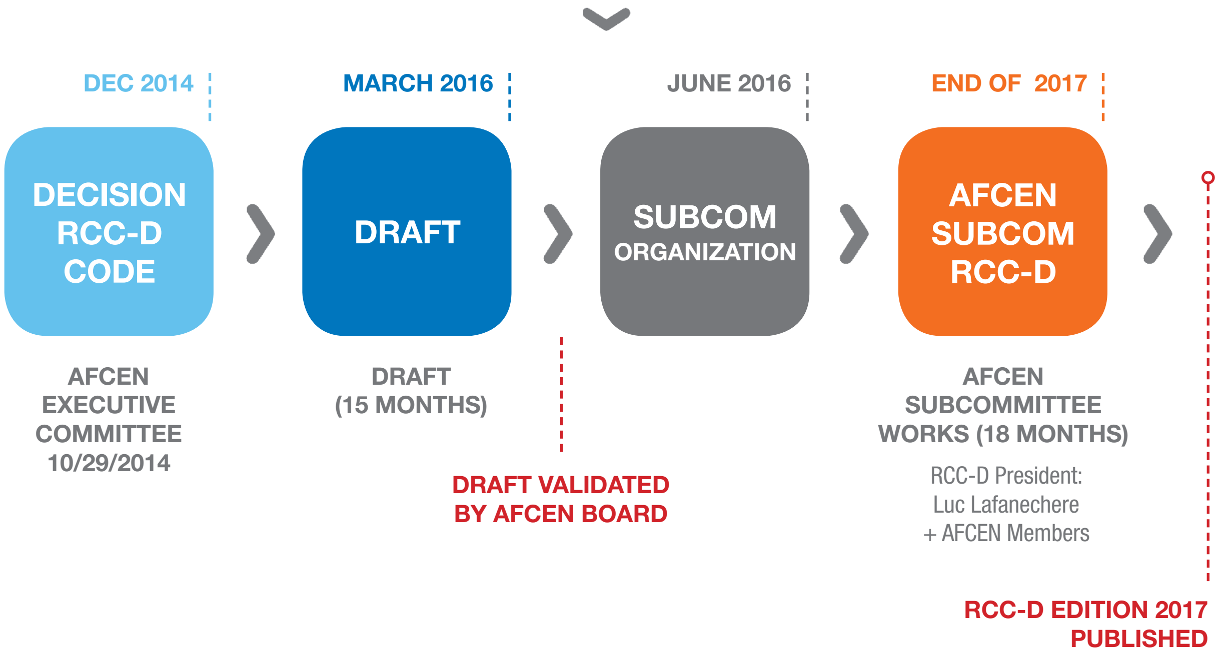
2.2.9 Field of Deconstruction: RCC-D

RCC-D

Design, construction and deconstruction rules for nuclear facilities

The decision to produce a deconstruction code was taken in October 2014 by AFCEN's Board of Directors, based on an opportunity assessment that showed the value on an international and especially European level of publishing such a code, and the feasibility of producing the code within three years according to the following program:

AFCEN PROGRAM FOR PRODUCING THE RCC-D DECONSTRUCTION CODE



The scope of the code will cover all nuclear facilities.

A working group led by an AFCEN Member has been tasked with carrying out a draft.

Once approved by AFCEN's Board of Directors, the draft will serve as an input for the work of the new RCC-D Subcommittee, which will be created mid-2016.

The goal is to publish the RCC-D code by the end of 2017.

In particular, the code must be in keeping with AFCEN's other codes.

2.3 AFCEN's activities around the world

AFCEN's international activities are strongly focused on the five key objectives below:

1) Provide the nuclear industry with a working platform in each area concerned, mainly Europe and China.

2) Pursue AFCEN's development in its target countries: Asia (China and India), the European Union (especially the United Kingdom and Poland) and the Middle East (Saudi Arabia).

3) Build on the industrial practice of international users (the United Kingdom and China in particular) and the technical instructions relating to the licensing of projects using AFCEN codes as a benchmark (GDA of EPR UK, for example).

4) Be in touch with the needs of the international nuclear environment and potential expectations.

5) Continue the harmonization efforts with the other nuclear codes within MDEP and CORDEL.

GENERAL SUMMARY OF AFCEN'S INTERNATIONAL ACTIVITIES IN 2014

ACTIVITY	The 01/11/2013	The 01/11/2014	OBJECTIVE
International members AFCEN	Opening of AFCEN after change of status in 2010 42 AFCEN members including 12 international members	50 AFCEN members including 19 international members	Gather new members from UE through WS CEN, and from UK and China through UG
Creation of User Groups	• Ongoing UG RCC-M in UK (with TWI) • Agreement with CGNPC ready for signing in november 2013	• Signed agreement with TWI 3 UG RCC-M meetings in UK with TWI • Signed agreements with CGN, CNNC et CNEA • Workshop CNEA/AFCEN in June 2014 • First Steering Committee the 01/02/2014	Development of UG in China and UK on 3 or 4 major codes: RCC-M, RSE-M, RCC-E, RCC-CW
European recognition of AFCEN Codes	EUROPEAN COMMISSION: Recognition of RCCMRx in 2012 (WS 64 CEN RCC-MRx)	EUROPEAN COMMISSION: Start of WS CEN on RCC-M, RCC-MRx et RCC-CW	European recognition on other codes, through WS CEN RCC-M, RCC-E, RCC-CW
	POLAND: First relationship	POLAND: Strong development of relations with Poland GERMANY: meeting with KTA	Promote European nuclear industry
Harmonization of international codes	MDEP, SDO Board	• MDEP, CORDEL, SDO Board • Ongoing discussions with NEA and ISNI on NB Chinese norms	• MDEP, SDO Board (Transfer in 2014 MDEP activities to CORDEL) • Contribution to NB Chinese norms

2.3.1 AFCEN's activities in France

a) Relationship with France's nuclear safety authority

With respect to AFCEN's relationship with France's nuclear safety authority, two points deserve a mention:

1) AFCEN's senior management meets the nuclear safety authority's executives approximately every two years.

