

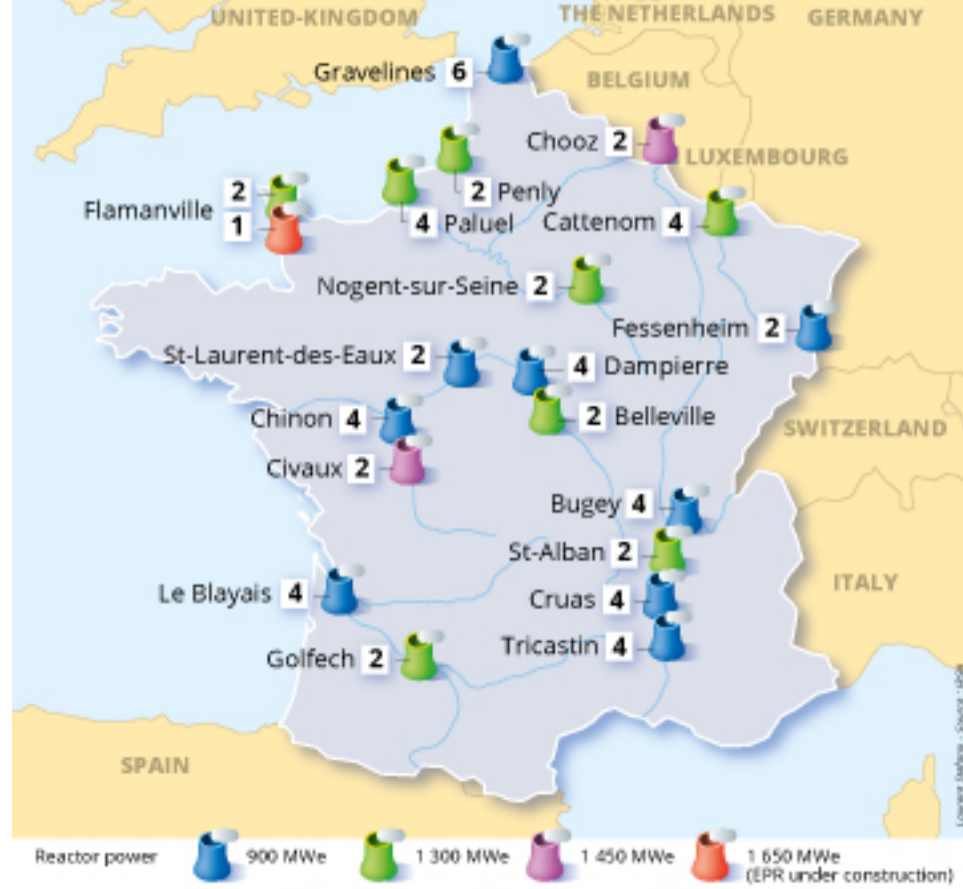
# 1 WHAT IS AT STAKE?

This report presents IRSN's overall assessment for the year 2014 of safety and radiation protection performance of the 58 nuclear power reactors currently in operation in France. It is based on the Institute's scientific and technical expertise of significant events, and its analysis of several events that it found to be the most noteworthy in 2014.



Standardization is a characteristic of the French nuclear power plant fleet operated by French electric utility company EDF.

In a French nuclear facility site plant, there are 2 to 6 Pressurized Water Reactors (PWRs) referred to as "second generation" by comparison to the European Pressurized Reactor (EPR) under construction at Flamanville (Normandy), referred to as "third generation".



## FACTORS TAKEN INTO ACCOUNT BY IRSN TO ACHIEVE ITS OVERALL ASSESSMENT

Assessment is performed using data of 'significant events' that plants operators of basic nuclear facilities are required to report to the French Nuclear Safety Authority (ASN) after each minor and major event. Analysis also takes into account lessons from the most noteworthy events and significant upgrades performed with the aim of continuously improving safety at the French nuclear power plant fleet.

### SIGNIFICANT EVENTS

Significant events can refer to 'significant safety-related events' or 'significant radiation protection-related events' or 'significant environmental protection events'. ASN classifies each event on the "International Nuclear and radiological Event Scale" (INES) which consists of seven levels (plus Level 0, below the scale, corresponding to non-compliance with no safety importance.

#### AREAS OF IMPACT

##### SAFETY-RELATED EVENTS

Events with a potentially significant impact on nuclear power plant safety.

##### RADIATION PROTECTION-RELATED EVENTS

Ionising radiation exposure events posing a potential threat to the health of exposed workers or the populations close to the event's location.

##### ENVIRONMENTAL PROTECTION EVENTS

Events with impact on the surrounding environment or on a larger area.

