France

Presentation of the sixth National Report

Sixth Review Meeting of the Joint Convention
Country Group 2

Will be presented in French

Presentation of the 6th French report

- **Views from the Regulatory Body (ASN)**

  Olivier GUPTA

  Director General of the French Nuclear Safety Authority
  (Autorité de sûreté nucléaire)

- **Views from the Waste Management Agency (ANDRA)**

  Pierre-Marie ABADIE

  Director General of the French Radioactive Waste Management Agency
  (Agence nationale pour la gestion des déchets radioactifs)

Presentation Contents

- Overview of national programme
- Challenges identified at the 5th RM
- Changes since last RM
- Presentation by Andra
- Current challenges
- Good practices and areas of good performance
- Questions on French report
- Conclusions

Presentation Contents

- Overview of national programme
  - Legal framework and Regulatory Body
  - Waste agency
  - National plan
  - Funding of waste management and decommissioning
  - Radioactive Waste and Spent Fuel Generation
  - Management routes and disposal facilities
  - Summary Matrix
- Challenges identified at the 5th RM
- Changes since last RM
- ➢ Presentation by Andra
- Current challenges
- Good practices and areas of good performance
- Questions on French report
- Conclusions

National programme overview

French policy on waste, spent fuel and decommissioning

Broad principles:

- Responsibility of the waste producers until waste elimination
- The amount of waste and its harmfulness must be minimised
- No foreign waste can be disposed of in France
- Involvement of general public

A management framework resting on 3 pillars:

- A clear legal and regulatory framework
- A dedicated public agency: **Andra**
- A triennial national plan: the **PNGMDR**

National programme overview

Legal and regulatory framework

3 European Directives:

- Responsible and safe management of spent fuel and radioactive waste
  (Council Directive 2011/70/Euratom of 19 July 2011)
- Basic Safety Standards for protection against the dangers arising from exposure to ionising radiation
  (Council Directive 2013/59/Euratom of 5 December 2013)
- Nuclear Safety of Nuclear Installations
  (Council Directive 2014/87/Euratom of 8 July 2014 amending Directive 2009/71/Euratom of 25 June 2009)

National programme overview

Legal and regulatory framework

Main Acts relevant to waste management

- Act of 30 December 1991 relative to research in the management of high-level long-lived radioactive waste
- Planning Act of 28 June 2006 on the Sustainable Management of Radioactive Materials and Waste (Waste Act)
- Act of 25 July 2016 relative to the creation of a deep geological repository

Other relevant Acts

- Act of 30 October 1968 relative to civil responsibility in the field of nuclear energy ("RCN" Act)
- Act of 13 June 2006 on Transparency and Security in the Nuclear Field (TSN Act)
- Act of 17 August 2015 on energy transition for green growth ("TECV" Act)

Most of these acts are codified in the Environment Code

National programme overview

Legal and regulatory framework

- **Decrees** and **ministerial Orders**
  - Nuclear safety of nuclear installations and the supervision of the transport of radioactive materials (Decree of 2 November 2007)
  - Management of disused sealed sources (Decree of 27 February 2015)
  - Modification, final shutdown and decommissioning of nuclear installations (Decree of 28 June 2016)
  - Triennial prescriptions of the National Plan (Decree + Order)
- **ASN** statutory general scope **Resolutions**
- **ASN Guides**

National programme overview

Regulatory Body: the Nuclear Safety Authority (ASN)

- Established by Law as an independent Authority in June 2006
- ASN is tasked, on behalf of the State, with regulating nuclear safety and radiation protection in order to protect people and the environment
- It informs the public and contributes to informed societal choices
- ASN decides and acts with rigour and discernment: its aim is to exercise oversight that is recognised by the citizens and constitutes an international reference
- Core-values:
  - Independence
  - Transparency
  - Competence
  - Rigour

National programme overview

Regulatory Body: the Nuclear Safety Authority (ASN)

- **ASN is independent of the Government**
  - ASN receives no instruction from the Government
  - ASN has powers to oblige licensees to stop operating nuclear installations.
  - ASN reports to Parliament and to the Public
- **The Commission embodies ASN independence**
  - The ASN Commissioners are non-dismissible
  - The Commission defines ASN strategy
  - It submits ASN opinions to the Government and issues ASN resolutions