For instance, on 2 July 2014, AFCEN's Board of Directors was received by ASN's Chairman, senior executives and representatives from the Nuclear Power Plant Department (DCN), the Nuclear Pressure Equipment Department (DESPN) and its supporting body IRSN.

AFCEN presented the following points:

- General presentation of AFCEN (background and creation, organization, ISO 9001 certification).
- AFCEN's international operations (China, United Kingdom, "Europeanization" of AFCEN codes, Poland and Saudi Arabia).
- Work of the Editorial and Training Committees.
- Brainstorming ways of improving recognition of the code, and ASN's and IRSN's involvement in editorial groups.

In conclusion, ASN stressed its interest in AFCEN's activities and its support for AFCEN's objectives. ASN and AFCEN wish to hold discussions about strategies for improving recognition of codes.

2) A progress report on the program aimed at demonstrating conformity of the RCC-M code in France with the French Nuclear Pressure Equipment Regulation (ESPN) has been presented to ASN roughly every three months since 2013 under the responsibility of AFCEN's Editorial Committee and attended by the relevant AFCEN members.

During meetings, program directions are discussed, and ASN gives its opinion on the documents submitted.

b) AFCEN's participation in the World Nuclear Exhibition (WNE) 2014

AFCEN took part as an exhibitor in the first World Nuclear Exhibition, which was held in Le Bourget, France from 14 to 16 October 2014.

AFCEN's stand attracted a number of visitors, operators, major industrial firms and manufacturers.

The exhibition gave AFCEN the opportunity to share the concerns faced by many manufacturers that are not yet AFCEN members.

AFCEN will take part in the second World Nuclear Exhibition in June 2016.

VIEWS OF THE AFCEN STAND AT WNE 2014 IN LE BOURGET

2.3.2 AFCEN's activities in European Commission

In a bid to consolidate and forge a tight-knit European nuclear industry faced with the global energy challenges in which the nuclear industry plays a strong role (construction and deconstruction of power plants), an exercise in "Europeanizing" a code was carried out in 2009 by a CEN* workshop (WS 64).

This workshop targeted the process of preparing the RCC-MRx code, which culminated in the publication of the 2012 edition of the RCC-MRx code, including the recommendations put forward by the WS's European partners.

Based on what was considered positive feedback by all partners, a continuation of the CEN* Workshop was launched in 2014 to investigate the potential needs for creating a code for mechanical and civil engineering for Gen II to Gen IV nuclear facilities (see Section 2.4.3).

This activity is being supported by the European Commission's Directorate-General for Energy.

** CEN: European Committee for Standardization*

2.3.3 AFCEN's activities in China

AFCEN's ties with China can be traced back to the construction (1986) of the Daya Bay nuclear power plant (two 900 MWe units based on the Gravelines 5/6 plant design).

Subsequently, AFCEN codes were gradually chosen for such projects as Qinshan Phase II (600 MWe), Ling AO Phase I (1,000 MWe), Ling AO Phase II (1,000 MWe), Qinshan Phase II Ext (600 MWe), 22 nuclear units of the CPR-1000 design (1,000 MWe), Changjiang (600 MWe) and finally Taishan EPR.

The Chinese safety authority (NNSA) has lent its full support to the adoption of AFCEN's codes by making their use a requirement in 2007 (Decision no. 28) for all CPR-1000 units.

Following this decision by NNSA, CGN decided, with approval from AFCEN, to translate the following AFCEN codes into Chinese (AFCEN – CNPRI agreement signed in 2008):

- **RCC-M:** "Design and Construction Rules for Mechanical Components of PWR Nuclear Islands" – 2000 - 2005 add.
- **RCC-G:** "Design and Construction Rules for Civil Works of PWR Nuclear Islands" – 1986
- **RCC-E:** "Design and Construction Rules for Electrical Components of PWR Nuclear Islands" – 2005
- **RCC-I:** "Design and Construction Rules for Fire Protection of PWR Nuclear Islands" – 1997 (rev. 4)
- **RCC-P:** "Design and Construction Rules of PWR Nuclear Islands: System design and Safety classification" – 1991 (rev. 4) modif. 1995
- **RSE-M:** "In-service Inspection Rules for Mechanical Components of PWR Nuclear Islands" – 1997 - 2005 add.
- **RCC-C:** "Design and Construction Rules for Fuel Assemblies" – 2005

[1] RCC-P is not an AFCEN code,
but an EDF document published by AFCEN

Translation of AFCEN codes into Chinese was completed in 2011.

2012 and 2013 were marked by technical seminars (Shenzhen in March 2012 and Beijing in September 2013) and the process of gradually ensuring the appropriate conditions for fostering partnerships with the leading players in China's nuclear industry.

In the meantime, Chinese users of AFCEN codes made their voice heard by submitting a large amount of clarification and Requests for Interpretation (over 600 clarification requests received between 2008 and 2012).

2.3.3 AFCEN's activities in China

In light of such high levels of activity, the idea of setting up Users Groups was discussed and approved.

Partnerships forged in 2014

One of the major highlights in 2014 was AFCEN's signing of a series of MoUs (Memoranda of Understanding) with Chinese nuclear groups and organizations.

1) The agreement that AFCEN signed on 18 February 2014 with the CGN Group, operator of the largest fleet of nuclear facilities in China, coinciding with the launch of AFCEN's Users Groups in China.
2) The MoU that AFCEN signed on 16 June 2014 with the CNNC Group, China's largest longstanding operator.
3) The MoU that AFCEN signed on 17 June 2014 with CNEA, the largest nuclear association in China.

