Challenges faced by the EDF Nuclear Operations Division

WNU Summer Institute
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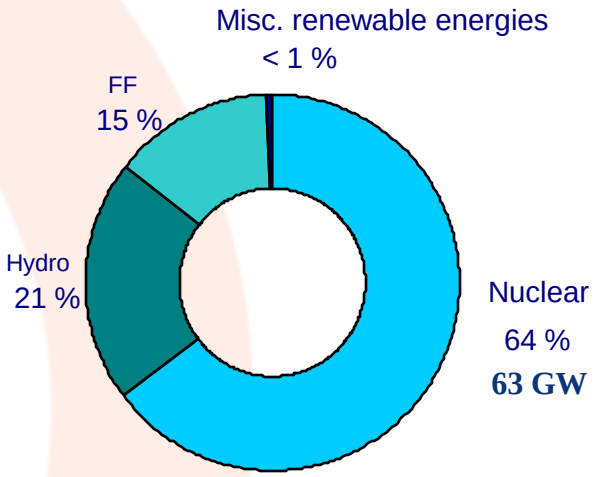
5. **Securing new skills for the future**
6. **Preparing tomorrow's leaders**

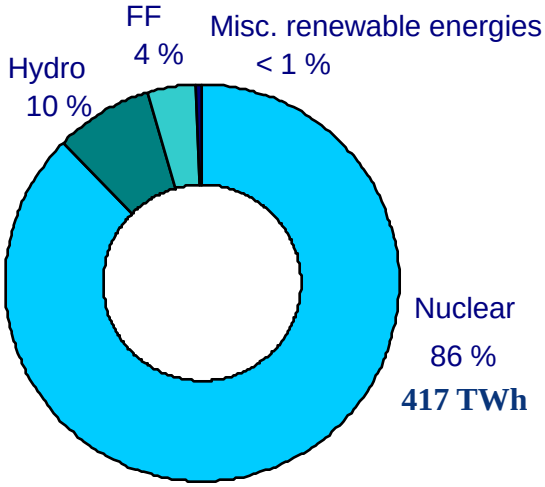
1. Presentation of the French nuclear fleet

1.1 - The position of nuclear power within EDF's energy mix (France)

Installed capacity 98 GW (2008)



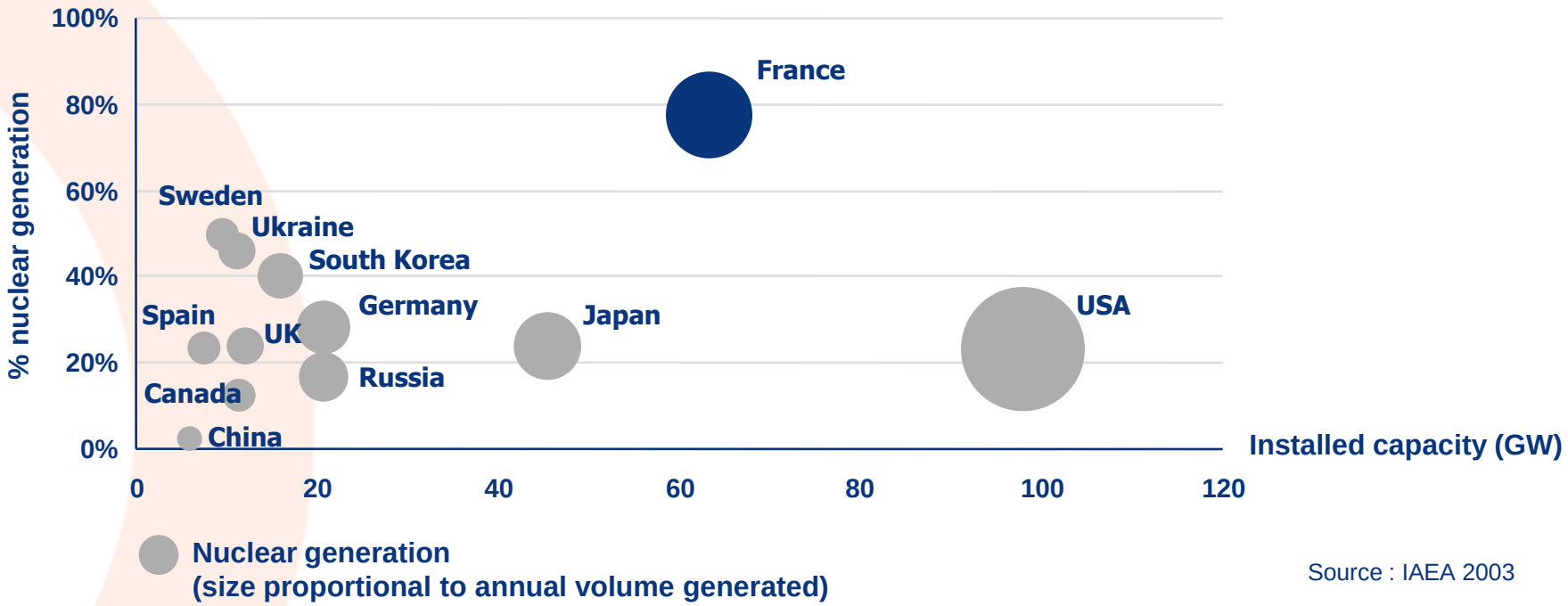
Power generated 484 TWh (2008)



- A competitive energy mix, 95 % of which is not affected by the price of hydrocarbons

1. Presentation of the French nuclear fleet

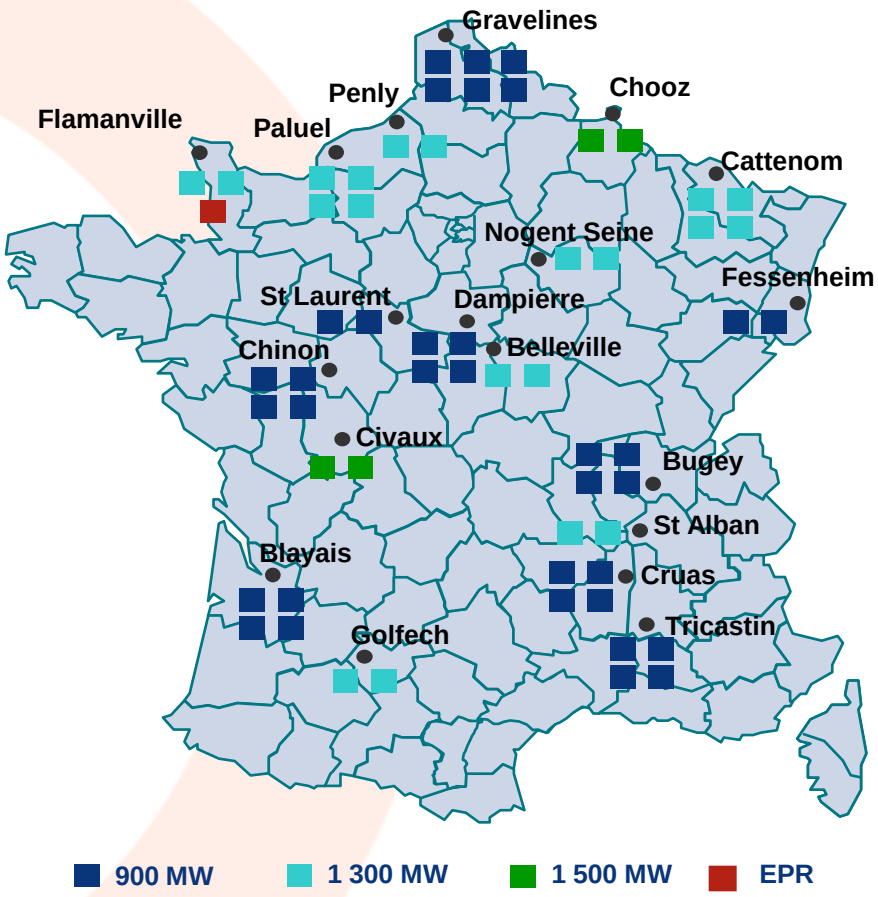
1.2 – A unique global position



Source : IAEA 2003

1. Presentation of the French nuclear fleet

1.3 - Characteristics of the nuclear fleet



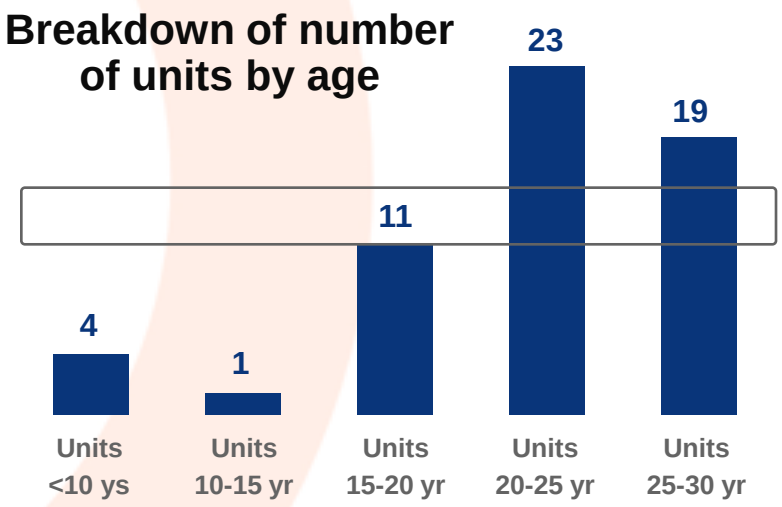
- 17 % of global nuclear generation capacity
- 80 % of power generated in France
  - 58 reactors in operation, spread across 19 sites
  - One type of technology : PWR
  - 3 output levels, depending on reactor series :
    - Thirty-four 900-MW units
    - Twenty 1300-MW units
    - Four 1500-MW units
  - 9 reactors currently being decommissioned
  - 1 reactor currently being built (Flamanville 3)
  - Average age : 23 years

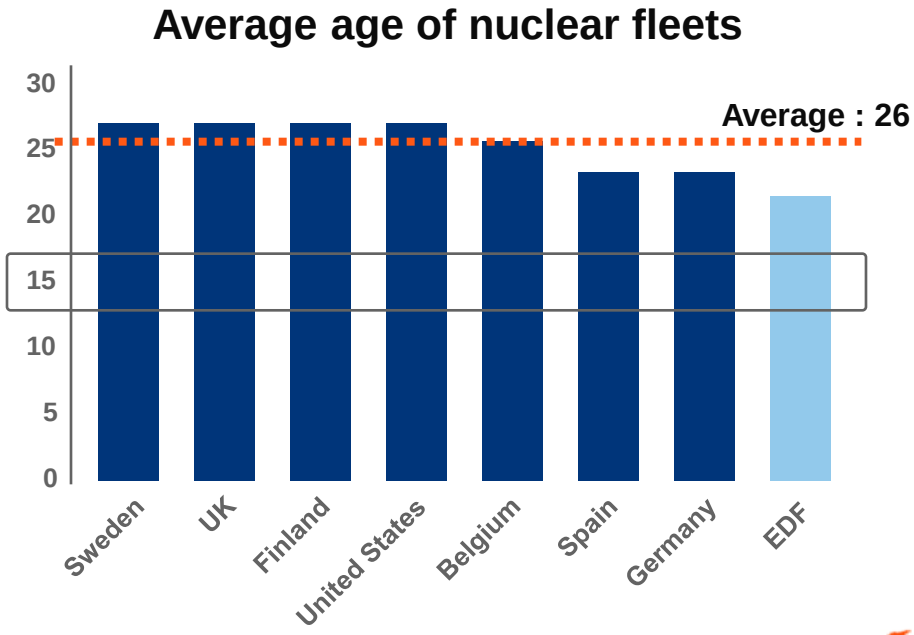
- EDF is owner of the nuclear installations and of the sites.