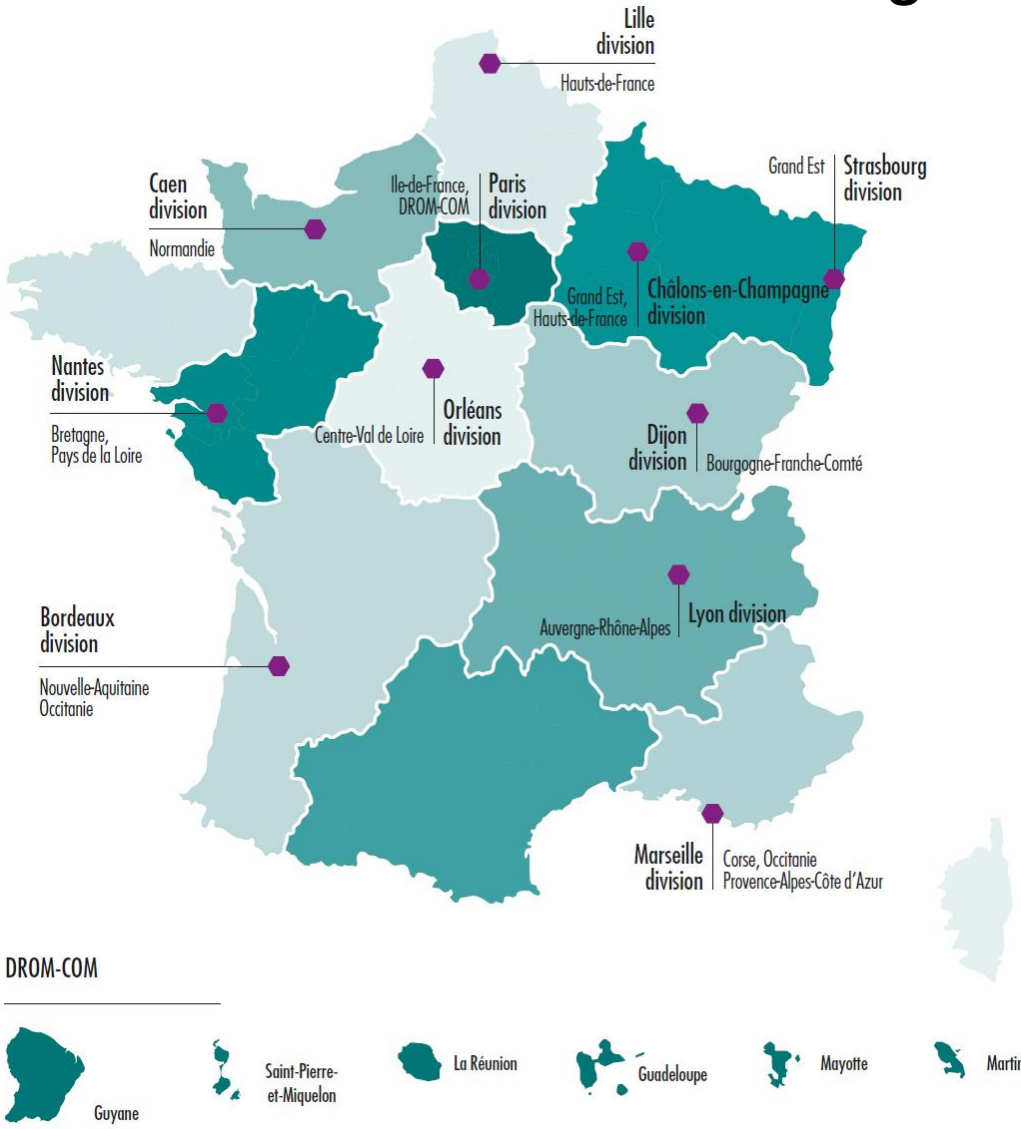
National programme overview

Regulatory Body: the Nuclear Safety Authority (ASN)

- **Five Main duties**
  - Regulations
  - Authorisations
  - Inspections/enforcement
  - Emergency preparedness and response
  - Public information
- **Some principles**
  - Integrated view of nuclear safety and radiation protection
  - Graded approach
  - Continuous improvement of nuclear safety
  - International benchmark

National programme overview

ASN's regional offices



- 11 regional offices
  - Up to 40 staff per regional office
  - Offices near nuclear installations (< 3 hours' drive)
- Conduct most of the inspections

National programme overview

ASN's technical support and resources

- Technical support bodies
  - **Institute for Radiation Protection and Nuclear Safety - IRSN**
    - Created by the law of 9 May 2001
    - ASN main technical support organisation (TSO)
  - For major issues: **7 advisory committees of experts**
- Resources for oversight of nuclear safety
  - **ASN staff:** about 500, half in headquarters (Paris suburbs), half in regional offices, including 270 nuclear safety inspectors. **ASN budget: ~ € 80 M**
  - About 500 dedicated experts within **IRSN**. **Expertise costs: ~ € 85 M**

Supervision of civilian nuclear activities: ~ 1,000 persons

~ € 165 M

National programme overview

Waste management's agency

Andra: public agency in charge of radioactive waste management

- Created in 1991 (1991 Act)
- Notably in charge of:
  - Managing the existing disposal facilities
  - Research
  - Design and construction of disposal facilities
  - The national inventory of radioactive material and waste on the French territory