These three partnership agreements / MoUs lay the foundations for the future development of AFCEN's activities in China.

SIGNING OF MoUS WITH CGN, CNNC AND CNEA IN 2014

Promotional initiatives spearheaded in 2014

Several promotional initiatives were spear-headed in 2014, including:

1) Launch of the Chinese Users Groups (CUG) on 18 February 2014 and the meeting of the first CUG Steering Committee with strong attendance from Chinese industry. A major delegation from AFCEN headed by Cecile Laugier led the meeting. The delegation met players who are important for the use and promotion of nuclear codes and standards in China, including the CNNC Group, the national body responsible for nuclear standards (ISNI), technical support from the safety authority (NSC), the China Nuclear Energy Association (CNEA) and the CGN Group.

2) The first AFCEN-CNEA Franco-Chinese seminar on feedback from the nuclear industry, held from 17 to 19 June 2014 in Beijing. This seminar boasted high levels of attendance (approximately 200 people) from French and Chinese experts, and served as the ideal occasion for sharing feedback from the nuclear industry in both countries on such topics as regulations, codes and standards, qualification and management of ageing assets, maintenance, I&C components and systems for nuclear power plants.

3) The participation of a Chinese delegation from CGN in AFCEN's General Meeting in Paris. Featuring representatives from CGN's various subsidiaries (CNPEC/CNPDC, SNPI, CNPRI), the delegation spoke with AFCEN's executives about the prospect of promoting the different topics described in the MoU signed between AFCEN and the CGN Group (launch of the CSUGs, training, etc.).

Outlook for AFCEN in China in 2015

In 2015, AFCEN will pursue its goal of promoting its codes and cooperative activities with China.

The main foreseeable prospects are as follows:

1) Launch of the CSUGs (China Specialized Users Group s): the first seven CSUGs will be launched early March by CGN and CNNC for the following codes: RCC-M (design and fabrication), RSE-M, RCC-MRx, RCC-E, RCC-C and RCC-F. CNNC will launch the RCC-CW CSUG later during the course of 2015.

2) AFCEN's presence in CIENPI (China International Exhibition on Nuclear Power Industry): recognizing AFCEN as a strategic partner, CNEA offered an invitation to take part in CIENPI to present its expertise in preparing nuclear codes and standards.

3) Second AFCEN-CNEA Franco-Chinese seminar on feedback from the nuclear industry: spurred on by the tremendous success of the first seminar on nuclear feedback in 2014, there are plans to repeat the event in June 2015.

4) Development of a partnership with ISNI / NEA on Chinese nuclear standards. Note: NEA (National Energy Administration) could be interested in the prospect of a long-term cooperative arrangement with AFCEN on nuclear standards.

5) Strong Chinese attendance is expected at AFCEN's 2015 International Congress: various governmental organizations (NEA, NSC) and Chinese industry (CGN, CNNC, ISNI, CNEA) have expressed their interest in taking part in AFCEN's international congress on nuclear codes and standards, which will be held late March 2015 in Paris.

6) Development of a partnership with NSC: as part of its role in delivering technical support to the Chinese safety authority (NNSA), NSC is an intensive user of AFCEN codes in China for its technical safety assessments of Chinese nuclear power plants. NSC is looking to strengthen its relationship with AFCEN in an effort to share its expertise directly with AFCEN. There are plans for a partnership between AFCEN and NSC.

2.3.4 AFCEN's activities in United Kingdom

a) Background and general objectives

Following certification of the EPR reactor in the United Kingdom (GDA, Generic Design Assessment), licensee NNB (Nuclear New Build) has been overseeing relations with the safety authority (ONR, Office for Nuclear Regulation) and investigating all open points relating to AFCEN code implementation.

The investigation is targeting the codes covering mechanical components (RCC-M, RSE-M Appendix 5.4), electrical systems (RCC-E), civil engineering works (ETC-C) and fire protection systems (ETC-F).

It leverages the NNB–RD relationship (Responsible Designer = EDF/DIN), and specific issues are forwarded to AFCEN by the EPR-UK project for analysis and action via representatives of members EDF and AREVA in the subcommittees of which NNB is actually a member.

Furthermore, dissemination of AFCEN's code culture within British industry is important, not to say essential for simplifying understanding and use of the codes and benefiting projects.

This observation prompted the creation of AFCEN code Users Groups (UK Users Groups), comprising the companies concerned and representatives from NNB and AFCEN, with a Steering Committee responsible for overseeing all groups.

These Users Groups are tasked with disseminating AFCEN's code culture in an effort to:

- Simplify uptake among British industry and partners (designers, manufacturers, contractors, suppliers and consultants).
- Ascertain users' requests and suggestions (as far as drafting guides or appendices specific to the local context if necessary).
- Establishing an effective communication channel with AFCEN's Subcommittees (occasional contributions from experts in the groups, management of Requests for Modification and Interpretation).
- Organizing training requirements.

Such a need for Users Groups was mainly identified for the RCC-M, ETC-C and RCC-E codes.

The aim is to simplify the roll-out of EPR UK projects by minimizing discrepancies caused by poor interpretation of the codes early into the project lifecycle and strengthening the solidity of AFCEN's codes, particularly their ability to be deployed on an international level.

b) Activities in 2014

In terms of the RCC-M code, the Users Group was created in 2013 (two sessions). The agreement between AFCEN and TWI (The Welding Institute) was signed on 27 March 2014 during the AFCEN Days event.

SIGNING OF THE AGREEMENT BETWEEN AFCEN AND TWI IN 2014 FOR THE LAUNCH OF AN RCC-M CODE USERS GROUP IN THE UNITED KINGDOM

The TWI leader of the RCC-M UK Users Group set up the group's terms of reference and held three sessions in 2014. The group comprises approximately 15 members and includes participation from NNB (representation of a Design Authority (DA) member and a Manufacturing Inspection Team (MIT) member to cover design and fabrication aspects).

