

Regulatory framework for ITER

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Disclaimer: The views and opinions expressed herein do not necessarily reflect those of the ITER Organization

Regulatory framework for ITER

- French regulatory context for ITER nuclear facility
- Licensing process
 - what did we achieve?
 - what is the current status?
 - what are the next steps?
- How could the ITER licensing experience help the fusion regulatory framework ?
 - Main insights from the ITER licensing process
 - ITER safety stakes to be considered for fusion regulatory framework

Before ITER creation, implementation of a French law defining legal duties and responsibilities of the (future) ITER nuclear facility

 **Implementation of ITER agreement**

The ITER Facility shall comply with the French regulations regarding Nuclear Safety, Radiation Protection and Environmental Protection according to Article 14 of the ITER Agreement

Article 14

Public Health, Safety, Licensing and Environmental Protection

The ITER Organization shall observe applicable national laws and regulations of the Host State in the fields of public and occupational health and safety, nuclear safety, radiation protection, licensing, nuclear substances, environmental protection and protection from acts of malevolence.

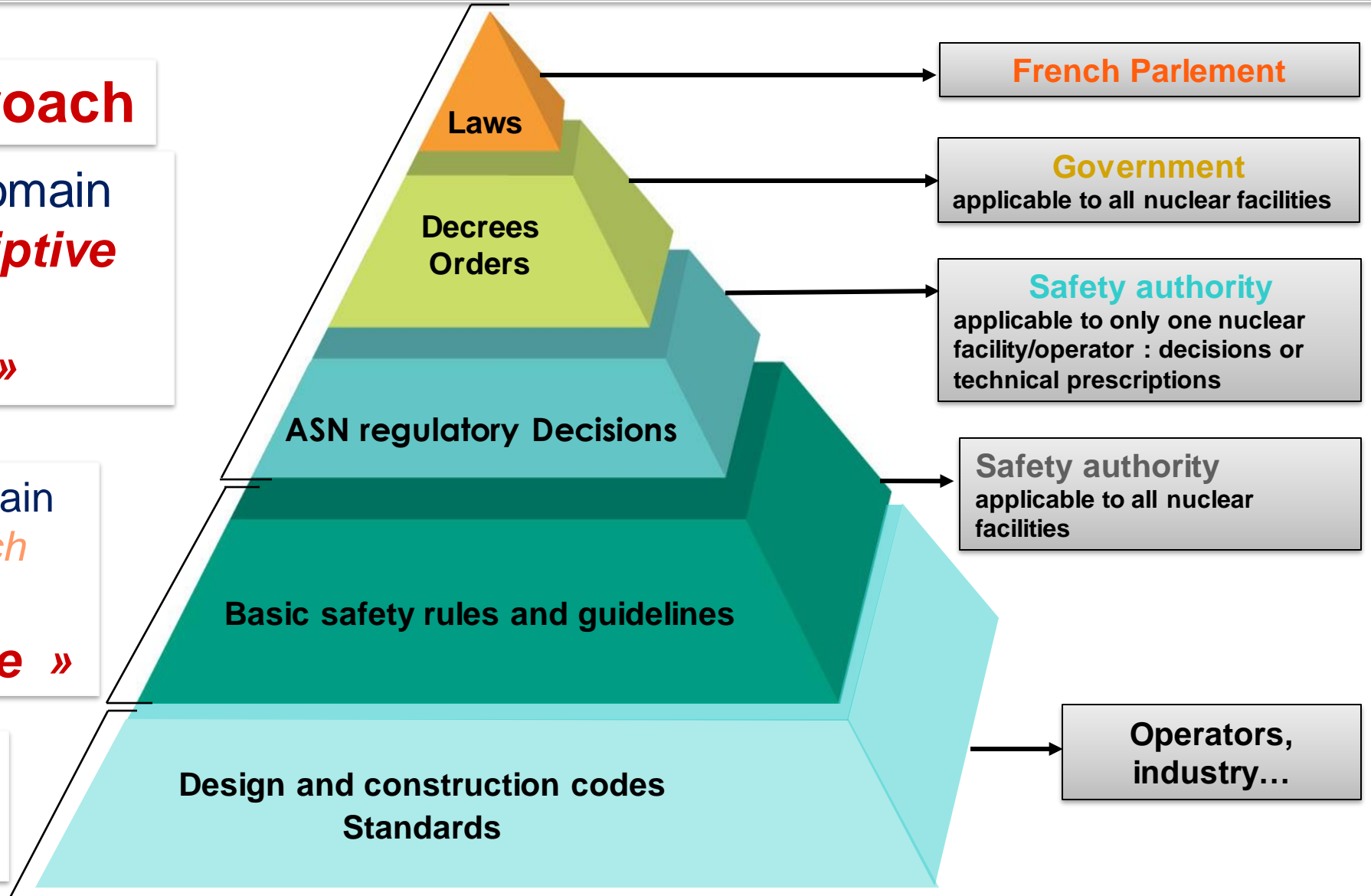
French Regulatory Framework

Regulatory approach

Legally binding domain
General Prescriptive approach
« **Must do** »




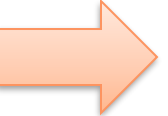
Non Legally binding domain
Demonstrative approach
« **Should do or must demonstrate** »

“State of the art”
Best available techniques



How is safety organised in France?

Main principles followed by the nuclear safety authority

-  Principle related to operator responsibility: the nuclear operator is responsible for the safety of its facility (security and transparency law)
-  Based on a limited set of prescriptive requirements and a large room for a demonstrative approach
-  Principle related to “the entity that pollutes will pay for the safety provisions” (Environmental code)
-  Radiation protection principles (public health code)
 - limitation principle (doses shall be lower than regulatory limits)
 - optimisation principle (i.e. doses shall be ALARA)
 - justification principle (no “free” doses for workers)