National programme overview

National plan and inventory

- National inventory
  - Since 2004, updated every 3 years by Andra
- National Plan for management of radioactive materials and waste (PNGMDR)
  - 1st issue in 2007, renewed every 3 years
  - Prepared by an open working group (including Andra, waste producers and NGOs) co-headed by the Ministry in charge of energy and ASN
  - Concerns all radioactive waste and materials
  - Specifies the management routes existing and to be implemented
  - Identifies areas to be improved and emits recommendations which become binding through regulatory texts
  - Describes the research work

National programme overview

Funding of waste management and decommissioning

- Facility operators support the full liability of waste and spent fuel management and decommissioning (“long term charges”)
- They must secure this funding through dedicated assets
- **This securing is controlled by the Government**
- Operators must submit every 3 years a report describing
  - A conservative assessment of their long-term charges
  - The method applied to calculate accruing provisions to those charges
  - The choices made regarding the composition and management of the assets
- Every year they provide an update note of that report
- They inform the Government without delay of any event likely to modify its content

National programme overview

Types of radioactive waste and management routes

<table>
<tr><th>Half-life
Activity</th><th>Very short half-life
(< 100 days)</th><th>Short half-life (SL)
(≤ 31 years)</th><th>Long half-life (LL)
(> 31 years)</th></tr>
<tr><td>Very Low Level (VLL)</td><td rowspan="3">Management by radioactive decay</td><td colspan="2">Surface disposal facility (CIRES)</td></tr>
<tr><td>Low Level (LL)</td><td rowspan="2">Surface disposal facilities
▪ CSM
▪ CSA</td><td>Dedicated sub-surface facility under study</td></tr>
<tr><td>Intermediate Level (IL)</td><td rowspan="2">Deep Geological Repository under study (Cigéo)</td></tr>
<tr><td>High Level (HL)</td><td></td><td></td></tr>
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National programme overview

Radioactive waste and spent fuel generation

NPPs in operation	EDF
Fuel cycle	Orano, Framatome (formerly Areva)
RRs, laboratories	CEA, ILL
Facilities being decommissioned	EDF, Orano, CEA
Storage facilities	EDF, Orano, CEA
Mining/milling tailings	Orano
Legacy waste	EDF, Orano, CEA

- Large range of sealed and unsealed radioactive sources
  - Hospitals, conventional industries and research

National programme overview

Radioactive waste and spent fuel generation

58 power reactors in operation, 1 in construction

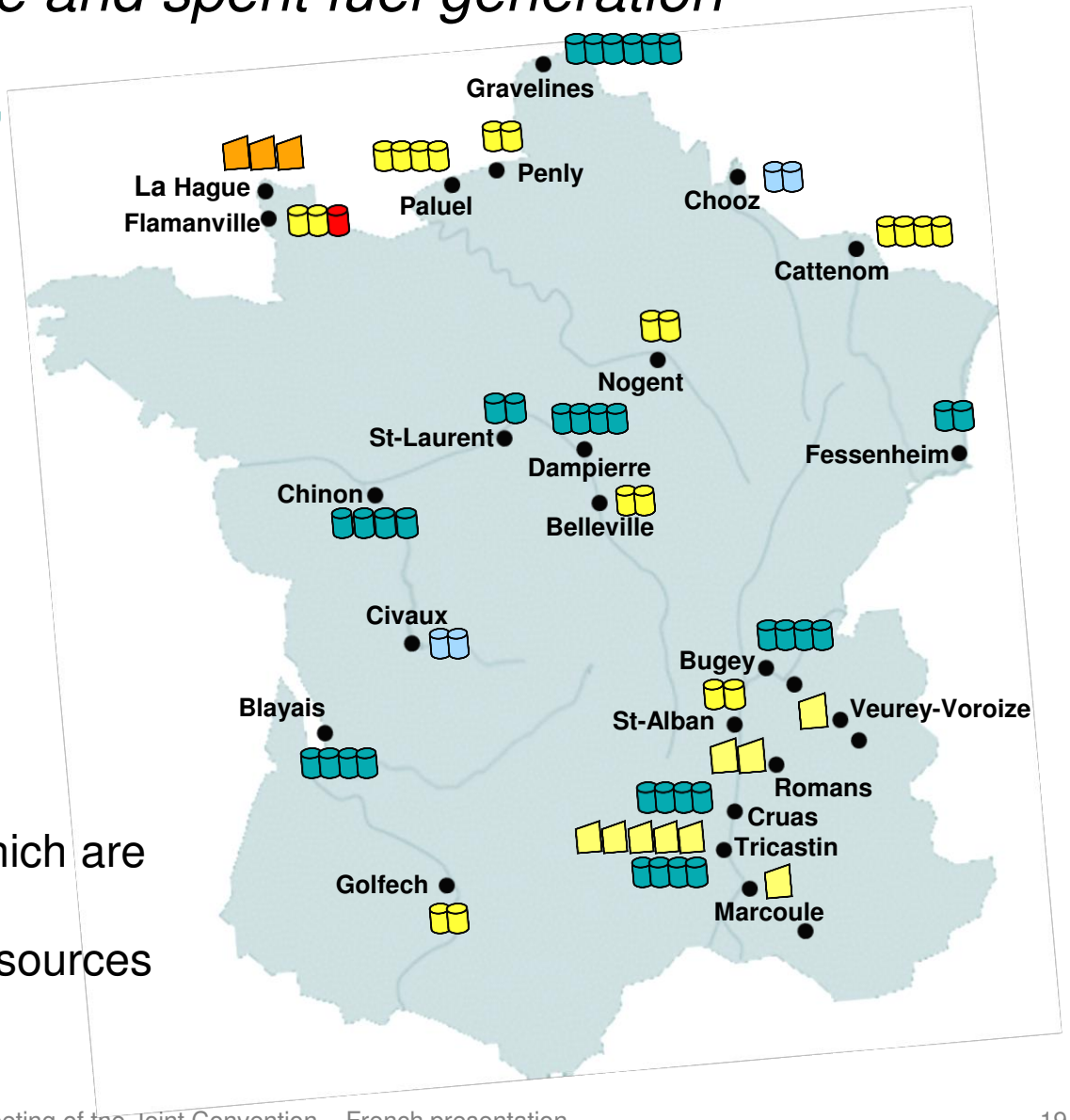
900 MWe ( )
1300 MWe ( )
1450 MWe ( )
1650 MWe EPR in construction ( )