1. Présentation du Parc Nucléaire français

1.4 - A Young and mature fleet

- **Average age of 23 years** (from 6 to 30 years) vs. an industry average of 26 years.
- **44 GW** commissioned between 1980 and 1990.

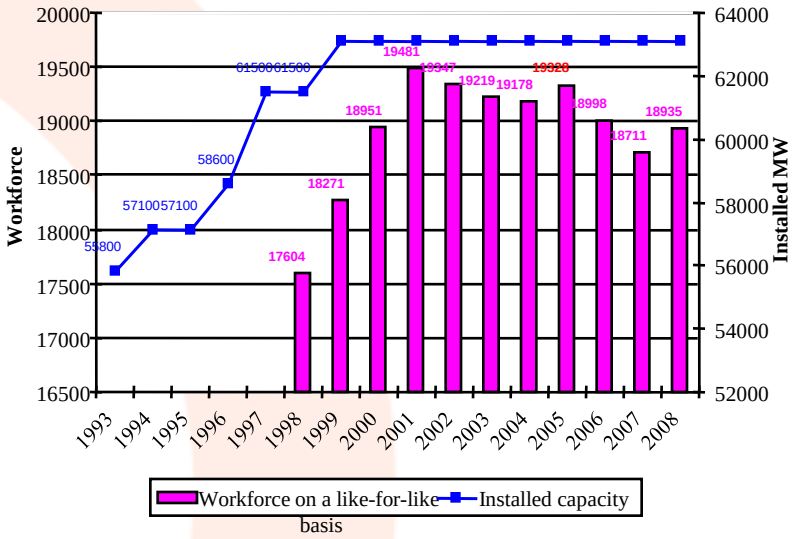




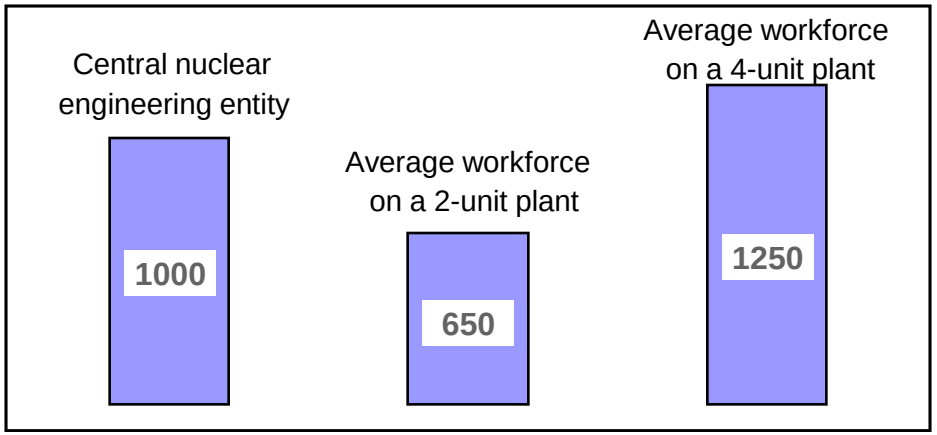
1. Presentation of the French nuclear fleet

1.5 – Close to 23 000 EDF employees,18 000 of which work on nuclear power plants

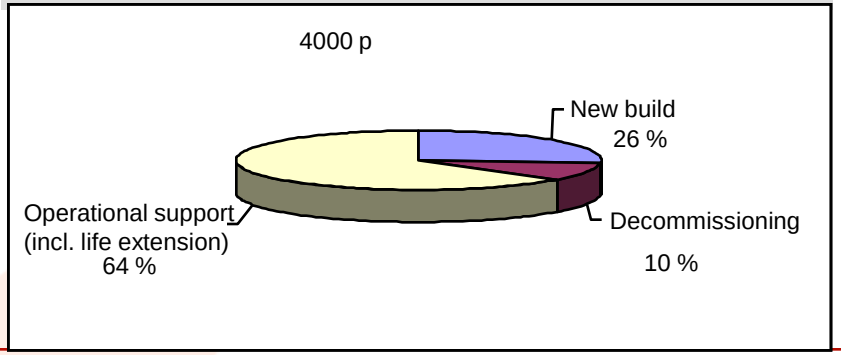
Trend in staff numbers as against installed capacity



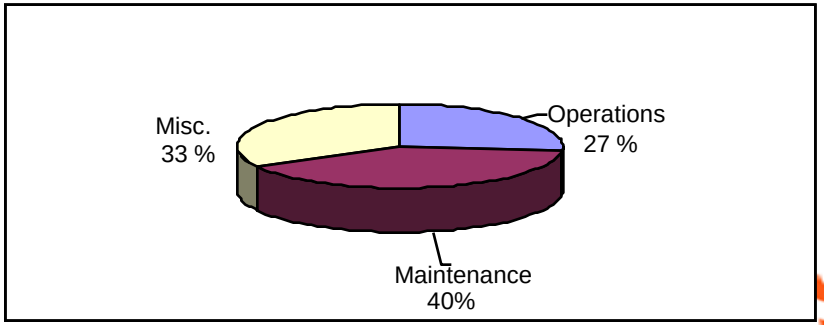
Centralized staff numbers and NPP staff numbers



Centralized design engineering workforce



Fleet-wide spread



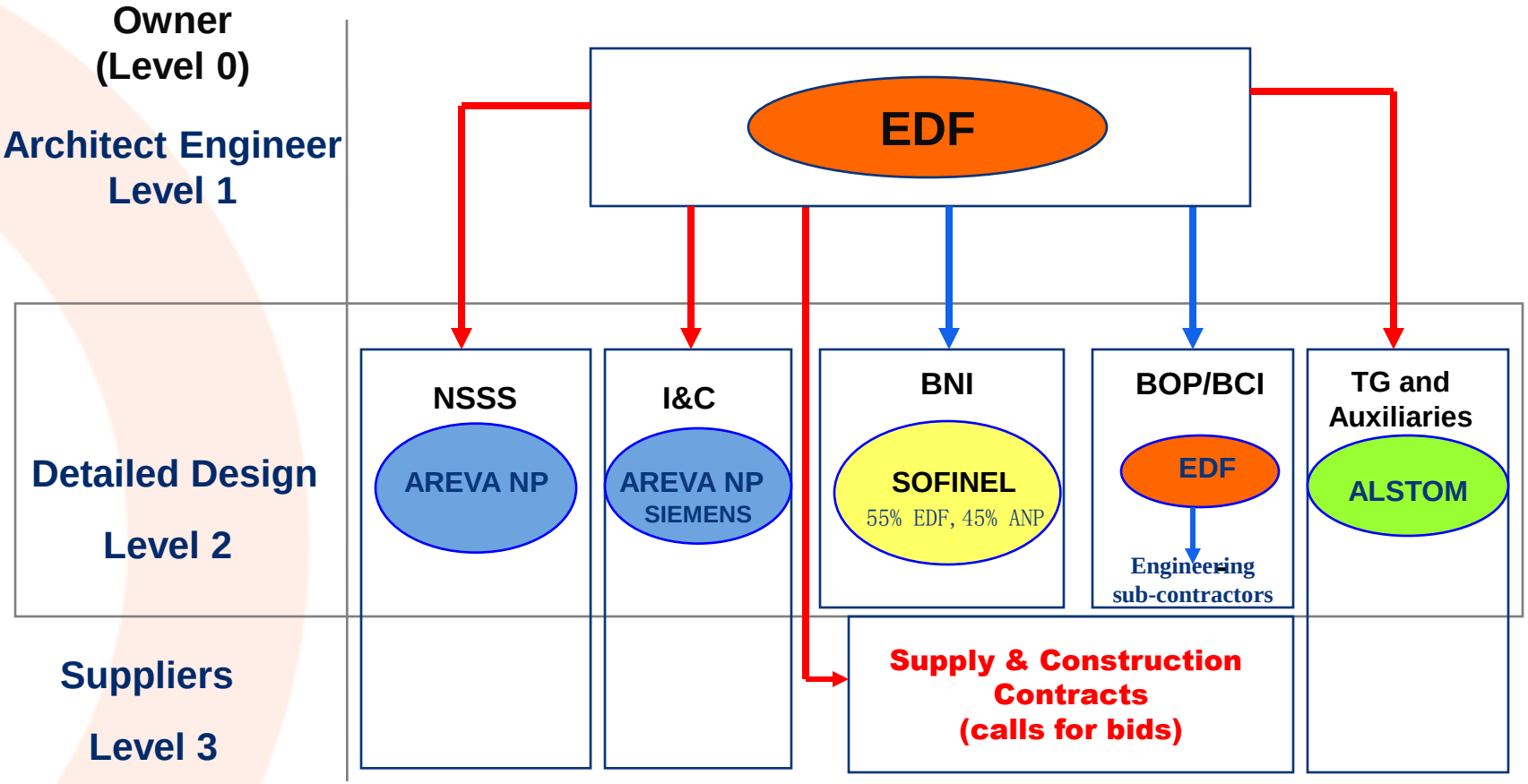
2. The EDF engineering model

2.1 – One guiding principle : the architect-engineer

- The architect-engineer is involved right from the design phase through to the decommissioning of a power plant.
- In its role as architect engineer, EDF assumes the following responsibilities :
  - **Manages the project** (quality, schedule, cost, risks, interfaces, etc.).
  - **Interfaces with the Nuclear Regulatory Authority.**
  - Awards contracts, places orders and **manages contracts.**
  - **Defines technical reference standards.**
  - **Optimizes "owner's costs"** by incorporating French nuclear operating experience into design.
  - **Oversees detailed vendor design studies** and **equipment manufacturing quality**.
  - **Coordinates** on-site **construction** and **commissioning tests.**
- Through its involvement in high added-value activities, EDF is thus able to **ensure that its needs are met while at the same time optimizing costs.**

2. The EDF engineering model

2.2 - Architect-engineer : Application of the principle to the Flamanville 3 project



3. Operational safety management

3.1 – Key aspects of safety risk management by EDF

- Given the standardized design of the EDF nuclear fleet, as well as its size and its significance for the EDF Group :

▪ Safety culture and safety management are constantly at stake.	→	▪ “Cult” of transparency and “safety first”.
▪ Any safety issues giving rise to significant capability loss would have considerable economic consequences.	→	▪ The amount of capital expenditure required for guarding aginst these issues is small when compared with the potential effects.
▪ Whenever design modifications are required, they must be able to be fitted promptly if need be.	→	▪ The standardized fleet allows for modifications to be standardized.
▪ Safety issues – and generic issues in particular — have very powerful effects in terms of public image.	→	▪ The nuclear operator is always in the foreground.