French Regulatory Framework

The ASN, as the French regulator for nuclear activities, is in charge of the following missions:

– Regulations

- The ASN contributes to drafting of regulations, by giving the Government its opinion on draft decrees and ministerial orders, or by issuing technical regulatory decisions.

– Inspections

- Through inspections, the ASN checks compliance with the applicable regulations, rules and specifications.

– Information

- The ASN informs the public and other stakeholders about the state of nuclear safety and radiation protection in France

The ASN can be assisted in its missions by the Institute for Radiation Protection and Nuclear Safety (IRSN), which acts as a technical support organisation (TSO).



French Regulatory Framework

Why is ITER a nuclear facility in France?

- A “basic nuclear installation” is submitted to the French nuclear safety regulations and controlled by the nuclear safety authority
- A nuclear facility is named as such depending on (Public Health Code):
 - the nature of the facility (e.g. a nuclear power plant, a research reactor)
 - the amount of radioactive inventory that may be stored/processed/created/used in the facility.
 - For tritium, the amount is 1E16 Bq (around 27 g), different amounts for other nuclides
- Under the French law, ITER is the nuclear facility known as #174 of the French civil “basic nuclear installations”, notably because of its inventory greater than 27 g under the regime of “fuel / laboratories” nuclear facilities
- Please note: the Joint European Torus (JET) in UK would have been treated as a “basic nuclear installation” if it was located in France

French Regulatory Framework

How has IO adapted to the French regulatory context?

- **ITER safety case based on safety objectives, defense-in-depth safety principles and optimization principles (ALARA) such as to ensure that the consequences on the workers and the members of the public are well below the safety objectives**
- **Demonstrative approach used to show how these safety objectives and safety principles were met and ensured, even though there were uncertainties in the maturity of design of the facility**
- **Frequent discussions with the regulator to explain ITER safety, demonstrating the adequate safety level at any phase, for modifying deadlines and requirements**