12 Fuel cycle facilities

- Enrichment and manufacturing
- Spent fuel processing and storage

Unsealed and sealed sources users

- ~ 48,000 sealed sources 80% of which are for the industrial sector
- 747 nonmedical users of unsealed sources
- 232 Nuclear medicine units

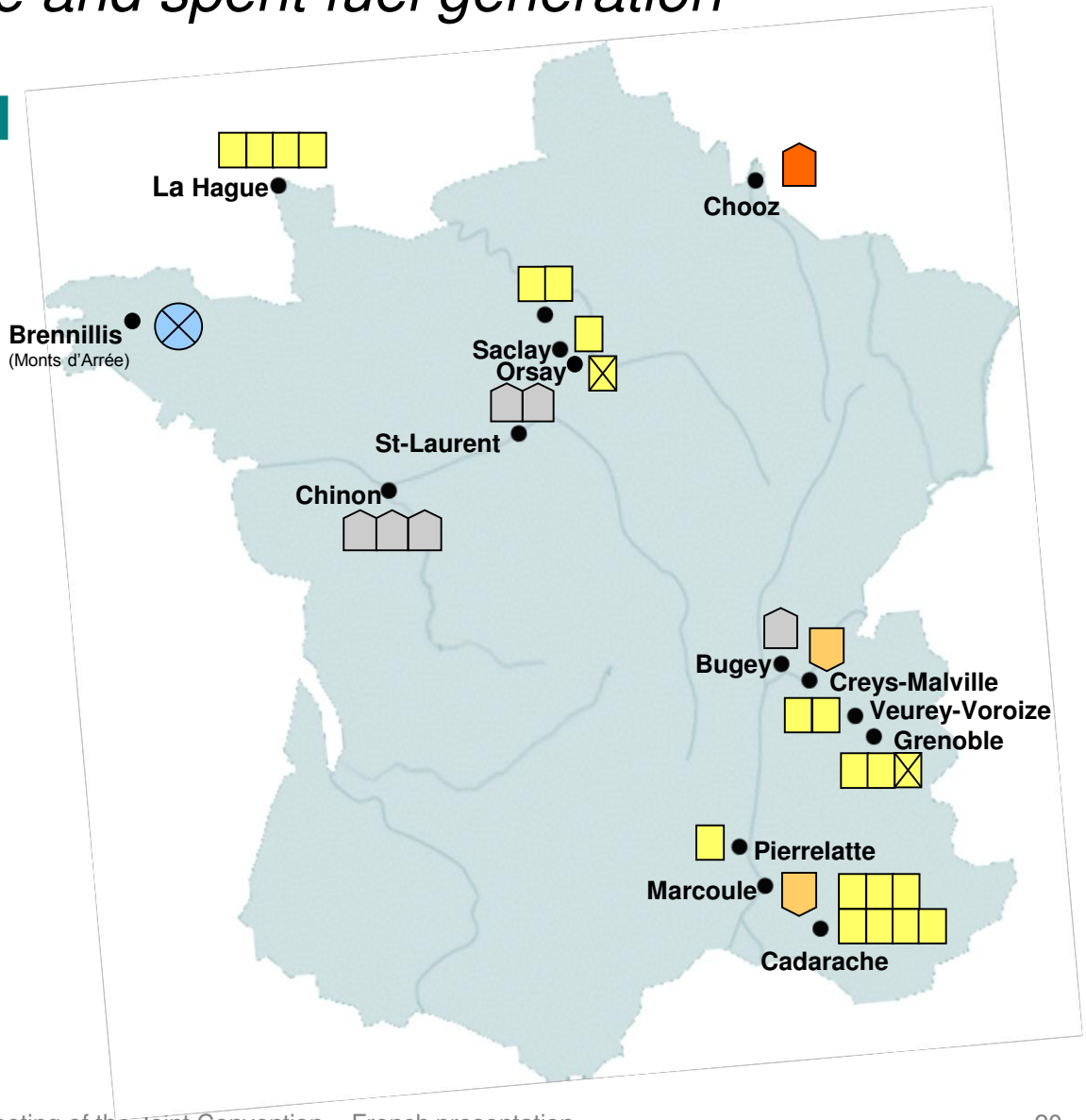


National programme overview

Radioactive waste and spent fuel generation

Facilities being dismantled or shut-down

- 10 power reactors:
  - ➢ 6 GCRs
  - ➢ 1 HWR
  - ➢ 1 PWR
  - ➢ 2 FNRs
- Other facilities
- Facilities delicensed since the 5th RM