3. Operational safety management

3.2 – A permanent technical monitoring structure

- Risks :
  - Failing to identify a precursor event in France or the rest of the world.
  - Failing to detect the generic nature of an event.
  - Failing to get to grips with the nature and pace of requisite actions.

- Measures taken to guard against these risks :
  - Monitoring of French and international operating experience, as well as analysis of events liable to adversely affect safety or availability (almost 20 000 a year).
  - Additional analyses in order to ascertain whether international events could occur in France.
  - Development of “just in case” remedies.
  - Powerful R&D capacity : materials research.

3. Operational safety management

3.3 – Possessing the right industrial tools

- Risks :
  - Failing to be fully in command of technical strategies requiring the regulator's approval.
  - Failing to secure the necessary industrial resources on the contractor market, or only being able to secure them at a prohibitive cost.
  - Failing to maintain contractor skills.

- Measures taken to guard against these risks :
  - Implementing an asset management strategy, supported by routine programmes.
  - Equipping oneself with a solid engineering structure to support operations.
  - Ensuring that one has a selection of suitably qualified contractors.

3. Operational safety management

3.4 – Remaining mindful of the effects of a standardized fleet

- Risks :
  - Being in possession of processes, methods and procedures which have failed to incorporate fleet-wide operating experience.

or

  - Depriving each plant of its discretionary leeway through the standardization of every last detail, which could potentially result in :
    - Inappropriate solutions being devised for individual plant specificities;
    - Managers losing their sense of accountability and no longer taking the initiative;
    - Loss of staff motivation.

- Measures taken to guard against these risks :
  - Standardization of all things liable to generate benefits at a reasonable cost.
  - Plant involvement in the setting of standards.
  - Encouraging innovation.
  - Explicitly promoting experimental initiatives.

3. Operational safety management

3.5 - Management focus on safety (1/3)

- Risks
  - A management structure that is not sufficiently committed or that does not exhibit visible signs of commitment.
  - Insufficient and/or poor oversight.
    - Fleet safety = Safety of the fleet's weakest link
  - Tendency of the Nuclear Operations Division to be too inward-looking.
  - Production placing too much strain on operational safety.

3. Operational safety management

3.5 – Management focus on safety (2/3)

⊙ A robust safety oversight structure

Chairman of the Board

- ⊙ Nuclear Safety Inspector General
  - Annual report made public

Nuclear Operation

- ⊙ Associate Director for Nuclear Safety
  - Nuclear Inspectorate : 35 engineers

Power Station

- ⊙ Senior Safety/Quality Advisor
  - Implementation of safety standards on site
  - A team of safety engineers

O&M teams

- ⊙ Safety Engineer
  - Supports the shift manager

Nuclear Safety Council

Operational Safety Review Committee

Plant Safety Review Committee

Daily Nuclear Safety meeting

3. Operational safety management

3.5 – Management focus on safety (3/3)

- Regularly assessing each plant
  - Three-yearly comprehensive safety reviews (EGS) conducted by the Division's Nuclear Inspection Department.
  - A Joint Peer Review (JPR) conducted by WANO every 6 years.
  - A targeted safety review (ECS) conducted 18 months after the EGS.
- Exhibiting visible signs of commitment through the entire line of command
  - Each plant manager briefs the Vice-President of the Nuclear Operations Division on his plant's annual safety performance.
  - 3 to 4 times a year, members of DPN senior management conduct inspections on the various plants.
- Strong safety leadership
  - A special monitoring structure at plant and at corporate level to review and challenge the decision-making process and ensure, with indsight, that safety is always granted precedence in the event of major arbitrations.

4. The importance of outsourcing

4.1 - The benefits of outsourcing

- Why outsource maintenance work ?
  - Focus on fundamental activities (operations, project design and construction, day-to-day project management, etc.).
  - Use of professional expertise (specialised work, expertise, etc.).
  - Use of external operating experience.
  - Proper management of peak and off-peak work periods.
- Outage work : Approx. 85 % of work performed by contractors, and 15 % by EDF personnel.
- Work performed during the power cycle : Approx. 50 % of work performed by contractors.

4. The importance of outsourcing

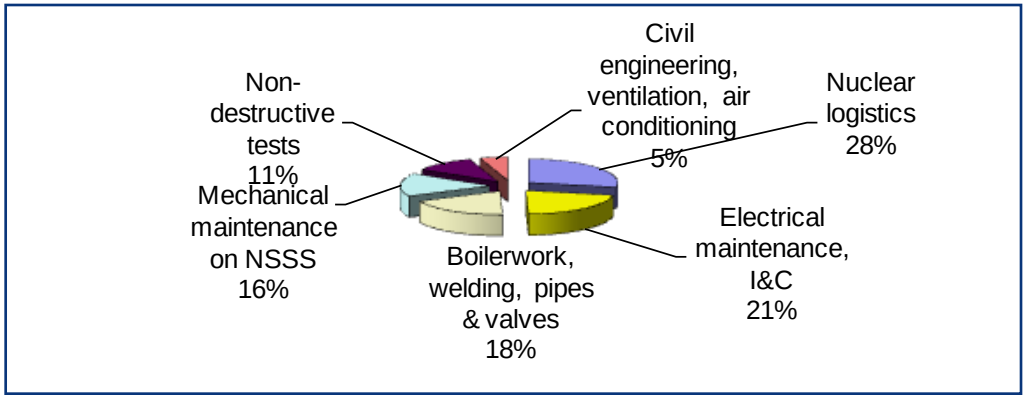
4.2 – Qualification and certification of contractors

- Contractors have to be qualified to work on nuclear power plants.
  - An audit is performed to evaluate contractors on the basis of four criteria:
    - Technical ability and performance
    - Socio-economic performance & contribution to EDF's objectives
    - Nuclear safety and quality assurance
    - Industrial safety, radiation protection and the environment
  - Contractor qualification is valid for 3 years.
  - Only qualified contractors are allowed to perform safety-related work on EDF nuclear power plants.
- Any contractor employing personnel that is regularly required to work in nuclear areas must be in possession of a CEFRI certificate (French contractor certification committee overseeing the training and monitoring of workers exposed to ionizing radiation).

4. The importance of outsourcing

4.3 – Overview

- About 400 contract companies are qualified by EDF, based on the following criteria :
  - Technical ability,
  - Socio-economic performance,
  - Safety/quality,
  - Industrial safety/Environment.



- Approx. 17 000 workers
  - Having received basic training in the areas of safety, quality and radiation protection, identical to that received by EDF staff.
  - 60 % of whom work on one plant, and 20 % of whom only work on two closely situated plants.
  - 14 million man.hours, including 7 million during outage.

4. The importance of outsourcing

4.4 – Charter on continuous improvement and sustainable development

- Signed by EDF and 13 labour organizations in 2004.
- Several areas for improvement :
  - Transparent contractor bidding process,
  - Enhancement of worker professionalism,
  - Procurement and more accurate workload forecasting,
  - Reduction of individual and collective dose,
  - Improved risk prevention,
  - Better working conditions and accommodation close to nuclear power plants,
  - Housekeeping and environmental protection.
- These areas for improvement are jointly managed and monitored.
  - Six joint work meetings a year, plus an annual meeting attended by corporate executives.
- **Example of improvement : From 2004 to 2008, the contractor industrial safety accident rate fell by 40 %.**

5. The need for continuous improvement

5.1 - Safety first : Human Intelligence beside Technical Design

- The Human Factor and its Issues had to be considered alongside Quality Management System and Design :

80's (Post-TMI)

- Position of Nuclear Safety Engineer is created : independent line
- Ergonomic analysis is taken into account
- From event-oriented procedures to the state-oriented approach

- Nuclear Safety Culture (IAEA INSAG 4) : Human Factors are taken in account :

90's (Post-Chernobyl)

- Nuclear Safety Culture is asserted as an overriding priority
- Operations Shift Managers are created to embody nuclear safety culture and empower high industrial performances
- Position of Human Factor Counsellor is implemented
- Competencies issues : questions concerning safety skills and work conditions (including contractors) are taken into account