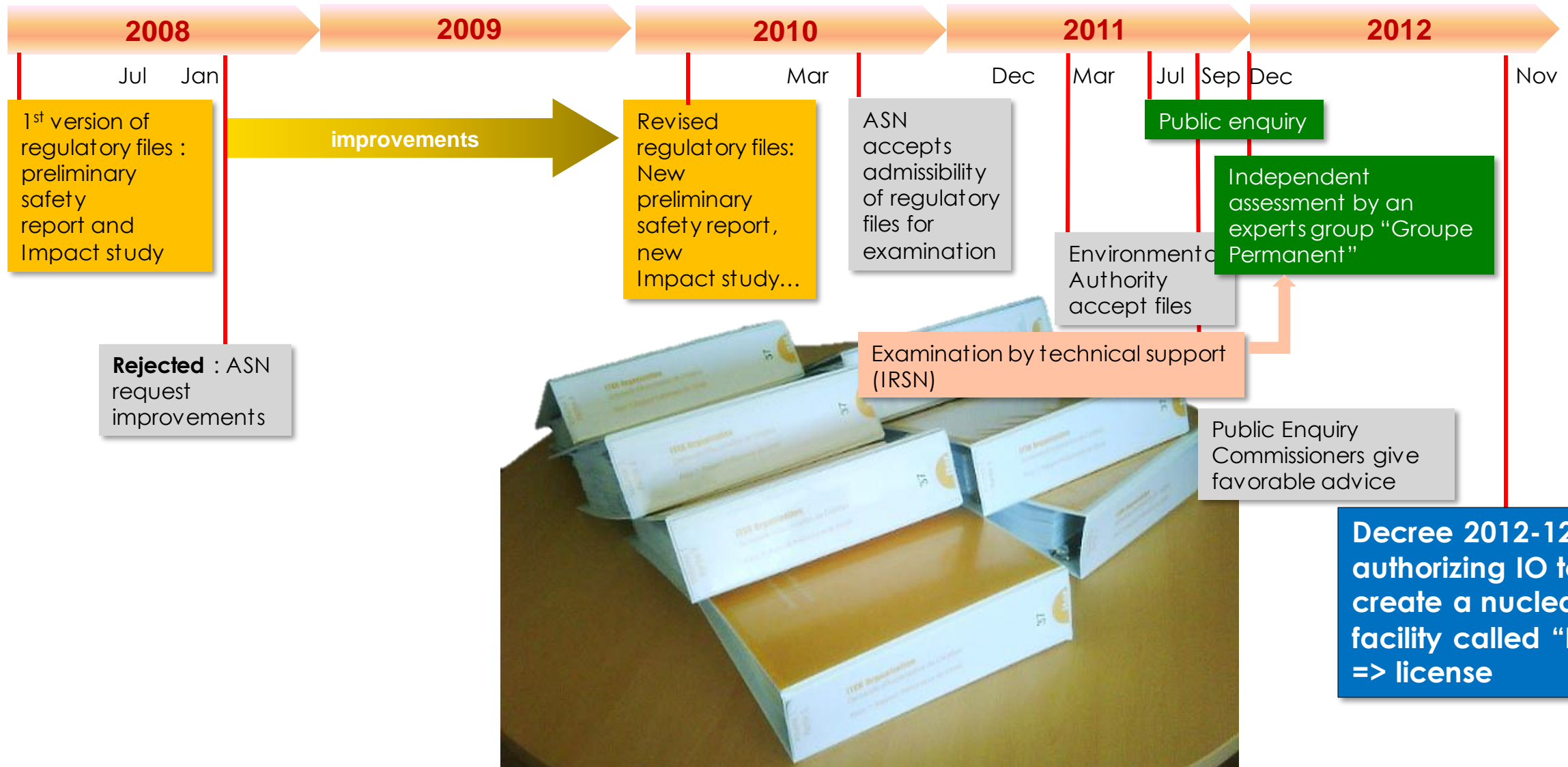
Licensing files for nuclear facilities

The licensing of a nuclear facility in France is governed by several legal codes and notably the *Environmental and public health codes*