During each session, AFCEN's experts and the group's corporate members share their views on a technical issue mainly concerning fabrication (quality, procurement of materials and products, welding and NDT).

Feedback on the group's operation has been satisfactory, with good leadership by TWI amidst the pending final investment decision (FID) and the uncertainties inherent in such pre-contractual stages.

Users Groups have not yet been formed for the ETC-C and RCC-E codes, although talks are well underway for ETC-C.

The Steering Committee has been defined and includes the leaders of the different Users Groups, the NNB Chairman of the Steering Committee and the international relations coordinator with the United Kingdom.

The Memorandum of Understanding between AFCEN and the Steering Committee Chair is due to be signed at the next AFCEN Congress in 2015.

2.3.5 AFCEN's activities in Poland

a) Background and general objectives

The actions spearheaded by AFCEN in Poland are naturally aimed at promoting Europe's nuclear industry and driving Europe's industrial proposal for the Polish electronuclear RFP (2 x 3,000 MWe by 2035).

Use of AFCEN codes for designing and building Poland's first nuclear power plant is referenced alongside other top-tier international standards in the Polish Nuclear Power Programme (PNPP) adopted by the Polish Council of Ministers on 28 January 2014. This concerns the codes for mechanical components (RCC-M), electrical systems (RCC-E), civil engineering works (ETC-C) and fire protection systems (ETC-F).

The PNPP is drawing on "Poland's Energy Policy until 2030" adopted by the Polish Council of Ministers on 10 November 2009.

Despite suffering several delays, the invitation to tender for Poland's first nuclear power plant could be launched early 2016, with the contract signed late 2017.

With a helping hand from the French Embassy in Warsaw, AFCEN is stepping up its efforts to inform and raise awareness among the Polish partners involved in developing the nuclear program. Prior to the future RFP, AFCEN's actions in Poland are aimed at achieving two objectives:

- Take a proactive approach towards nuclear safety and quality: the goal is to promote the importance of a European technical standard that is recognized, tested and shared by the entire industry, which represents a key component of safety and economic efficiency, insofar as it simplifies and structures dialogue and discussions between industry, suppliers, partners and the safety authority, as well as safety authorities in the international arena.
- Work alongside Poland in developing its Human Capacity Building project; that is the reason for which AFCEN is planning to expand its action plan in Poland with training and knowledge transfer solutions geared towards the needs of the stakeholders in the Polish Nuclear Power Program.

2.3.5 AFCEN's activities in Poland

Broadening AFCEN's working groups to encompass Polish partners is another prospect for the longer term if the EPR technology is chosen. The need for Polish Users Groups was mainly identified for the RCC-M,

ETC-C, RCC-E and ETC-F codes.

For instance, AFCEN's collaboration with Poland is part of a long-term outlook that goes much further than the invitation to tender.

Over the last two years, AFCEN has forged a solid network of contacts in Poland within the institutions concerned by the nuclear power project (ministries, academia, research institutes, etc.) and all of industry in general.

The eight Polish institutions that actually represent AFCEN's special Polish contacts are:

- Nuclear Energy Department of the Ministry of Economy (NED).
- National Centre for Nuclear Research (Narodowe Centrum Badañ Ja¸drowych, NCBJ).
- Institute of Nuclear Chemistry and Technology (Instytut Chemii i Techniki Ja¸drowych, IChTJ).
- Warsaw University of Technology (Politechnika Warszawska, WUT).
- Gdansk University of Technology (Politechnika Gdañska, GUT).
- Krakow AGH University of Science and Technology (Akademia Górniczo-Hutnicza, AGH).
- Welding Institute (Institut Spawalnictwa de Gliwice, IS).
- Polish National Atomic Energy Agency (Polska Agencja Atomistyki, PAA).

The actions that AFCEN pursued among the abovementioned Polish institutions and Polish industry are intended to disseminate the AFCEN code culture. Codes have been enhanced since the 1980s using the experience acquired from over 100 reactors around the world.

b) Activities in 2014

AFCEN staged a series of seminars in Poland to put its initiatives and publications firmly on the radar.

Four seminars have been organized since 2012.

The first three were held in 2012 and 2013 at the French Embassy in Warsaw.

- First seminar on 13 December 2012.
- Second seminar on 16 April 2013.
- Third seminar on 12 December 2013.

Fourth seminar in June 2014

The fourth seminar, entitled "RCC-M: NDT, Welding and Materials", was held on 4 and 5 June 2014 in Krakow and gave participants a general presentation of the RCC-M code.

The seminar was organized jointly with the Institut Spawalnictwa de Gliwice (IS) and attracted 60 participants: universities including NCBJ, AGH and UDT (Office of Technical Inspection), the Ministry of Economy and companies from the nuclear sector. Also deserving a mention is the participation of a representative from the Polish safety authority PAA, as well as a representative from electric utility PGE EJ1, which is responsible for preparing the construction and operation of Poland's first nuclear power plant.

Presentations zeroed in on the overview of the RCC-M code, how the provisions in the code dovetail with European standards, use of the code for Class II and III mechanical systems and components, with the focus on the materials and NDT, QA rules and third-party actions, followed by a presentation on the impact of construction choices (design and fabrication) on in-service operations (repairs, in-service inspection and maintenance).

Participants gave the seminar an enthusiastic reception and appreciated the fact that AFCEN's experts travelled to Krakow, while calling on the association to organize practical workshops to provide a clearer insight into implementation of the RCC-M code.

Following the seminar, the Institut Spawalnictwa de Gliwice (IS) told AFCEN of its desire to forge cooperative ties between both organizations for the purpose of establishing a first step in Franco-Polish collaboration on the RCC-M code and acting as a driving force for simplifying upskilling for the companies operating in the sector. Several topics were raised, including training and the translation into Polish of certain chapters on industrial welding in RCC-M.