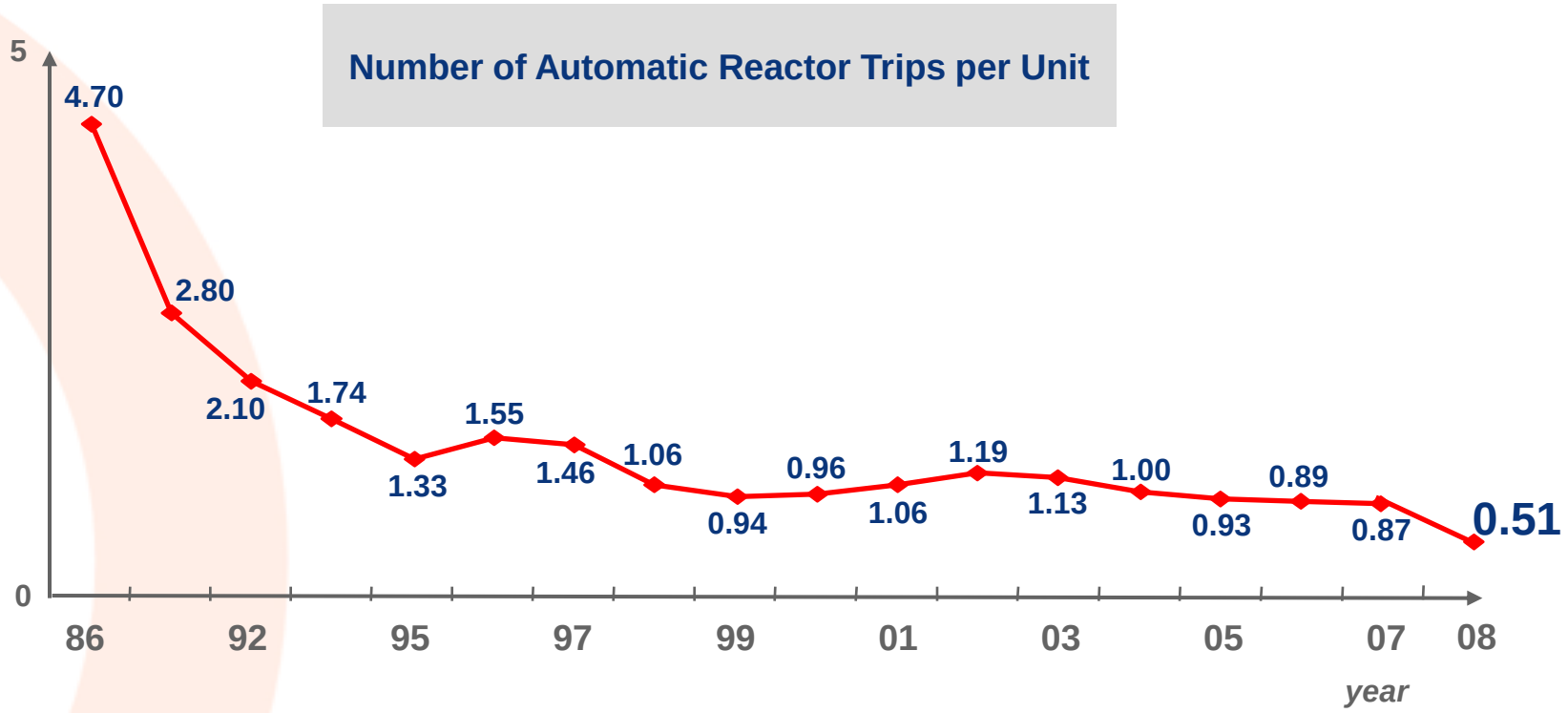
- Nuclear Safety Management Process :

2000's

- Continuous improvement process for EDF and contractors teams
- Risk Analysis are strengthened
- Human Performance Tools are implemented.

5. The need for continuous improvement

5.2 - Significant improvements including increasingly stringent nuclear safety rules

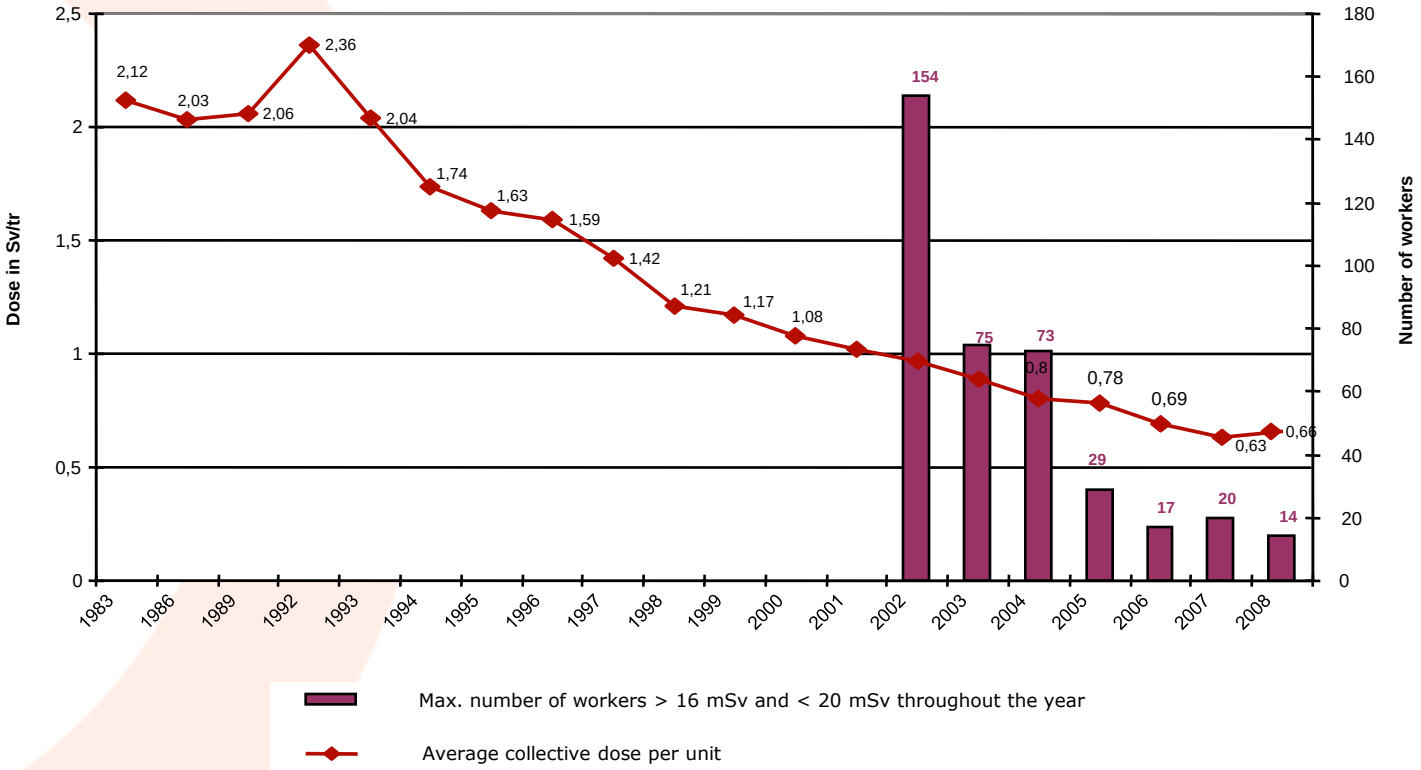


- Thanks to a specific maintenance program dealing with the main causes of SCRAM failure and the implementation of Human Performance tools, a new record low has been achieved in 2008.

5. The need for continuous improvement

5.4 - Radiation protection : Drop in collective and individual dose

Collective and individual dose

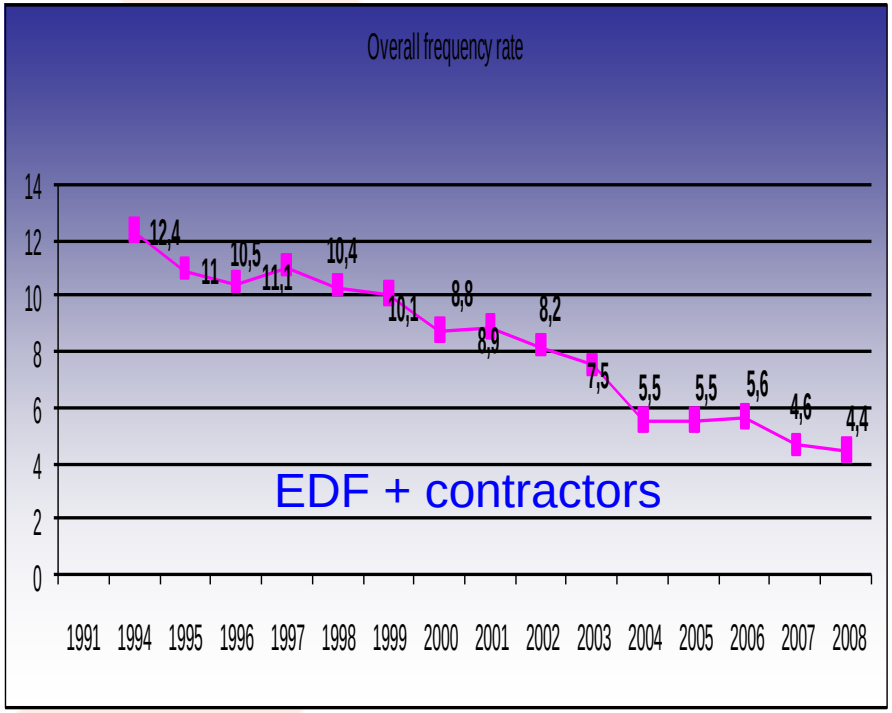


- **Drop in individual worker dose**
- **e.g. 30 % drop from 2004 to 2008 among heat insulation fitters**

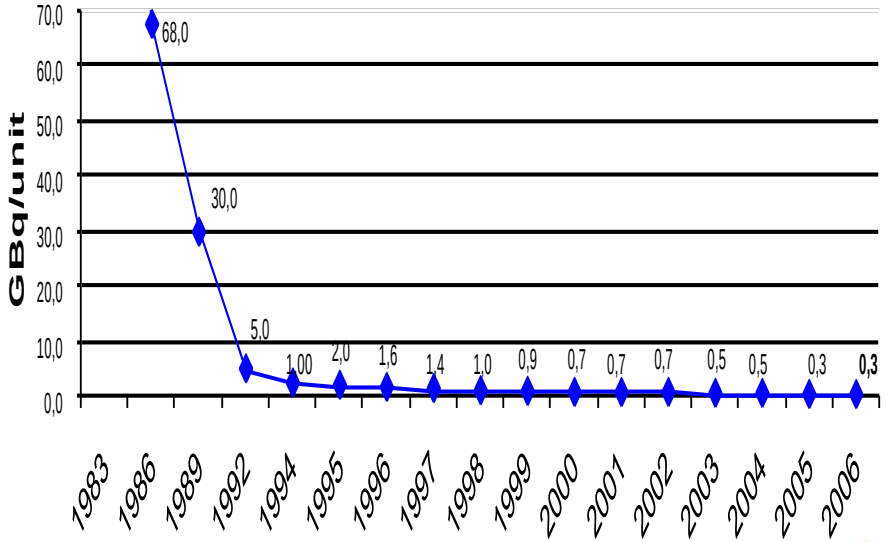
5. The need for continuous improvement

5.5 - Industrial safety and radioactive liquid waste

Industrial safety accident rate (injuries per million hours worked)