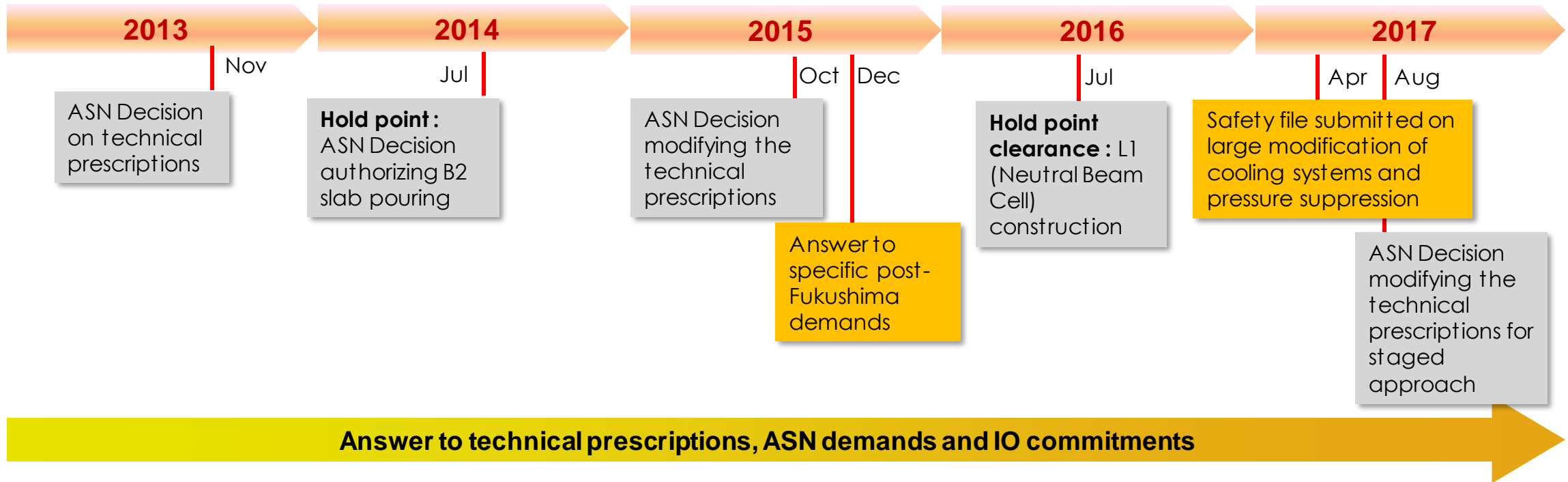
This licensing process relies on several stages

1. Virtual creation
 - Safety Options
2. Creation of the facility, subject to a decree (license)
 - 14 regulatory files
 - Among the 14 : **Preliminary Safety Report** and **Impact study**
 - Public Enquiry
3. Operation (first introduction of radioactive materials)
 - Safety Report – *Update of Preliminary Safety Report*
 - Safety General Operating Rules
 - Other files (Emergency plan, Waste management, decommissioning plan)
 - File stating the end of commissioning (synthesis of commissioning tests)
4. Periodic re-assessment of the facility every 10 years
5. Decommissioning / dismantling, subject to a new decree