AFCEN code ceremony in September 2014

Other noteworthy events of 2014 include the ceremony whereby AFCEN codes were handed out to key Polish figures. The ceremony was held on Monday, 29 September 2014 in the offices of the French Embassy in Warsaw.

The ceremony was held under the auspices of the French Embassy and AFCEN, and heralded a new milestone in the cooperative ties between French and Polish nuclear stakeholders in the wake of the series of four topical seminars. The ceremony was attended by stakeholders in the Polish nuclear power program, such as the Nuclear Energy Department of the Ministry of Economy, the Polish safety authority PAA, WUT University, NCBJ, ICHTJ, IS and PGE EJ1.

The ceremony also provided the ideal platform for reminding our Polish partners of AFCEN's commitment to developing design and construction standards for electricity-producing nuclear reactors.

As part of this mission, AFCEN contributes towards nuclear safety by producing rules reflecting established industrial practices.

AFCEN draws strength from the contributions of its members, industry, manufacturers and operators to publish robust standards that drive the standardization process and leverage the best international and European standards.

In doing so, AFCEN plays an active role in raising the economic efficiency bar in the nuclear industry.

AFCEN CODE CEREMONY IN WARSAW IN 2014

SPEECH BY CLAUDE DUVAL,
AFCEN REPRESENTATIVE AT
THE CODE CEREMONY IN WARSAW IN 2014

2.3.5 AFCEN's activities in Poland

Other events

Another highlight was the Polish delegation led by Poland's Ministry of Economy which, acting on an initiative by AFCEN, visited AFCEN's experts at their stand during the World Nuclear Exhibition, which was held from 14 to 16 October in Le Bourget, Paris.

c) Outlook for 2015

Other initiatives and seminars will be staged throughout 2015 to build on the work aimed at forging strong cooperative ties with Poland which, while showcasing French experience, helps promote best practices in terms of nuclear safety and the technical and industrial knowledge required for the responsible development of a nuclear power industry.

Two new seminars have already been scheduled for 2015:

- A seminar concentrating on the application of European standards by the RCC-M code, from 15 to 17 April 2015.
- A seminar organised by Poland's Ministry of Economy in Warsaw on 24 and 25 September 2015, offering a technical comparison between AFCEN / ASME codes and the standards and regulations (especially quality) on which they rely.

2.3.6 AFCEN's activities in Germany

Franco-German cooperation on nuclear issues was subject to strong activity in the 1990s as part of the development of the EPR and, to a lesser extent, the EFR. Such cooperation led to joint work on codes.

Following successive decisions by German governments to abandon nuclear energy, cooperation drew to a standstill in the early 2000s.

However, AFCEN was keen to restore ties with its German counterpart KTA. The motivation for fostering a close working relationship can be explained by the fact that both countries have compiled significant feedback on the design and operation of electricity-producing reactors and the importance of capitalizing on the technologies involved.

Initial contact between representatives from both organizations was established during the summer of 2014, and the principle for cooperation was approved in the autumn by their governing bodies.

Specific actions are expected to be proposed in 2015.

2.4 Harmonization and cooperation initiatives

Empowered by its long tradition as a major force in the nuclear codes sector in several countries, and as part of its determination to continually incorporate industry best practice and local regulations for its code users, AFCEN is naturally involved in the harmonization programs either set up by international organizations or created at its own initiative.

For example, AFCEN contributes to the objectives of harmonizing mechanical codes as set forth in the multinational design evaluation program (MDEP) implemented by the safety authorities in the main countries using nuclear energy.

Similarly, AFCEN is represented in the "Codes & Standards" task force of the working group (formed by the World Nuclear Association WNA, which includes industry's main players) on cooperation in reactor design evaluation and licensing (CORDEL).

Furthermore, at the European level, AFCEN has taken the initiative to create a workshop within the European Committee for Standardization (CEN) to bring the various European stakeholders together and thereby anticipate needs for codes.

In the same spirit, AFCEN's members are active in various standardization bodies on a European (CEN / CENELEC) and international level (ISO / IEC).

2.4.1 MDEP

SDO Convergence Board

AFCEN has taken part in the group of Standards Development Organizations (SDO) ever since it was created by the MDEP Mechanical Codes and Standards Working Group (CSWG) in 2006. In 2011, the SDO group published a report entitled "Code Comparison Report for Class 1 Nuclear Power Plant Components". Box below provides a preview of the conclusions of the SDO group concerning the comparison of RCC-M with ASME code BPVC Section III.

EXTRACT FROM SDO REPORT STP-NU-051-1 ON THE COMPARISON OF RCC-M CODES AND ASME SECTION III

Extract from SDO Report STP-NU-051-1 : CODE COMPARISON REPORT for Class 1 Nuclear Power Plant Components ; §4.11.

....To summarize the preceding, the first point concerns the prescriptive nature of the RCC-M Code compared to the ASME. The RCC-M dictates the specific design of a respective component to a greater degree than ASME Section III, which, due to the broader scope, leaves more responsibility to the owner (designer and/or manufacturer). As defined in the foreword, the ASME BPVC is intended to apply broadly to the mechanical equipment industry, while the RCC-M focuses on PWR components and is derived from the industrial experience in France. The ASME BPVC is intended to apply more generally and does not attempt to represent the specific experience of a single industry, as is the case regarding the RCC-M Code. In practice, the owners (individual utilities, designers and/or manufacturers) define the additional experience-based requirements used in conjunction with the requirements defined in the ASME BPVC to achieve an end result.

The second point concerns the evolutionary nature of the RCC-M, which tends to include more experience feedback, as can be illustrated by the part of the code on cleanliness, stemming directly from practical cases. Since its first edition in 1984, materials have been added, paragraphs have evolved, and new results from R&D have been integrated.