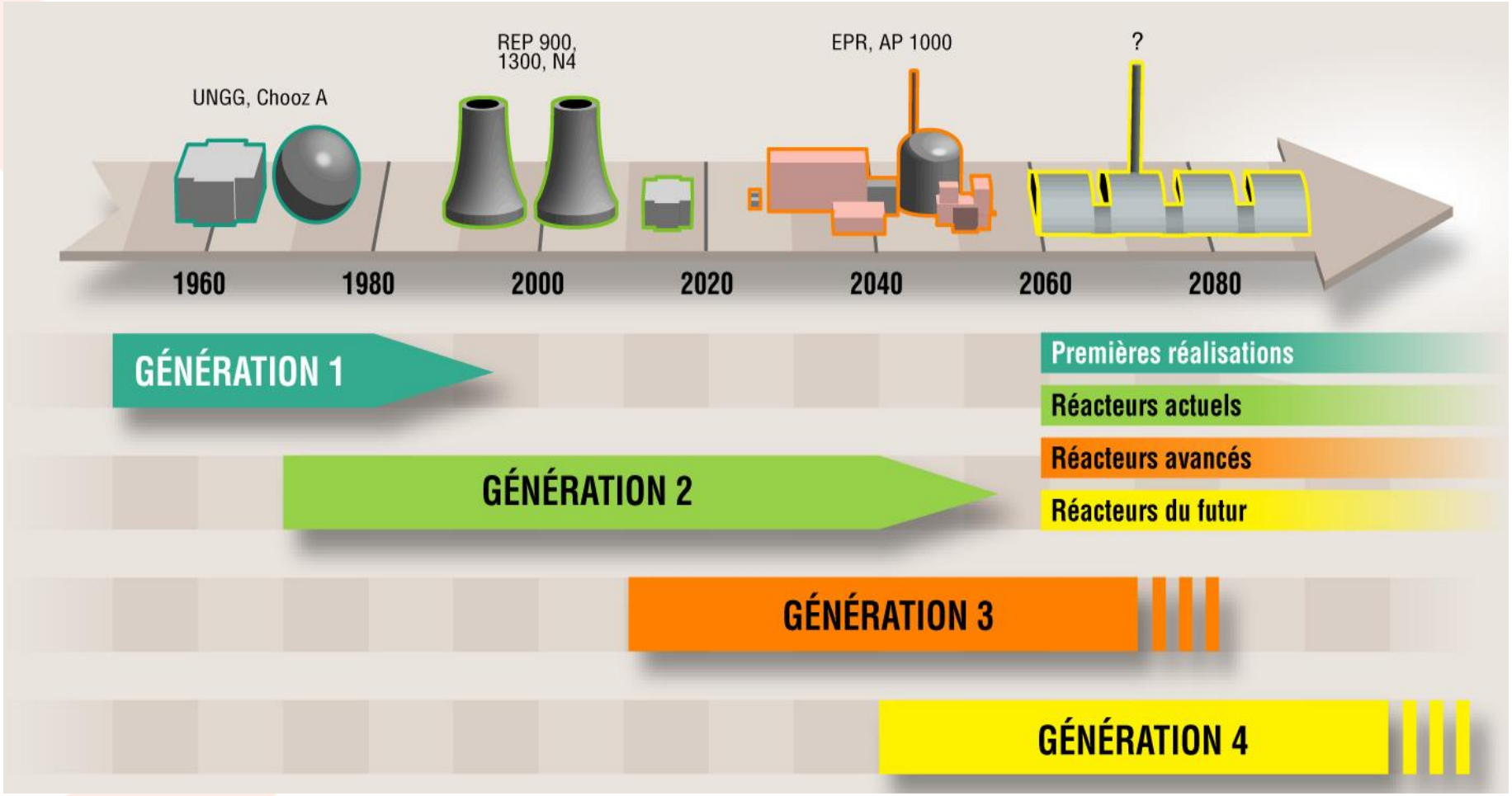


Liquid discharges excl. tritium and C14 per unit (in GBq)



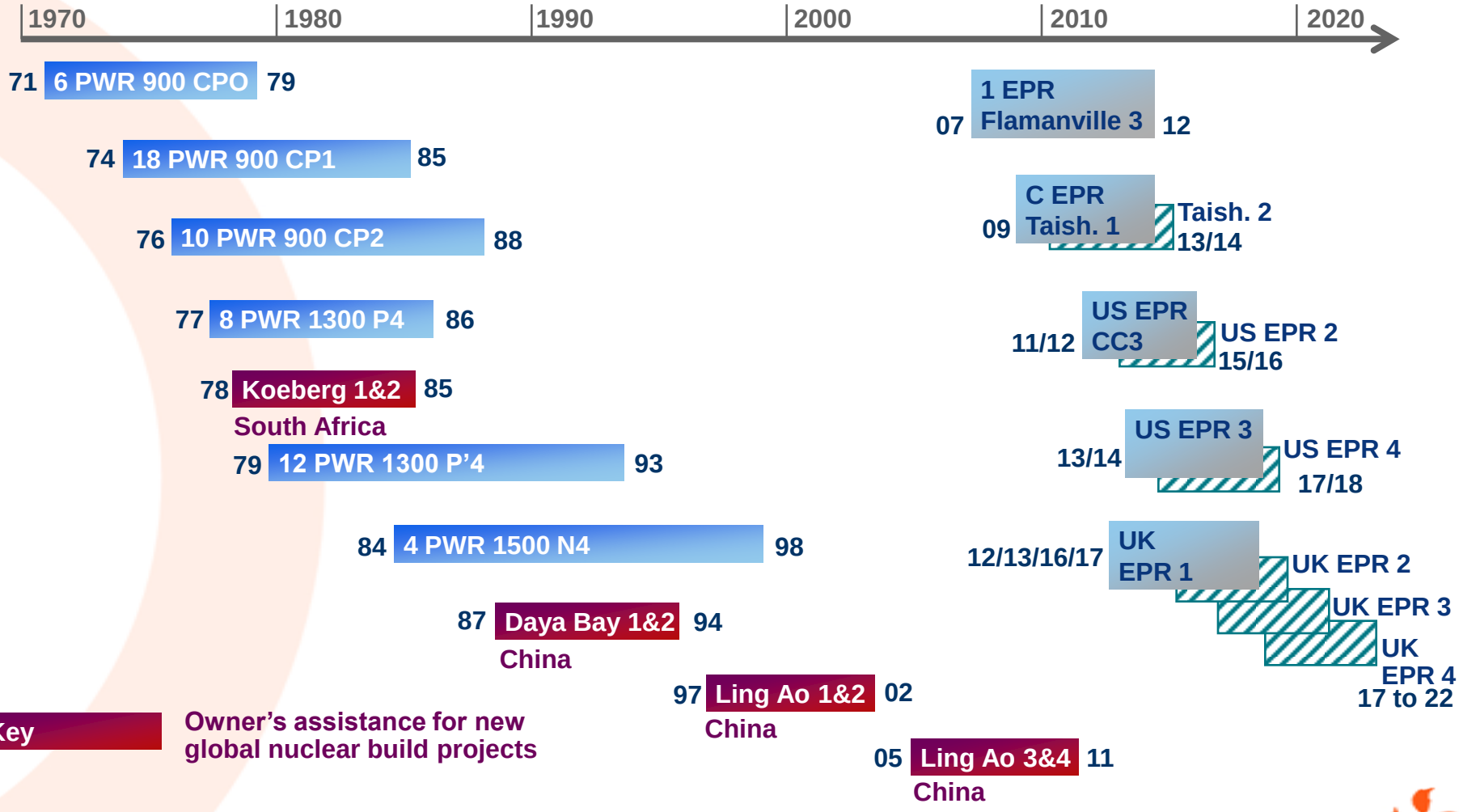
6. EDF production & engineering strategy

6.1 – Background : Continuous construction (1/2)



6. EDF production & engineering strategy

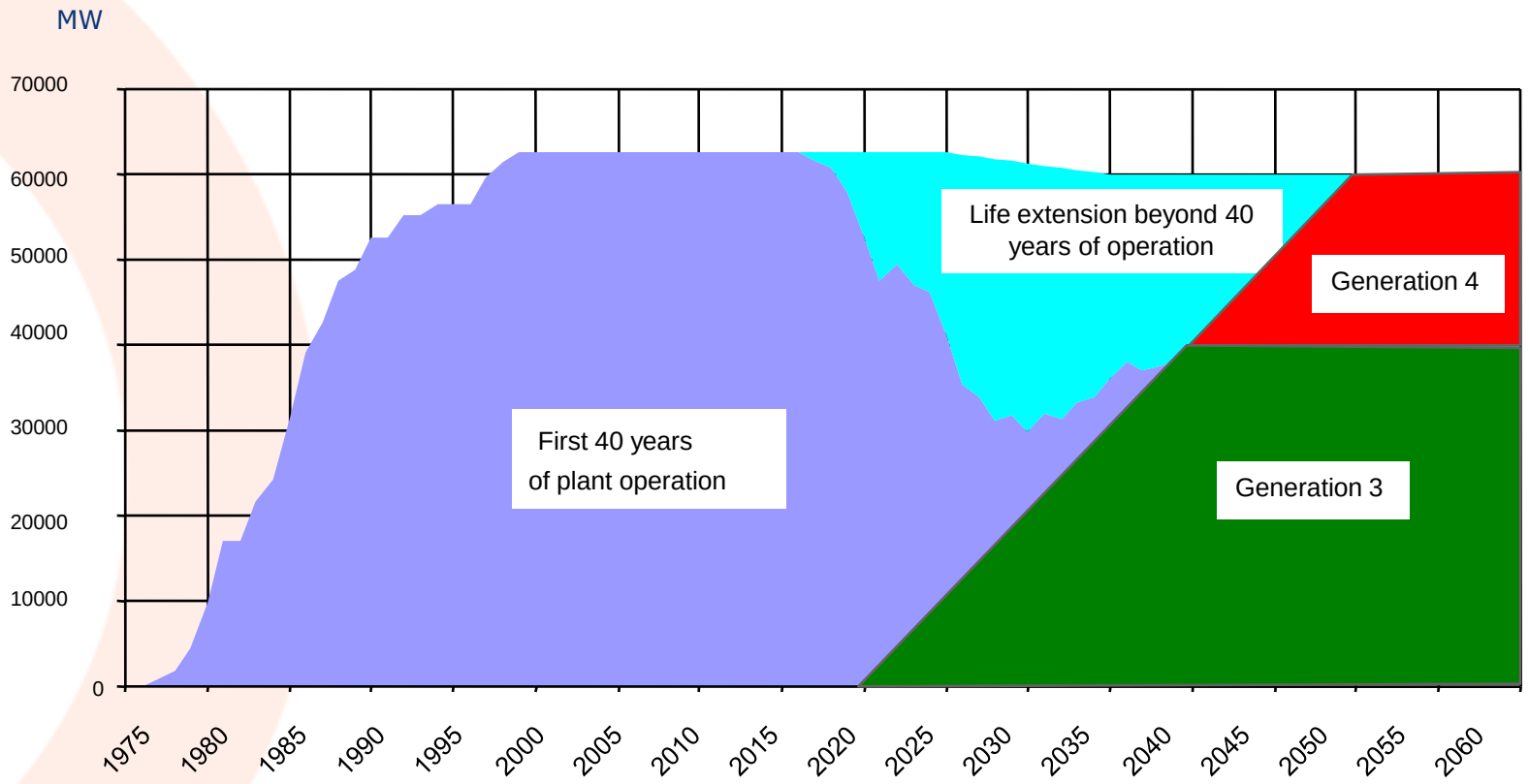
6.1 – Background : Continuous construction (2/2)



6. EDF production & engineering strategy

6.2 - Background : preparing for the renewal of the existing fleet

◉ Example illustrating the renewal principle



6. EDF production & engineering strategy

6.3 - Key nuclear challenges for EDF

- First and foremost : The **safety and performance** of the EDF nuclear fleet remain our key priority.
- **Life extension** of the EDF nuclear fleet: beyond 40 years and up to 60 years.
- **Commissioning of the first French EPR** in Flamanville and after that in Penly
- Becoming **a major player in the revival of the global nuclear industry**: USA, UK, China, etc.
- A challenge : **renewing and bolstering the skills** needed to achieve these objectives

7. Regulatory background

7.1 – Outsourcing regulations

- Quality decree of 10 August 1984
  - Licensees must arrange for the **supervision** of all contractors working on their premises so as to ensure that work is properly performed to a high standard.
  - 2600 contractor supervisors across the fleet.