#### LEVEL ON INES SCALE

##### LEVELS 0 AND 1

**Non-compliance and anomalies**  
In France, several hundred non-compliances (Level 0) per year, and about one hundred anomalies (Level 1) per year.

##### LEVELS 2 AND 3

**Incidents**  
In France, a few cases each year. Five level 2 incidents on pressurized water reactors between 2007 and 2012.

##### LEVELS 4-7

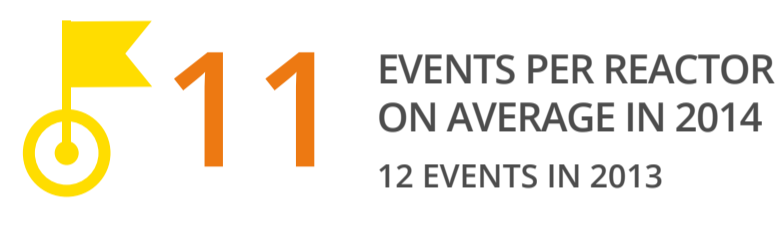
**Accidents**  
Internationally, two "major accidents" (Level 7) in Chernobyl (Ukraine) in 1986 and Fukushima (Japan) in 2011. In France, one "accident with local consequences" (Level 4) in Saint-Laurent-des-Eaux A (Loire Valley) in 1980.

### SIGNIFICANT UPGRADES

Changes and upgrades are made to France's nuclear reactors throughout their operation life, mainly with the aim of continuously improving safety. These modifications are subject of detailed analysis by IRSN.

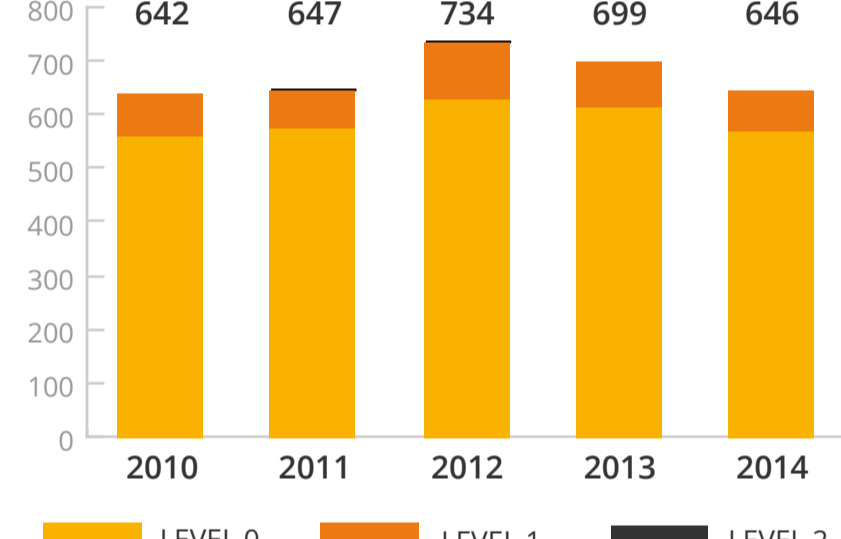
# 2 SAFETY PERFORMANCE IN 2014

In 2014, the number of 'significant safety-related events' decreased by 8% compared with 2013. A downward or rising trend does not alone indicate that the safety level is better or worse. 'Significant safety-related events' reflect difficulties that need to be investigated and understood, in order to identify relevant strategies for improving plant safety.



There were 11 events per reactor in 2014, against just over 12 in 2013 and 12.5 in 2012. This is the lowest average since 2010.