National programme overview

Disposal facilities and URL

Repositories

1. Centre de stockage de la Manche (CSM), *undergoing closure*

   LIL-SL: 527,000 m^3 *

2. Centre de stockage de l'Aube (CSA)

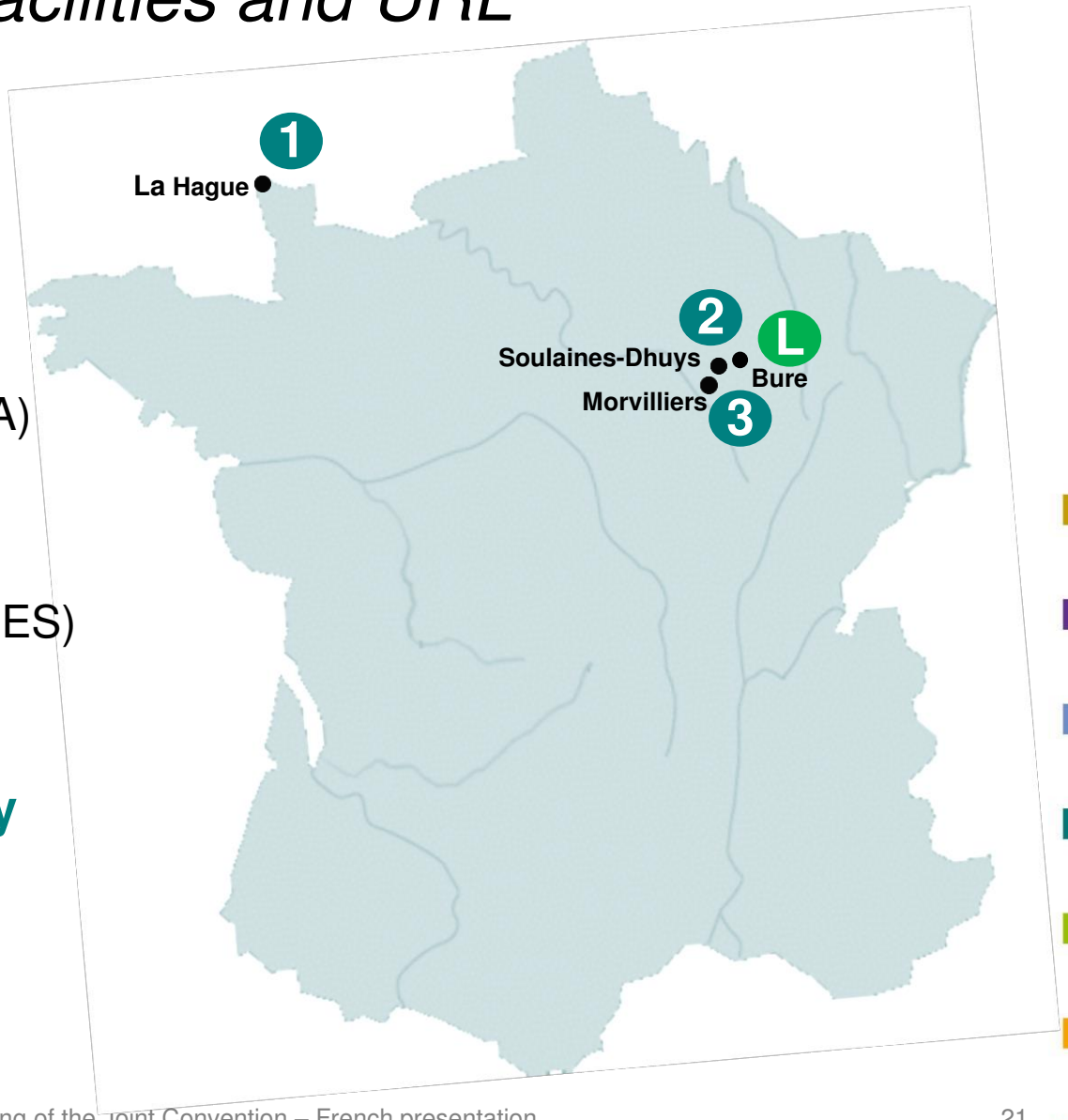
   LIL-SL: 316,000 m^3 *

3. Centre industriel de regroupement, d'entreposage et de stockage (CIRES)

   VLL: 360,000 m^3 *

Underground research laboratory

L. Bure laboratory



** Volumes of waste disposed of by end of 2016*

National programme overview

Stored waste inventory

Type of waste	Volume *(m^3)*
HL waste	**3,650**
IL-LL waste	**45,000**
LL-LL waste	**90,500**

Total volume of HL, IL-LL and LL-LL waste stored at the end of 2016 (in m^3)

National programme overview

Spent fuel inventory

Location	Mass of French spent fuel in storage (t)
La Hague (Orano)	9,739
EDF NPP sites	4,150
CEA centres	88

Mass of French fuel stored at the end of 2016 (in metric tonnes)

National programme overview

Summary Matrix

Type of responsibility	Long-term management	Financing	Current practice / Installations	Planned installations
Spent fuel	Reprocessing	The owner finances reprocessing.	La Hague reprocessing plant (licensing to be modified to reprocess all spent fuels).	
Waste from the nuclear fuel cycle	Disposal	The producer finances. Ring-fenced assets are required by law for ultimate waste.	LLW/ILW-SL waste is disposed of in the CSA and VLLW in the CIRES; storage for the other waste.	New disposal centres for HLW, ILW-LL and LLW-LL (under study).
Waste not from energy production	Disposal routes must be set up for certain waste.	The producer finances.	Disposal centres for VLLW and LLW/ILW-SL waste. Management by decay for VSL waste.	Projects ongoing for substances containing radium and other waste (LLW-LL).
Decommissioning	Immediate dismantling after shutdown.	The licensee finances. Ring-fenced assets are required by law.	Dismantling initiated immediately after shutdown.	
Sealed sources removed from service	Return to manufacturer. Disposal or recycling routes being implemented.	System of insurance between users and suppliers or deposit of a bond with ANDRA.	A few sources are disposed of in the CSA and CIRES. Storage in specific facilities.	New repositories for HLW, ILW-LL and LLW-LL (under study). Storage in the CIRES.