- Stringent and specific regulations :
  - Regulations **prohibit "combined" work teams** (a mix of EDF staff and contractors).
  - Regulations **prohibit contractors from receiving their orders directly from** an EDF employee.

7. French regulatory background

7.2 – Specific technical requirements laid down by French legislation

- Every 10 years, EDF is required to conduct a safety review for each of its reactor series, based on operating experience **and** new designs.

- Main primary circuit and main secondary circuit
  - Hydro-proof test at 1.2 times design pressure, every 10 years and after repair or replacement of components in France.
  - In the USA, only a leak test at 1 or 1.05 times design pressure is performed during plant start-up (no core unloading required in USA).

- Containment
  - Containment integrity test: at full design pressure every 10 years in France.
  - In the USA, this test is performed at a lower pressure level.

Chapter 2

1. **Building and operating an extensive nuclear fleet**
2. **Remaining an industry standard across the globe**
   1. Fundamentals of the STEP 2010 programme
   2. Continuing to improve nuclear safety
   3. Delivering the expected level of technical & economic performance and sustaining our generating assets
   4. Improving the work environment; helping each individual to contribute to performance
   5. Adapting and renewing skills. Supporting international expansion of the fleet
   6. Involving contractors in our efforts to improve performance; standardizing work practices
3. **Plant life extension management**
4. **Expanding the EDF Group's global business**
5. **Securing new skills for the future**
6. **Preparing tomorrow's leaders**

Ch.2 1. Fundamentals of the STEP 2010 programme

- A programme initiated by the Nuclear Operations Division in early 2006, in order to make a **step change in performance** across a number of areas

- 5 key strategic principles :
  - **Maximizing the benefits** of a standardized fleet.
  - **Building on operating experience** from the best French and international practices.
  - **Taking initiatives to improve the reliability** of our facilities and the quality of our work, while consolidating achievements.
  - Continuing to improve **relations with contactors**
  - Accommodating **social changes.**

- **7 key focus areas**, **12 major projects and 10 key objectives**.

2. Continuously improving safety

- Significantly reducing the number of events where **human factors** have been a contributor

To develop Human Performance

- Improving in all areas of **fire** risk management: prevention, response, management, training.

To control Fire-risk

- Sustaining improvements achieved with regard to **collective dose** and further reducing **individual dose of the** most exposed workers.

- Improving **housekeeping standards** by bringing all plants up to a very high level by 2011.

To achieve exemplary housekeeping standards

- Early detection and intervention at plants with precursor signs of decline.

Ch.2 3. Delivering the expected level of technical & economic performance and sustaining our generating assets

- Enhancing **generation performance**
  - Reducing the amount and extent of rework, followed by total eradication.
  - Improving maintenance through the implementation of AP913
  - Implementing a round-the-clock outage control structure.
  - Ensuring availability of spare parts.

- Planning for **life extension to 60 years of operation**
  - Defining a 10-year capital expenditure programme for each plant.
  - Improving our operating methods to support longer service life.
  - Evaluating and monitoring our industrial assets.

To increase fleet availability

To improve spare part logistics

Completed end 08

To reduce maintenance volumes

Completed end 08

“Technical/economic viability” project

4. Improving the work environment ; helping each individual to contribute to performance

- Realizing that **quality of life** (lack of stress, right balance between private and professional life, etc.) and the **work environment** (organisational structures, plant condition, etc.) form an integral part of performance.

- Continuing to **bring down the number of industrial accidents**
  - By improving industrial risk prevention and worksite housekeeping.

- Providing a look-ahead to **future career paths**.

- Increasing the **social diversity of newly hired staff**.

- Continuing to improve **dialogue with staff representatives**.

5. Adapting and renewing skills Supporting international expansion of the fleet

- Ensuring that **managers provide genuine training oversight**.
- Continuing to pursue **partnerships with contractors**.
- Reviewing **training curricula**.
- Ensuring the **successful commissioning** of Flamanville 3.
- **Sharing the knowledge and experience from Flamanville 3** throughout to the fleet and other EPR projects.
- **Implementing a fleet's international exchange programme** in order to improve our skills and performance.
- Etc.

To adapt an renew competences

Ch.2

6. Involving contractors in our efforts to improve performance
Standardizing work practices

- Selecting contract companies which strive for **high work standards**, and for whom **skills and staff motivation are a priority.**
- Establishing **a targeted and distinctive labour policy** for each market segment.
- Encouraging contract companies to **continue improving their industrial safety performance.**
- 2010 - 2013 : Deployment of the new **Nuclear Technical Information System**.
- Reviewing the **operating experience system** so that it caters more to workers in the field.

To strenghen the partnership with contractors

To standardize procedures and practices

To renew the Nuclear Technical

To restructure Operating Experience Feedback

Chapter 3

1. **Building and operating an extensive nuclear fleet**
2. **Remaining an industry standard across the globe**
3. **Plant life extension management**
    1. Stringent service-life regulations
    2. Life extension factors
    3. Ten-year outages
    4. Extending service life beyond 40 years of operation
4. **Expanding the EDF Group's global business**
5. **Securing new skills for the future**
6. **Preparing tomorrow's leaders**

1. Stringent service-life regulations

- Every 10 years, EDF is required to perform a ten-year outage on each of its units.
- Prior to each ten-year outage on a given reactor series, EDF submits the following items to the nuclear regulatory authority (ASN) for approval :
  - A **new set of safety standards** for all units belonging to the same series.
  - An **upgrade programme**.
- EDF implements its upgrade programme on each reactor during the ten-year outage.
- EDF sends the ASN a conclusive report on the safety review conducted during the ten-year outage.
- The ASN submits its analysis of the report to the respective ministers.
- The decision as to whether a reactor may operate for a further 10 years is made by the public authorities.
- In 2009, EDF will be submitting its initial conclusive reports on the 3rd safety reviews of its 900-MW plants (3rd ten-year outage), with the prospect of continuing to operate up to 40 years.

2. Life extension factors

- Excellence of routine maintenance and plant operations
  - Quality of maintenance work
  - Quality of operating procedures.
  - Deployment of AP 913.
- Capture of operating experience through the “gradual” fitting of modifications where required
- Proactive approach to material ageing and obsolescence
  - Early replacement
  - Securing replacement supplies (contractor partnerships, strategic inventories, etc.).
- Ten-year outages and safety reviews with associated modifications
- Sustained investment in R&D
  - e.g. Creation of the Material Ageing Institute with EPRI, TEPCO.

3. Ten-year outages: an impressive combination of inspections and maintenance

3.1 – Scope of a ten-year outage

- Extensive tests and inspections
  - Full inspection of the primary circuit
  - Hydrostatic testing of primary circuits (207 bar) and secondary circuits.
  - Containment integrity test at 5 bar.
  - Surveillance tests
  - etc.
- In-situ checks to verify plant compliance with reference standards
  - e.g. anchor points, ventilation systems, etc.
- Modification programme for raising the level of safety.
- Analyses and inspections focusing on material ageing.

3. Ten-year outages : an impressive combination of inspections and maintenance

3.2 – A specific analysis of ageing phenomena

- Produced for all sensitive components and for each damage mechanism.
- The document is common to the whole 900 MW plant series, and is then adapted to each individual power plant.
- Method compliant with IAEA recommendations.
- A point-by-point check to ascertain whether the maintenance programmes set out in the new safety reference standards comply with a reactor's specific features.
- Submission to the regulator at least 12 months prior to the 3rd ten-year outage.

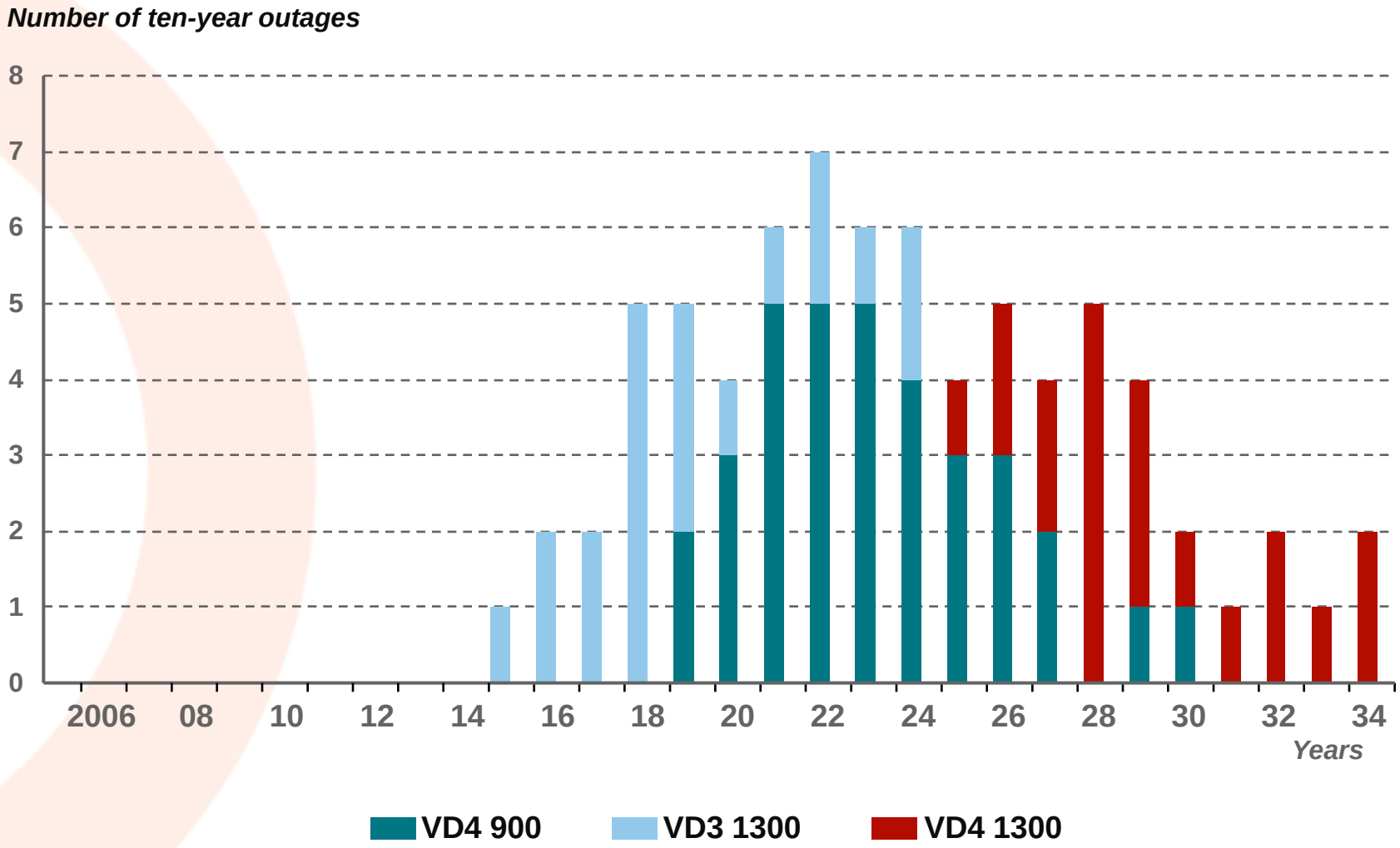
4. Extending service life beyond 40 years of operation