Initial ITER licensing



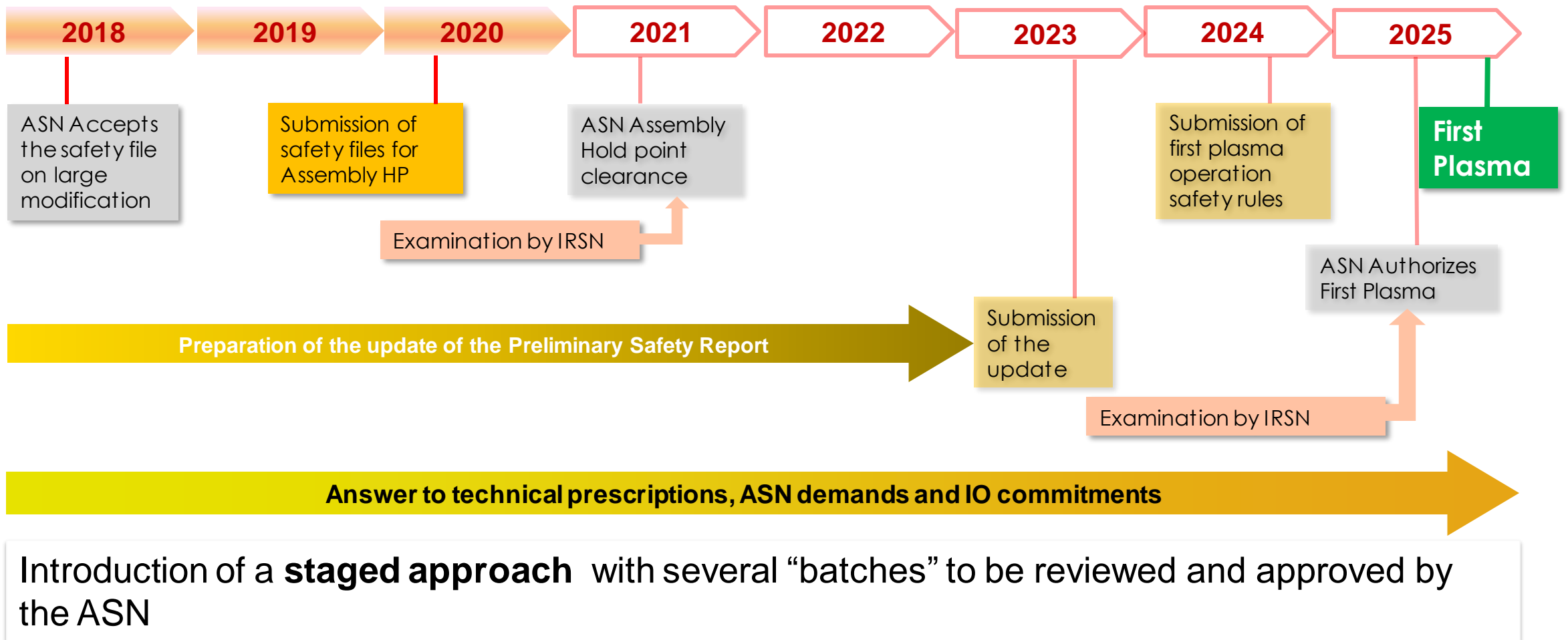
Steps in ITER licensing in recent years



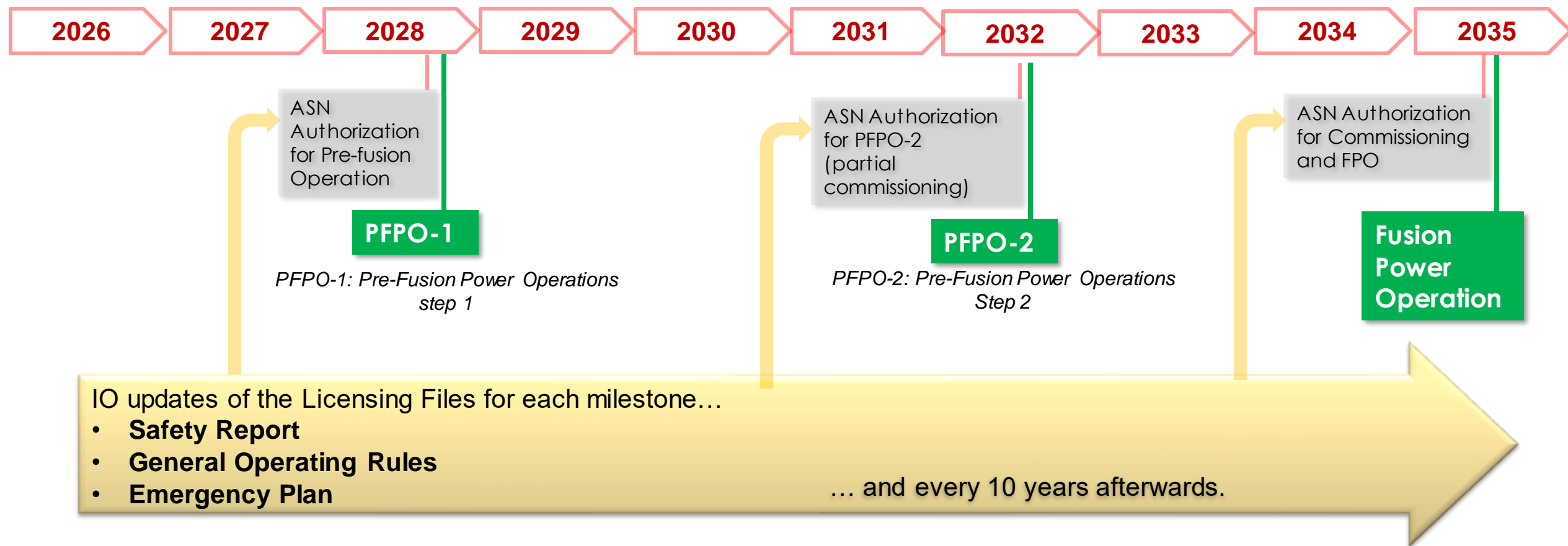
In November 2013, the ASN issues the Decision 2013-DC-0379 establishing the **technical prescriptions** applicable to ITER Organization.