These are two different approaches. The RCC-M approach, being more prescriptive, will guide the user to attain the desired end result, whereas, although a similar end will likely result through implementation of the ASME Section III rules by an experienced designer, the ASME does not provide the same level of direction. This difference is particularly apparent with respect to selection of materials. While, except for a few instances particularly based on French experience, the materials applied to address either RCC-M or ASME Section III requirements are very similar for like components, the RCC-M typically explicitly defines the material to be applied for a particular component while the selection in the case of the ASME component is generally based on design/manufacturing experience.

The comparison between the RCC-M Code and ASME Section III indicates that two types of differences can be identified: purely technical differences and differences resulting due to regulatory requirements. The former can be identified based on the work presented in this report with the responsibility left to the owner (designer and/or manufacturer) to address these differences. Concerning the latter, those differences resulting due to regulatory requirements are therefore related to some degree to cultural and political decisions resulting from the interpretation of industry developments. Addressing these kinds of differences requires discussion and reconciliation between the regulatory authorities of the respective countries. .....

2.4.1 MDEP

In this respect, CSWG highlighted the major difficulties in completely converging codes on an international level, but indicated that it would support any industrial initiative looking to harmonize codes and standards between the SDOs. In particular, CSWG recommended that a process be implemented to minimize any divergences between future editions of the codes.

With this aim in mind, the SDOs created the "Convergence Board [for nuclear mechanical codes]" to identify and facilitate the introduction of compatible rules in each of the mechanical codes (ASME, AFCEN, JSME, KEPIC, CSA and PNAE). AFCEN is a member of the Convergence Board. One of the first topics on the Convergence Board's agenda was welding practices, for which a comparative study is in progress.

MDEP plenary session of 15 May 2014

An MDEP plenary session was held in Washington on 15 May 2014. As part of its involvement in this particular issue, ASN called on AFCEN to take part in a round-table discussion on the prospect of converging codes.

During the round table, AFCEN supported the work that is currently targeting convergence towards ISO practices (qualification of welding operators and inspectors) and convergence in terms of the design approach.

2.4.2 CORDEL

WNA created the Cordel working group (Cooperation in Design Evaluation and Licensing) in 2007 to stimulate dialogue between the international nuclear industry and safety authorities.

As part of its conviction that harmonizing nuclear standards on an international level can have a beneficial effect on both safety and competitiveness, the Cordel working group continually promotes harmonization.

The Codes & Standards Task Force (CSTF) was created in 2010 with the aim of supporting initiatives for harmonizing codes and standards as they apply to both operators and manufacturers, while taking into consideration exchanges between safety authorities and the use of those codes and standards by stakeholders that did not take part in their development.

An opportunity assessment was therefore carried out on two pilot subjects (certification of non-destructive testing personnel and non-linear analyses), following which harmonization proposals were made.

AFCEN is active within the Cordel CSTF task force through its members and supports CSTF's actions. For instance, the conclusions of the report on the certification of non-destructive testing personnel were incorporated into the latest version of RCC-M.

2.4.3 CEN- WORKSHOP 64

AFCEN's determination to rally Europe's nuclear industry to a set of codes geared towards the needs of future nuclear projects in Europe has found a conducive framework for the development of its action with the 2007 creation of the Sustainable Nuclear Energy Technology Platform (SNETP).

The European Commission has been associated with AFCEN's initiative since day one and has lent its support ever since.

2.4.3 CEN- WORKSHOP 64

A proposal was initially made within CEN to set up a workshop to encourage the different organizations and stakeholders in the ESNII (European Sustainable Nuclear Industrial Initiative affiliated with SNETP and covering Generation IV fast neutron reactors) to help with enhancing the RCC-MRx code draft.

This proposal was accepted by CEN and joined by 14 European organizations.

Workshop 64, named "Design and Construction Code for mechanical equipment of innovative nuclear installations", was created on 3 February 2011. Its terms of reference were compared to those in force within AFCEN's Subcommittees.

Workshop 64 ran until October 2012 and produced 20 code change records, all of which were incorporated into the published edition. Furthermore, 13 proposals could not be converted into change records due to a lack of technical justification.

Feedback on the first initiative was considered to be highly satisfactory and rewarding by all stakeholders.

Spurred on by these results, AFCEN took the initiative of continuing to promote nuclear codes across Europe by fine-tuning objectives according to two focus areas:

- Invite short-term project leaders to come and work directly in the Subcommittee in order to enhance the code with the driving force adapted to their requirements.
- Prepare the future codes within external prospective groups, where parties potentially using codes for medium and long-term projects can express their technical requirements, discuss which supporting evidence is required, any R&D actions needed and the installations where such actions can be carried out.

As part of the first focus area, AFCEN gained three new European members.

The second focus area prompted AFCEN to propose a second phase for Workshop 64 with a broader scope than for Phase 1; in other words, in addition to mechanical engineering for Gen IV nuclear facilities, Phase 2 includes mechanical components for current reactors (based on the RCC-M code) and civil engineering works (based on the RCC-CW code).

This proposal was again accepted by CEN and has currently been joined by 15 organizations.

Workshop 64 - Phase 2, entitled "Design and Construction Code for Gen II to IV nuclear facilities (pilot case for process for evolution of AFCEN codes)" was created on 6 June 2014 for a three-year term, which may be renewed if necessary according to the participants' needs and interests.

The workshop actually comprises three "prospective groups", each of which covering one of the aforementioned fields (Gen II-III mechanical engineering, Gen IV mechanical engineering and civil engineering) and led by renowned experts from organizations that are not AFCEN members.

In each group, AFCEN has delegated a representative from the relevant Subcommittee to guide the group's work and provide information on the codes and the methods for updating the codes.

2.4.4 Standards

AFCEN codes are based on standards.