4.1 – EDF strategy

- A practice observed in other countries on plants of similar design.
- Action plans well underway in order to meet this objective.
  - R&D programme on long-term material behaviour.
  - Implementation of targeted solutions for dealing with the obsolescence of certain components.
  - Maintenance programme, including the replacement of certain major equipment items.
- The new set of reference standards is submitted to the ASN, in order to be allowed to continue operating beyond 40 years. The set of reference standards would be implemented during the 4th set of 10-year outages on the 900 MW plant series, and during the 3rd and 4th set of ten-year outages on 1 300 MW plants.

4. Extending service life beyond 40 years of operation

4.2 – Time frame for the 4th set of 10-year outages on the 900-MW plant series, and for the 3rd and 4th set of 10-year outages on the 1300-MW plant series



4. Extending service life beyond 40 years of operation

4.3 – The programme is aligned with the operation division objectives (STEP 2010)

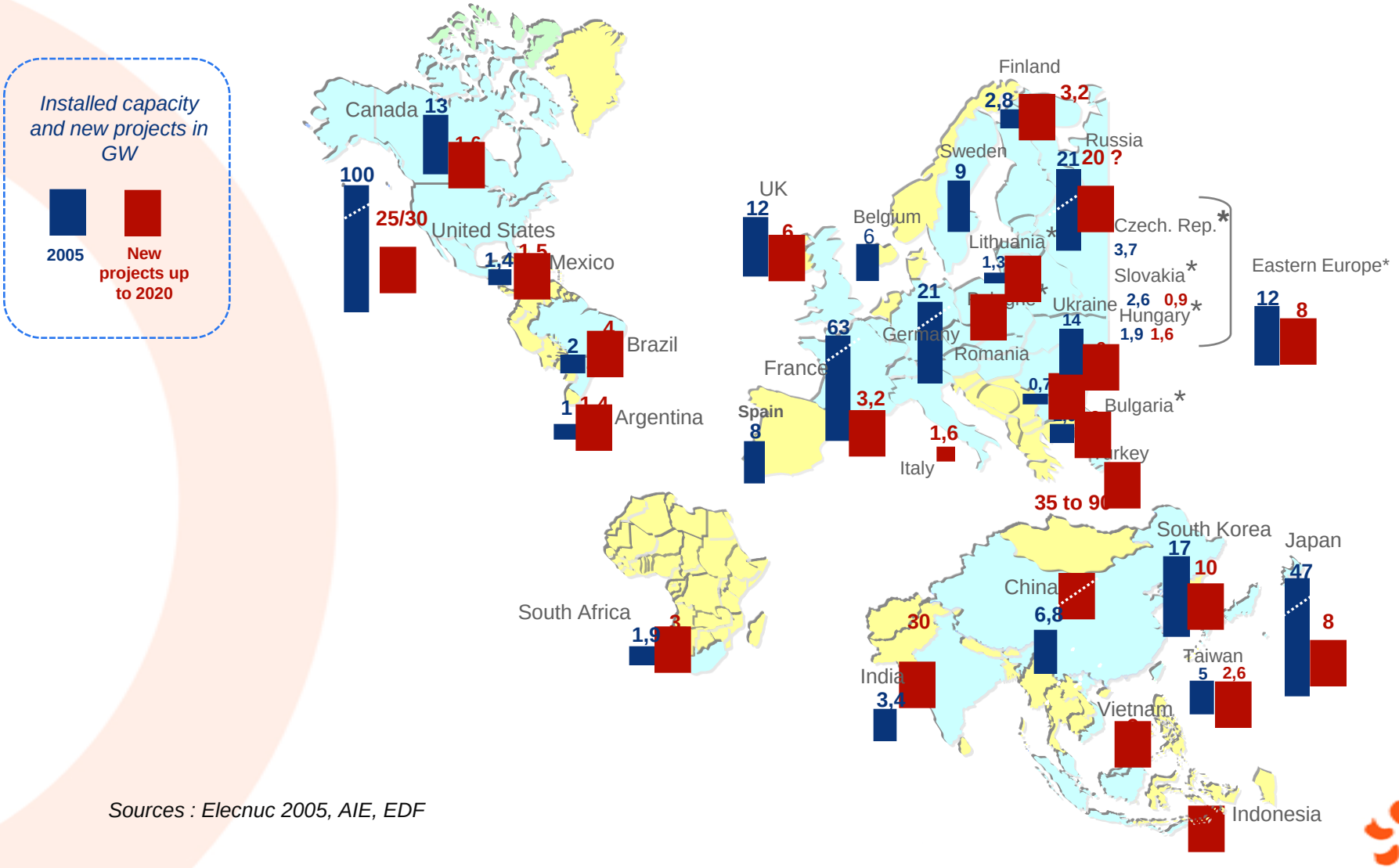
- Defining a capital expenditure programme for each plant over the 10 forthcoming years, in addition to the programme overseen at corporate level for each reactor series.
- Setting up a local structure and local methods in order to embed the dimension of “life extension” within the crafts.
- Ensuring that corporate services are staffed with the necessary operating resources.
- Improving the technical, industrial and regulatory monitoring process.
- Fleet-wide standardization of the industrial asset evaluation process.

Chapter 4

1. Building and operating an extensive nuclear fleet
2. STEP 2010 (Striving Towards Excellence in Performance)
3. Plant life extension management
4. **Expanding the EDF Group's global business**
    1. Global revival of the nuclear industry
    2. EDF global strategy
    3. Keys to success
5. Securing new skills for the future
6. Preparing tomorrow's leaders

1. Global revival of the nuclear industry

1.1 – Resurgence of the nuclear industry around the world



Sources : Elecnuc 2005, AIE, EDF

1. Global revival of the nuclear industry

1.2 – The nuclear industry, a foretold revival

- History's lessons have been understood
  - The nuclear industry must be competitive.
  - The nuclear industry must contribute to the security of energy supplies.
  - The nuclear industry must be accepted by society.

- Benefits of the EDF model
  - Choice of design.
  - Quality of regulatory framework (authorization process, choice of sites).
  - Economies of scale thanks to the industrial set-up and standardization.
  - Integrated design and operation.

2. EDF global strategy

2.1 - Commitment criteria in international nuclear projects

- Countries that have chosen nuclear energy in the short-term.
- Countries with which EDF is familiar and where EDF is welcome.
- Favorable conditions for investors in nuclear.
  - Legislative framework in force
  - Clear regulations
  - Transparent long-term fuel and waste management
  - Favorable public opinion
- Projects relating to tried and tested reactor models.
- A financial criterion for nuclear development projects that is consistent with the Group's finances & risk guidance.

2. EDF global strategy

2.2 - Being a selective operator - investor

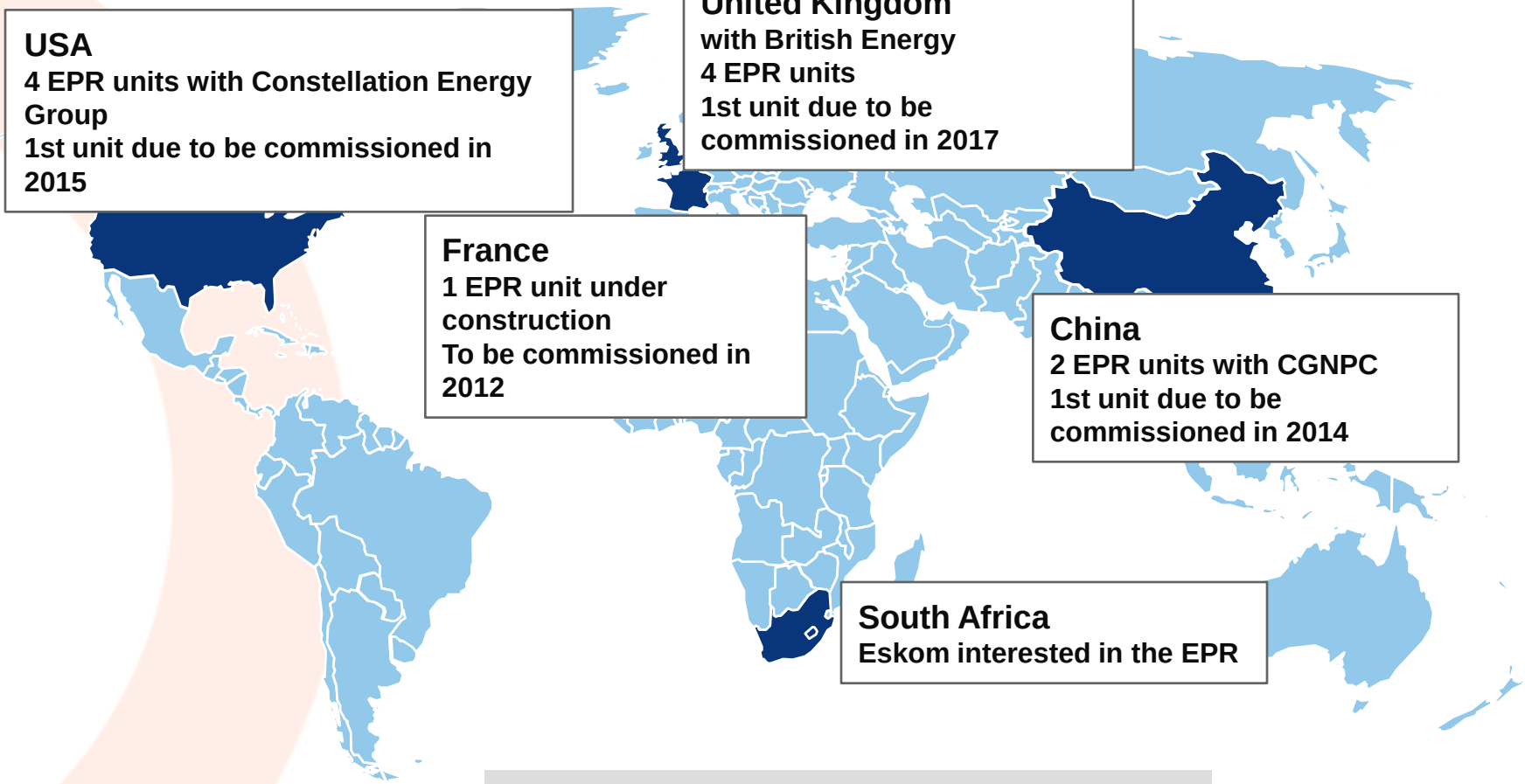
- Being an industrial partner :
  - Ensuring operational safety
  - Controlling risks
  - Ensuring project competitiveness