This Decision contains **70 technical prescriptions** specific to the ITER facility. They come in addition to the **25 demands** made by the ASN during the licensing process, and to the **162 commitments** taken by the IO at that time.

Steps in ITER licensing in coming years



Steps in ITER licensing in coming years



IO updates of the Licensing Files for each milestone...

- **Safety Report**
- **General Operating Rules**
- **Emergency Plan**

... and every 10 years afterwards.

Staged approach: Major safety risks are included into each batch considering the specific risks of the “batch”:

- Fire and seismic hazards, Beryllium risks at early batches (First plasma)
- Tritium detritiation qualification, radiation protection programme (PFPO-2)
- Test blanket systems, and other “nuclear” topics (FPO)

Licensing Challenges

- **First of a kind and large scale research facility, with no equivalent license granted; uncertainties in the design addressed with a staged approach and use of demonstrative approach**
- **Thorough licensing process, with several hold points and regulator reviews**
- **The regulatory framework needs to be flexible enough to accommodate uncertainties and long term construction : Long term project, with several steps, not necessarily in line with the usual licensing timeline for other projects**
- **Codes and standards defined for fission nuclear power plants, not necessarily and fully adapted to a fusion facility**
- **Specific skills requested at the regulator and its technical support for specific not classical risks (plasma events, H2/dust explosion accident modelling, tritium fuel cycle risks...)**
- **Need to introduce specific safety “tips” from the persons who actually participated to the ITER licensing process**
- **Regulator’s inspections never stopped through a MOU specifying between 3 and 15 inspections per year, including worldwide inspections at the manufacturers sites as well as at domestic agencies sites**

ITER licensing experience in support of fusion

Lessons learned

- **The process has brought new experience in the field of licensing a Fusion Nuclear installation.**
- **Lessons learned are valuable for further fusion facilities and for the continuous licensing process for ITER**
- **The regulations and standards applicable to nuclear power plants have been / have to be adapted for their for fusion plants**
- **The fusion emblematic load cases (Cryogenic, Electro-magnetic, plasma events) have been confirmed**
- **Validating the input data for safety cases at the earliest stages and a strong configuration management process are key factors for a success**
- **The substantiation of the robustness of the first and second confinement systems is the basis of the success of the licensing process.**
- **The design margins are crucial to cover the uncertainties associated with a first of a kind installation.**
- **R&D is important as a key support of fusion safety, since several uncertainties can still be present in the determination of fusion reactor safety cases**
- **The robustness of the ITER design is confirmed by the very low impact of releases in normal and accidental conditions.**

ITER liLicensing Lessons Learned




- The relationship with the regulator should be based on trust, which is difficult to get and easy to lose.
- The transparency during the technical discussions has been highlighted by the ASN as a strong value for ITER Organization.



Transparence et information

La transparence et l'information de l'ASN et du public sont un point fort de l'Organisation ITER, mesuré au travers :

Summary

-  **ITER is the first large scale fusion facility licensed as a nuclear facility**
-  **ITER licensing process is on-going using a staged approach of the risks at several operation steps, supported by a demonstrative approach**
-  **ITER licensing experience will help to establish a robust regulatory framework among regulators**