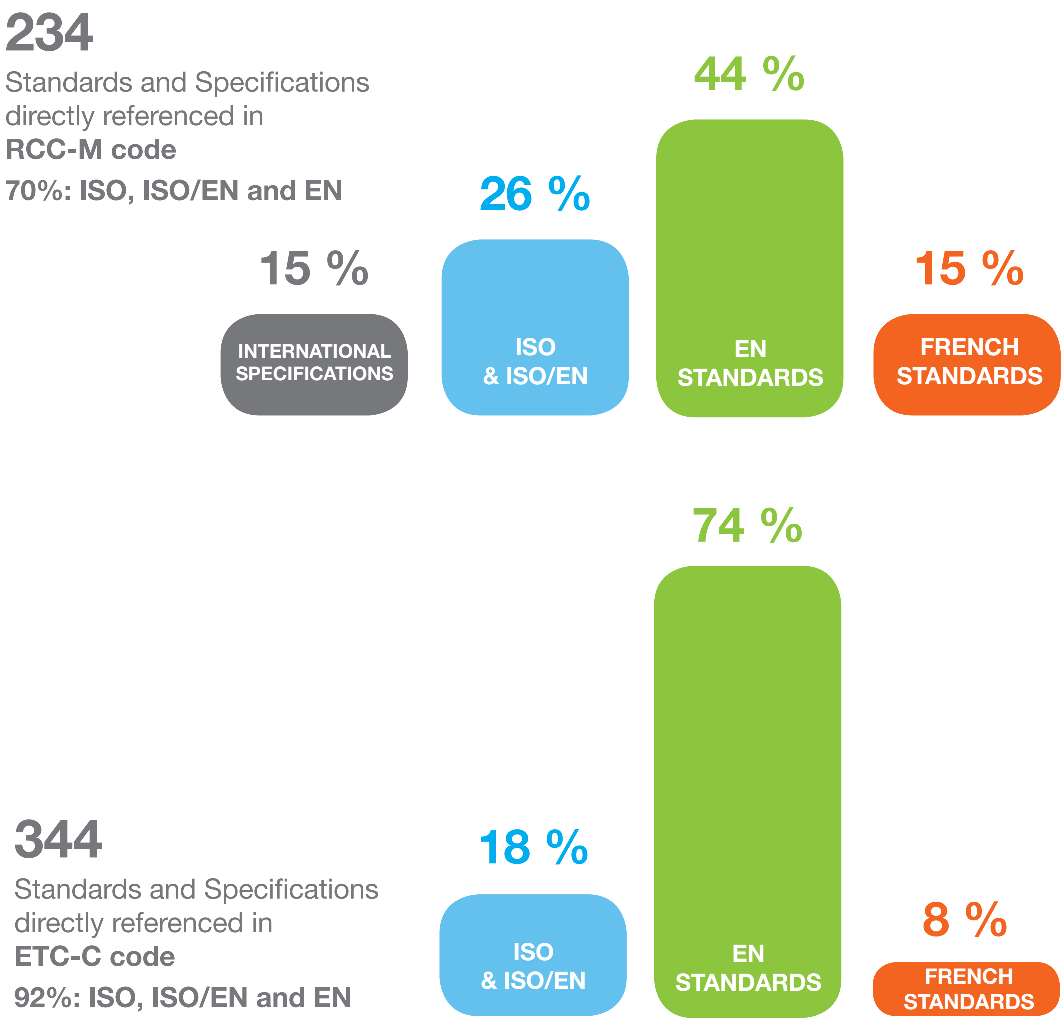
When drafting codes, ISO international standards are the first port of call when available, otherwise European EN standards are used.

If there are no existing ISO and/or EN standards for a given field, other standards serve as inspiration for the codes.

The standards used by a code are specified in one of the chapters in AFCEN's codes. The Subcommittees occasionally analyze the standards to determine whether any revisions have been made in order to ensure that codes are up-to-date.

The two following diagrams in figure hereinafter show for both RCC-M and ETC-C 2012 codes, the AFCEN approach to give priority to the use of international and European standards.

USE OF STANDARDS IN AFCEN CODES RCC-M 2012 AND ETC-C 2012



2.5 Support through training

The Training Committee ensures that certified training is available to users of AFCEN codes.

AFCEN does not personally run training courses, so that its experts can remain focused on drafting codes.

As such, the Training Committee outsources training to external providers and consequently assesses their ability to provide such training.

To do so, the Training Committee relies on the relevant Subcommittees wherever possible.

It establishes partnership agreements with training organizations and manages all the aforementioned aspects.

Partnership agreements:

AFCEN has signed partnership agreements with 12 organizations that are qualified in the field of nuclear pressure equipment:

APAVE, AREVA, CETIM, ECOLE DES PONTS, EFECTIS, INSTITUT DE SOUDURE, INSTN, INA, MJG Consulting, NUCLEXPERT, VERITAS, VINCOTTE.

NUMBER OF PARTNERSHIP AGREEMENTS SIGNED BY AFCEN WITH TRAINING ORGANIZATION, AT THE END OF 2014

RCC-M	RCC-MRX	RSE-M	ETC-C	ETC-F	RCC-E
8	3	5	1	1	2

Certified training

Following proposals from the training officers, the Committee has certified the content of 20 training courses to date.

When certifying courses, AFCEN validates the teaching aids and materials, and trainers are first audited and approved by specialists from the field in question.

Organizations that have signed a partnership agreement are authorized to provide trainees with certificates of attendance signed jointly by AFCEN.

AFCEN makes a point of notifying all training organizations that have signed a partnership agreement of any changes and modifications made to the codes. Teaching sequences for the code in question are updated and defined in mutual agreement with AFCEN.


afcen

Logo Organisme

ATTESTATION

de suivi de la session de formation

« TITRE DE LA FORMATION »

Titre du Code

Délivré à : M./Mme Prénom Nom

de la société : Société

Session réalisée : du jj au jj mmm 20xx à lieu – (durée XX heures)

Domaines techniques couverts par le stage : Contenu de la formation en termes de domaines du code couverts.