EVOLUTION OF 'SIGNIFICANT SAFETY-RELATED EVENTS' REPORTED PER YEAR



### EVENTS FOR THE YEAR 2014

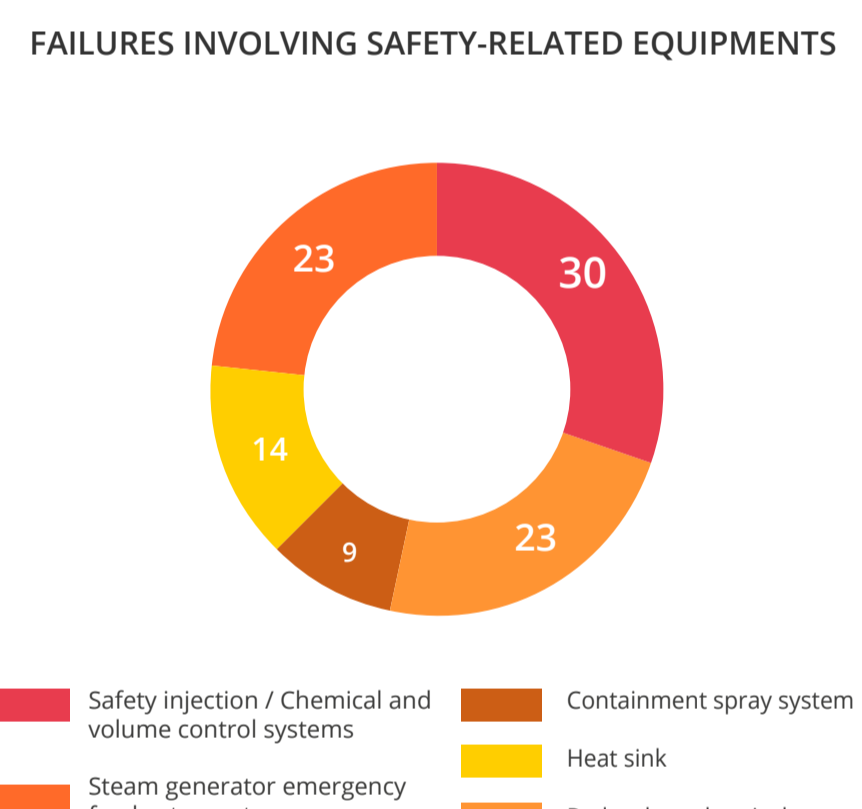
In 2014, no safety-related events were classified by ASN above Level 1 on the INES scale. The efforts of EDF, particularly to detect deviations at the earliest, may have contributed to the fact that no event with significant impact on safety has been deployed in 2014.

The decrease in the number of 'maintenance non-quality' events shows an improvement in the organization set up by EDF for these activities. Errors committed during maintenance activities are at the origin of half of the safety-related events declared.

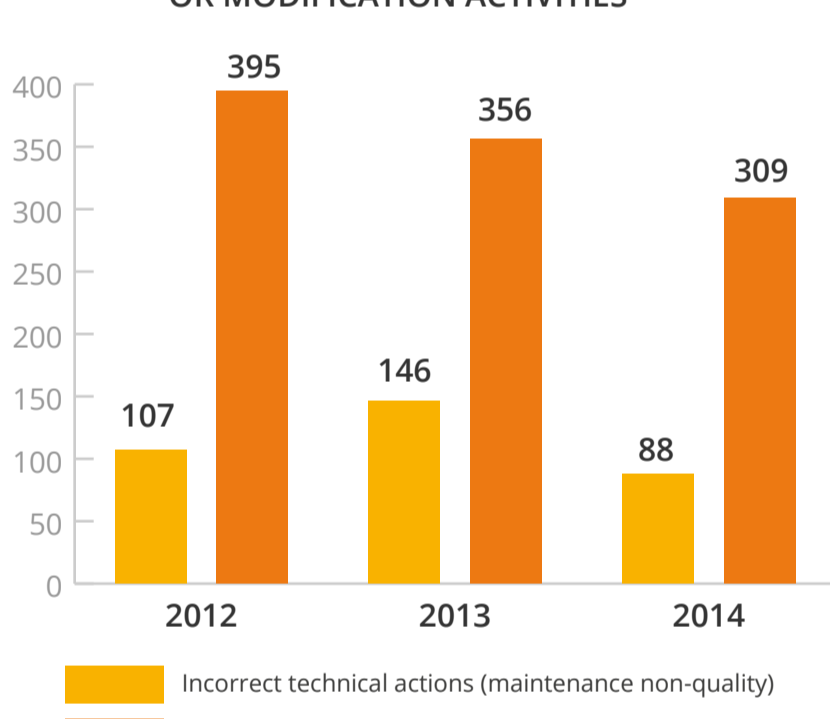
The number of events reported concerning 'system alignment errors' is increasing. These errors could have led to reactor safety-related systems becoming unavailable.

## 2 NOTABLE CASES OF 'SIGNIFICANT SAFETY-RELATED EVENTS'

FAILURES INVOLVING SAFETY-RELATED EQUIPMENTS



ERRORS CAUSED BY MAINTENANCE NON-QUALITY OR MODIFICATION ACTIVITIES



## PROPOSALS FOR IMPROVEMENTS

Improve control of maintenance activities which require meticulous preparation for optimum planning.

Prepare system alignment activities with continuous communication between field technicians and the operating team.