Ore extraction and preparation waste	Stabilised in-situ and reinforced monitoring.	Responsibility of licensee (Orano)	Stabilised mines.	

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Challenges for France identified at 5th Review Meeting

- Deep geological disposal (Cigéo project):
  - Proposal for safety options to be submitted by the end of 2015
  - General objectives of reversibility to be defined by law
  - Followed by the submission of the license application based on detailed design in 2017
- LL-LL waste:
  - Roadmap to be drawn up by the relevant Ministry (to be included in the 2016-2018 PNGMDR)
- Decommissioning of fuel cycle facilities (incl. UP2-400 La Hague)
- Management of legacy waste
- Plan for the management of disused sealed sources
- Strategy for the management of large quantities of VLL waste from plant decommissioning
- Post-Fukushima actions
- The available capacity of the CIRES facility is expected to be reached earlier than anticipated
- Decommissioning and waste disposal for gas-cooled reactors

Presentation Contents

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  - Evolution of regulatory framework
  - National inventory and national plan
  - International peer-review missions
  - Disposal facilities
  - Post-Fukushima actions
  - Legacy waste
  - Decommissioning
  - Disused sealed sources
- ➢ Presentation by Andra
- Current challenges
- Good practices and areas of good performance
- Questions on French report

Changes since 5th Review Meeting

Evolution of regulatory framework

- "TECV" Act of 17 Aug 2015 + Ordinance of 10 Feb 2016 + Decree of 28 June 2016
  - Enshrine in the Law the principle of decommissioning in as short a time as possible
- Act of 25 July 2016
  - Detail the steps towards creation of a deep geological repository
  - Provide precision on reversibility concept
  - Strengthen citizen involvement
- ASN general scope Resolutions, mainly:
  - 2015-DC-508: NIs' waste management studies and waste inventories
  - 2015-DC-532: Contents of NIs' safety reports
  - 2017-DC-587: Packaging of rad waste and conditions of acceptance in repositories