Fait à Lieu, le jj mmm 20xx

Pour l'AFCEN
Le Correspondant Formation CODE
Nom, Prénom

Pour l'organisme
Le Responsable de la Formation
XXXXXX

www.afcen.com

www.site organisme

CERTIFICATES OF ATTENDANCE SIGNED JOINTLY BY AFCEN

2.5 Support through training

Training courses delivered in 2014

In 2014, 42 training sessions were held and covered all codes (including two in China), representing 462 trainees and 1,354 days of training.

Training quality was assessed by codes and organizations, which checked that all associated safety messages were effectively driven home.

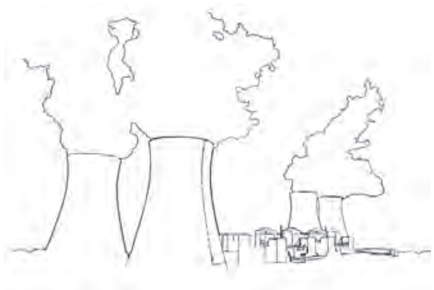
During this period, the Training Committee endeavoured to start changing the training catalogue to include more "specialized" courses.

Prospects for developing training abroad

The Training Committee also engaged the necessary resources to allow AFCEN certified training to be carried out abroad, especially in China and the United Kingdom.

AFCEN has adapted the training certification process accordingly. The courses organized by international training providers that have signed partnership agreements with AFCEN, irrespective of the country or the language used, therefore offer the level of quality expected by the Subcommittees that produce the codes.

3



Summary and outlook

One of AFCEN's first defining features is its assets and its drive to produce technical rules. AFCEN's seven codes represent over 9,500 pages leveraging the technical expertise and feedback that have been acquired over more than 30 years from manufacturing equipment and operations in over 100 nuclear reactors around the world. The three mechanical codes (RCC-M, RSE-M and RCC-MRx) account for nearly 80% of all content published and constitute the vast majority of code sales, just like their widespread use.

A dynamic editorial process is a top priority at AFCEN, and the objective is to publish a new version or addendum for each code at least every three years in keeping with the intervals at which the technical standards referenced by the codes are updated. As such, mention should be made of the considerable efforts realized over several years to specify ISO and IEC international standards in AFCEN codes: over 1,050 standards are specified, close to 80% of which are European or international.

The latest RCC-M news includes a number of highlights: in addition to the publication of a new edition in 2012 (followed by two addenda in 2013 and 2014), note the eagerly-awaited release in late 2014 of a specific work designed to explain and justify the rules featured in the code: the "criteria". Particular mention should be made of the many working groups poring over the French Nuclear Pressure Equipment Regulation (ESPN). The terms for enforcing this regulation are raising an unprecedented number of difficulties in this particular technical field, and AFCEN has brought all of industry together in a bid to address and resolve such difficulties, while delivering a stream of proactive ideas. An important prospect for RCC-M is the preparation of Subsection Q, which will cover the qualification of active mechanical equipment under accidental conditions.

The activity of the RCC-MRX and RSE-M Subcommittees paved the way for a 2014 addendum to each of these codes.

In terms of electricity, the latest edition of the code dates back to 2012. This code is currently undergoing a major overhaul, with publication slated for 2016.

The RCC-C Subcommittee expanded in 2014 and now counts two suppliers among its active members. Since the previous edition dates back to 2005, a new edition will be published early 2015.

The Fire Protection Subcommittee master-minded an ETC-F version in 2013 and is preparing an RCC-F code for 2016.

In terms of civil engineering, the Subcommittee has been remarkably active since 2010, the date on which it was broadened to encompass manufacturers: the 2015 edition will be an RCC-CW code that has been extensively revised and improved compared to the ETC-C code. Note the technical publication on seismic isolation bearings.

AFCEN is constantly preoccupied with the quality of the training courses that serve to provide a clear insight into the different codes and therefore help with their rigorous application. That is why AFCEN has set up a certification system to both satisfy demand and keep course content firmly under control: the strategy has proved successful with over 20 approvals issued. Today's priorities include developing new CPD modules and prioritizing hands-on exercises in the courses.

In terms of operation and organization, AFCEN is committed to pursuing major progress initiatives aimed at harmonizing and improving teamwork, while obviously providing proof of its quality assurance credentials (IS0 9001 certification awarded in January 2014).

Since 2010, an outward-looking approach and international development have formed the bedrock of AFCEN's new strategic focus areas.

In China, where AFCEN codes are widely known and used on the majority of nuclear reactors in operation or under construction, AFCEN fosters regular relations with the main industrial and institutional stakeholders with whom AFCEN develops a dynamics of Users Groups.

In the United Kingdom, AFCEN codes are an integral part of the technical standards used for the future EPR units; as such, they have been thoroughly examined by the British safety authority. AFCEN also lends its support to the creation of Users Groups, which play an essential role in improving industry's uptake of the codes.

AFCEN has developed a significant footprint in Poland in keeping with the interest of the Polish authorities and industry in future nuclear projects.

Spurred on by the success of its initial collaboration with CEN via Workshop 64, AFCEN is pursuing its work in the European platforms with the support of the European Commission's Directorate-General for Energy.

In conclusion, AFCEN's activities in 2014 bear testament to both the driving force of its editorial team and its determination to embrace an outward-looking approach and promote international development. As for what lies ahead, AFCEN will continue incorporating new members and satisfying their needs, as well as preparing and promoting appropriate technical and operational standards that help demonstrate the safety of nuclear reactors and facilities.

afcen

10, rue Juliette Récamier
F - 69456 Lyon cedex 06

Shaping the rules for a sustainable nuclear technology