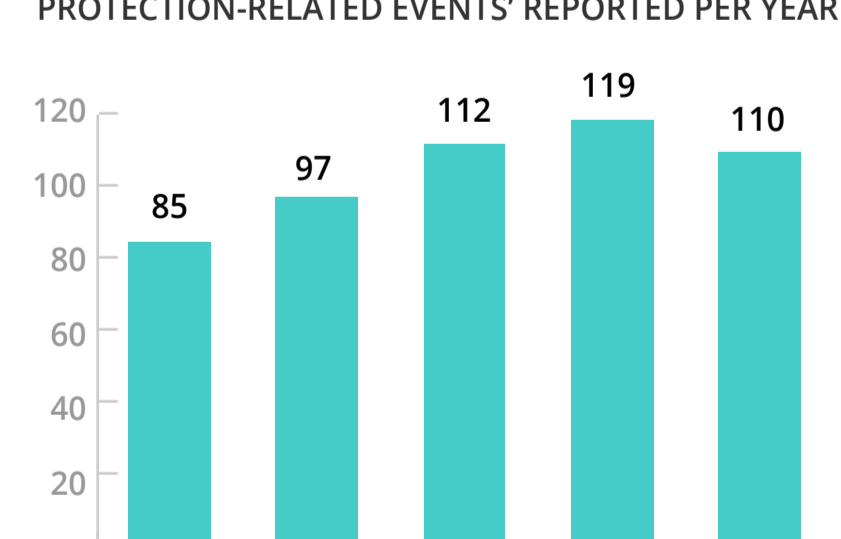
# 3 RADIATION PROTECTION PERFORMANCE IN 2014

After an increase observed every year since 2010, the number of significant radiation protection-related events of EDF nuclear power plants is decreasing. By a large majority, events that occurred in 2014 did not have significant consequences on the plants 'workers' health, the public's health or the environment.



Events with significant health implications remain at a low level. In 2014, no events were rated at level 2 (one event in 2013) and three events were classified at Level 1 (two events in 2013).

EVOLUTION OF 'SIGNIFICANT RADIATION PROTECTION-RELATED EVENTS' REPORTED PER YEAR



### EVENTS FOR THE YEAR 2014

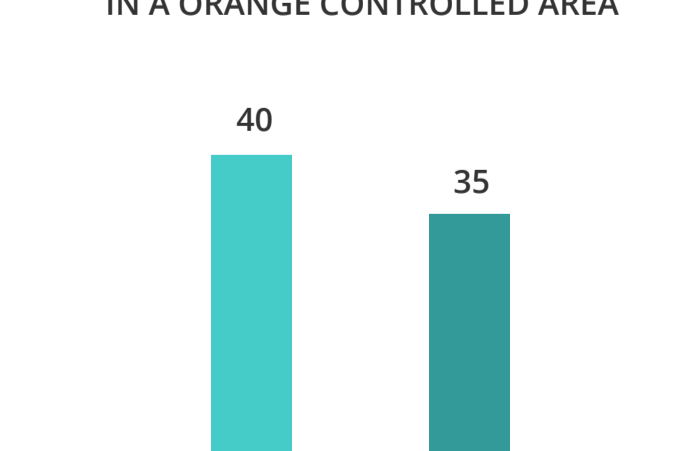
The number of events associated with gamma radiography inspections for checking welds, is down sharply. The number of non-compliances associated with access or time spent in orange radiologically controlled areas - that represents the largest number of reported events - is decreasing.

In contrast, the number of events related to workers dosimetry is rising significantly, particularly those concerning failure to wear a dosimeter.

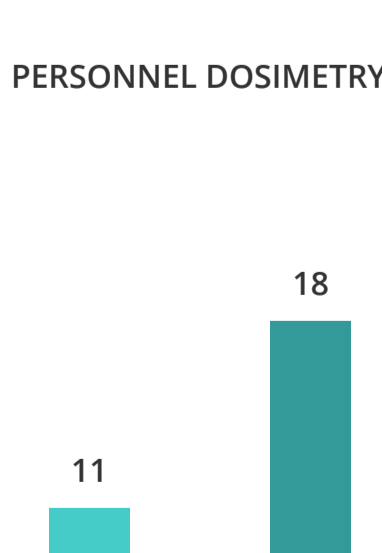
Noteworthy events: two significant surface contamination events as a result of which the operators concerned exceeded 1/4 of the regulatory annual exposure limit.

## 2 NOTABLE CASES OF 'SIGNIFICANT RADIATION PROTECTION-RELATED EVENTS'

UNAUTHORISED ACCESS TO AND/OR WORK IN A ORANGE CONTROLLED AREA



PERSONNEL DOSIMETRY



## PROPOSALS FOR IMPROVEMENTS

In order to limit the exposure of workers, actualize before the beginning of an intervention, the results of measurements made during the preparatory stage, to take into account a possible change in radiological conditions.

Improve the mastery by workers of dressing and undressing practices for work in controlled areas, and in confinement.