Changes since 5th Review Meeting

New or updated ASN Guides

Related to waste or decommissioning

- ASN Guide No 6: Shutdown, decommissioning and delicensing, 2016
- ASN Guide no 7: Transport of radioactive substances, 2016
- ASN Guide no 14: Structures' remediation in nuclear installations, 2016
- ASN Guide no 23: Establishment and modification of waste zoning in nuclear installations, 2016 **NEW**
- ASN Guide no 24: Management of polluted/contaminated soils, 2016 **NEW**

Published on ASN's website www.asn.fr

Changes since 5th Review Meeting

National waste management strategy

- Update of National Inventory of Radioactive Waste in June 2015
  - Lists quantities and location of all rad' waste and materials on French territory
  - Includes estimates of quantities to be produced up to 2030
  - Published on Andra website: www.andra.fr
  - Next release: June 2018

Changes since 5th Review Meeting

National waste management strategy

- National Plan (PNGMDR) for 2016-2018
  - 4th issue (after 2007, 2010 and 2013)
  - Includes recommendations with the general aim to:
    - reinforce the coherence between waste management strategy and decommissioning programmes;
    - consolidate the radioactive waste production forecasts, particularly for very low level waste;
    - reinforce the storage strategies pending the availability of final management solutions

Changes since 5th Review Meeting

International Peer Reviews

- **Cigéo's Safety Options** Specific IAEA-organised peer review mission in Nov 2016
- **IRRS** follow-up mission in Oct 2017 (after 2014 full scope mission)
- **Artemis** mission in Jan 2018
  - No recommendation, 7 suggestions
  - **7 good practices** in France's waste management policy

➢ *Reports published on ASN website* www.asn.fr

Changes since 5th Review Meeting

ASN opinions 2015-2018

Main ASN opinions related to waste and decommissioning

- Cigéo's safety options (Jan 2018)
- Draft Decree and Order for National Plan (PNGMDR) 2016-2018 (Dec 2016)
- In relation with PNGMDR:
  - 4 opinions on the operators' studies on waste management (Feb-Mar 2016)
    - VLL & LIL-SL
    - LL-LL,
    - HL & IL-LL
    - Particular waste
  - Operators' studies related to recycling of certain types of radioactive materials (Feb 2016)
  - Operators' studies on management of legacy waste (Feb 2016)
- Draft decree on licence of CEA's DIADEM facility to store IL-LL waste (Nov 2015)
- Draft decree for shutdown and decommissioning of Phénix FNR (Dec 2015)

Changes since 5th Review Meeting

Disposal facilities

- **Cigéo** project for HL and IL-LL waste
  - Safety Options Dossier submitted to ASN by Andra in April 2016 after public consultation
    - IAEA-organised peer-review on Safety Options Dossier Nov 2016
    - Assessment conducted by ASN with expertise of IRSN and Advisory Experts Groups
    - ASN's Opinion on Safety options released in Jan 2018 after public consultation: Project technically mature, recommendation concerning management of bituminised waste packages
  - Creation Licence Application to be submitted in 2019 by Andra

Changes since 5th Review Meeting
Disposal facilities

- **LL-LL waste**
  - Disposal project under study,
  - Plan of industrial system to be submitted by end 2019 by Andra
- **VLL waste**
  - Extension of current disposal capacity under study
  - Creation of a second repository under study
  - Andra to update its industrial scheme in 2020
  - PNGMDR prescribes
    - Work on reducing the volumes of VLL waste produced and on recycling prospects
    - Studies of disposal solutions providing alternatives to a centralised repository

More detail in Andra's presentation

Changes since 5th Review Meeting

Post Fukushima actions

Within the framework of the French and European Post-Fukushima stress test policies:

- **Facilities under decommissioning:** stress tests results have been reported to ASN, some follow-up actions undergoing
- **Andra's disposal facilities:**
  - CSA: Stress test report transmitted to ASN in Aug 2016, under review
  - CSM: Stress test report to be transmitted in 2019

Changes since 5th Review Meeting

Legacy Waste

Context:

- Long term management solution exists for 90% of the rad' waste in volume
- Remaining waste, mainly **legacy waste,** are stored pending solution
- Storage and/or packaging was carried out several decades ago with less stringent regulatory requirements
- Full retrieval and (re)packaging are necessary to meet the requirements for future disposal
- **The Law stipulates that all IL-LL waste produced before 2015 must be retrieved and packaged by 2030**

Changes since 5th Review Meeting

Legacy Waste

Updates:

- Progress on retrieval and packaging has been made
- Main facilities/operators concerned:
  - UP2-400 unit at Orano La Hague
  - Cadarache and Saclay CEA centres:
    - Solid waste in storage facilities to be decommissioned
    - Spent fuel from research reactor
  - EDF's graphite waste from shut-down GCRs
    - Processing, packaging and disposal concepts under study
- ASN ensures that operators' actions make it possible to meet the 2030 deadline

Changes since 5th Review Meeting
Decommissioning

- 2 facilities delicensed since last RM
- 32 facilities under decommissioning
  - 10 Power reactors (1st gen HWR, GCRs (6) and PWR; 2 FNRs)
    - New strategy for EDF's GCRs under assessment by ASN (dismantling under air):
      - Industrial demonstrator with remote manipulator tools before 10 years
  - Large fuel cycle facilities:
    - UP2-400 unit in La Hague
    - Eurodif enrichment plant: decommissioning application under review
  - Research reactors, laboratories, storage and smaller fuel cycle facilities

Changes since 5th Review Meeting

Disused sealed sources

- Decree of 27 Feb. 2015 on management of disused sealed sources
  - Specifies precise routes for all cases
    - DSSs must be retrieved by original supplier
    - If supplier no longer exists, any supplier is allowed to retrieve DSSs
    - DSSs manufactured before 2012 are retrieved by CEA
    - In case of impossibility of retrieval by source suppliers, DSSs are retrieved by Andra
  - Promotes recycling
- Acceptance criteria in disposal facilities
  - Existing for CIRES and CSA
  - To be established for Cigéo and future LL-LL repository

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Current challenges

- Cigéo project
- LL-LL waste
- Decommissioning of shut-down fuel cycle facilities and NPPs
- Management of legacy waste

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Artemis mission's outcome

*Good practices noted by the **Artemis** mission (January 2018)*

- **The systematic and structured manner of all the successive steps of management of radioactive materials and waste**, taking account of all interdependencies and management factors and of all stakeholders;
- **The legally binding character** of, and **continuing government commitment** to, the key actions identified in the ***National Plan*** for the management of spent fuel and radioactive waste to ensure progress in the objectives of the national policy;
- **The comprehensive *National Plan* includes all waste types** and nuclear materials, as well as alternative future scenarios and management routes. Preparation, implementation and follow-up of the plan is well organized, main stakeholders are committed, and continuous improvement of the plan takes place efficiently;

Artemis mission's outcome

*Good practices noted by the **Artemis** mission (January 2018)*

- The approach to compiling, maintaining, and publishing the ***National Inventory***, providing the *National Plan* with a **thorough record of all radioactive materials and waste types**, is commendable, as is the **proactive effort to identify legacy inventories and sources**;
- The development of preliminary safety cases or evaluations for facilities not only for the planned scenarios but also for **scenarios resulting from a change in the national strategy** fosters sound planning and decision making;
- Requiring the **creation of tangible assets to cover decommissioning and radioactive waste management liabilities** and giving these assets legal protection; and
- **The efforts made by the major actors** of the radioactive materials and waste management programme to establish, **to develop and to maintain the necessary and required competence and skills** of staff is robust and exemplary.

Suggestions for areas of good performance

- **Road map for all types of waste in national plan** (either a solution or an action plan with milestones)
- **Clear agenda for management of HLW, ILW-LL**
- **Requested international peer-review missions (Cigeo's safety options, Artemis)**
- **Legal framework for decommissioning as quickly as possible**
- **Legal framework of disused sealed sources**
- **Post Fukushima-Daiichi stress tests performed for fuel cycle and waste management facilities**
- **Transparency and information/participation of general public**

Suggestion for good practices

- **Enhanced legal framework for the reversibility of the deep geological disposal thanks to a continuous commitment over the years of Government and Parliament**
- **Legal framework for securing the funding for radioactive waste management and decommissioning long-term charges (dedicated assets periodically controlled)**

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Questions on French report

- **140 Questions and comments** posted to France by 21 countries
- Questions/answers file is published on ASN website (www.asn.fr)
- Main topics addressed:
  - Cigéo and LLW-LL repository projects
  - Rationale for reversibility principle
  - Funding system of waste management and decommissioning
  - Immediate decommissioning
  - Clearance
  - Legacy waste
  - Peer-review missions
- Good practices outlined in comments:
  - Systematic and transparent process for planning national programme
  - 2030 deadline to retrieve and package IL-LL waste produced before 2015
  - Disused sealed source retrieval policy

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Conclusions

- Strong and continuous commitment over the years of Government and Parliament to management of radioactive waste
- Strong will to involve general public
  - Public consultation on Cigéo
  - Public debate on PNGMDR 2018-2020
- Wide opening to international peer reviews

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