- Being an equity investor : majority shareholding or the largest possible stake locally.

- **Geographical priorities : United Kingdom, China, United States, South Africa, Italy.**

2. EDF global strategy

2.3 – Key player in the nuclear revival, for the most part involving 4 countries



Developing, investing in and operating 10 EPR units by 2020

Ch.4

3. Key factors for success

- Adapting to the country and its industrial environment
  - Drawing on the expertise of local benchmark electricity players involved in the construction and operation of nuclear fleets (British Energy, CGNPC, CEG,…).
  - Adapting the organisational model, in particular through industrial agreements with local engineering companies: CGNPC-CNPEC, Bechtel, AMEC,…
- Driving and controlling partnership projects
  - Using the Flamanville 3 reference model wherever possible .
  - Holding key positions in construction management and operations.
- Building on a firm French basis in order to benefit from standardization effects.
  - Pooling the resources needed for the different projects.
  - Drawing up standard construction and operating rules.
- Relying on the Group's existing skills and expertise.

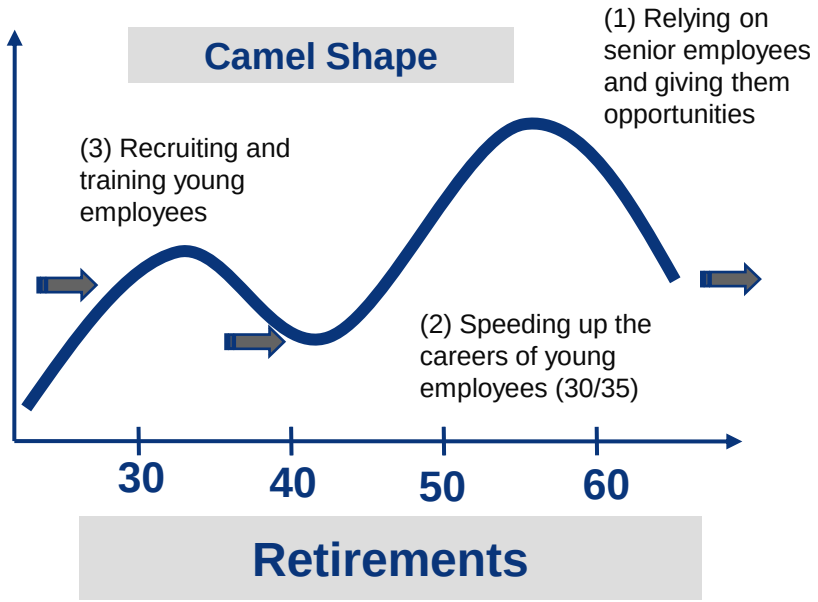
Chapter 5

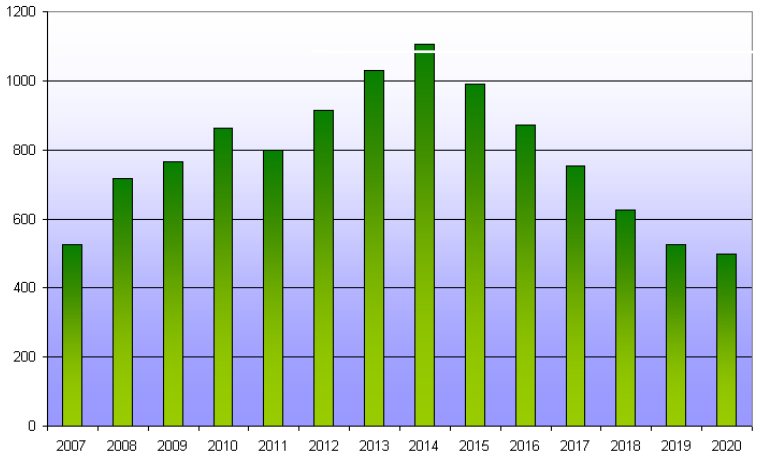
1. **Building and operating an extensive nuclear fleet**
2. **STEP 2010 (Striving Towards Excellence in Performance)**
3. **Plant life extension management**
4. **Expanding the EDF Group's global business**
5. **Securing new skills for the future**
    1. EDF needs in terms of skills
    2. EDF supports the training and recruitment of engineers
    3. Challenges faced by the Nuclear Operations Division
    4. Focusing on the "Nuclear Training Academy"
6. **Preparing tomorrow's leaders**

1. EDF neeeds in terms of skills

1.1 General background

- An camel-shaped age pyramid :
  - Massive recruitment over the period spanning 1974-1985.
  - A drop in recruitment figures over the period spanning 1985-2000.
- The “granddad boom” effect
  - In the 10 forthcoming years, 40 % of the EDF nuclear workforce will be retiring.
- Growth in France and in other countries.
- Internal restructuring within the Group.

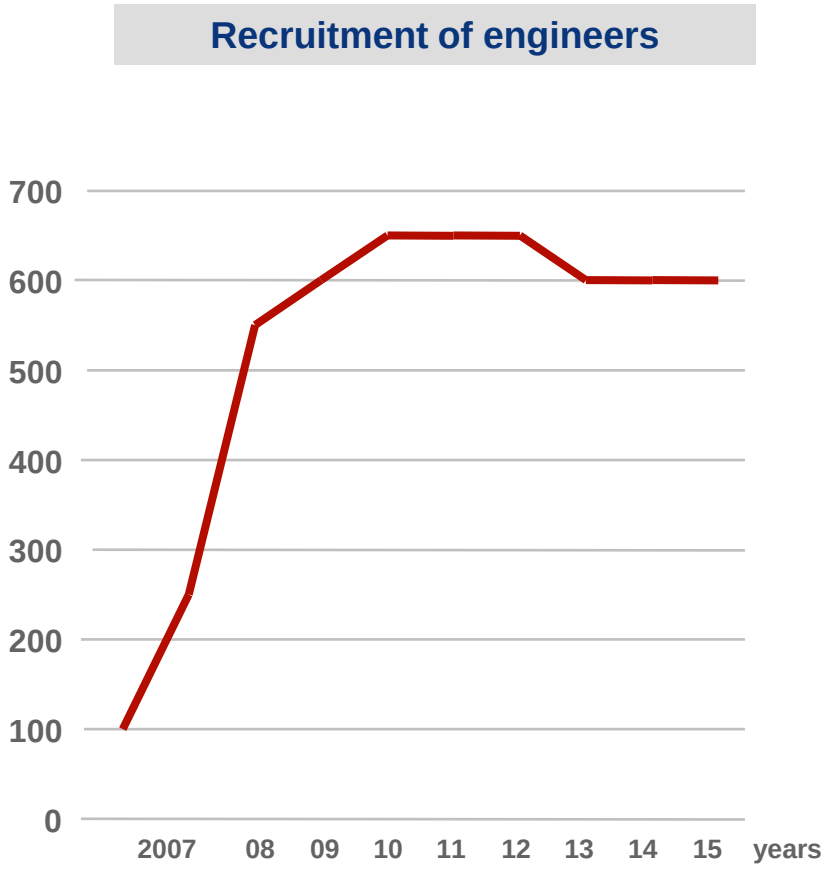




1. EDF requirements in terms of skills

1.2 – Recruitment of junior engineers

- Over the next 10 years, large numbers of people will be retiring from all sectors of the French nuclear industry.
- The need for skills in the energy sector is rocketing.
- Supply is not increasing in the same proportions (26 000 engineering graduates a year in France).
- Our needs : 400 to 600 engineers a year as of 2008.
- Our objectives :
  - Attracting a large number of engineering graduates.
  - Throwing our net wider.
  - Winning over the loyalty of junior employees.



2. EDF supports the training and recruitment of engineers

2.1 – European Foundation for Tomorrow's Energies

EDF has set up a European Foundation for Tomorrow's Energies, under the auspices of the *Institut de France*.

The aim of this foundation is to promote the development of education and research into energies that do not emit CO2.

www.energiesdedemain.eu

2. EDF supports the training and recruitment of engineers

2.2 – Creation of an International Masters in Nuclear Energy

- The aim of this international master's degree is to cover the entire scope of nuclear energy : engineering, operations, fuel cycle, dismantling, waste.

- The Nuclear Engineering elective started in September 2008 at *Paris Sud* University. The International Master's in Nuclear Energy will be operational in its entirety as of September 2009.

- Jointly developed by the following institutions : *ParisTech*, *Centrale*, *Supélec*, *Paris-Sud* University and the *Institut National des Sciences et Techniques Nucléaires*.

2. EDF supports the training and recruitment of engineers

2.3 – Assisting young students

- Provision of **teaching services by EDF personnel**
- **Setting up a network of EDF ambassadors in schools and universities**
- **Using EDF simulators for teaching purposes** (300 students expected over the period spanning 2008 – 2009).
- **Improving available training courses** (number and appeal) ; courses for French students abroad and for foreign students in France.
- A clearer and more efficient recruitment system based on meetings with students : Annual **Energy Day**.
- **Study loans, scholarships, pre-recruitment periods**, etc. to assist the best students with the accomplishment of their professional ambitions.

Special focus on the induction and integration of newcomers

3. Challenges faced by the Nuclear Operations Division

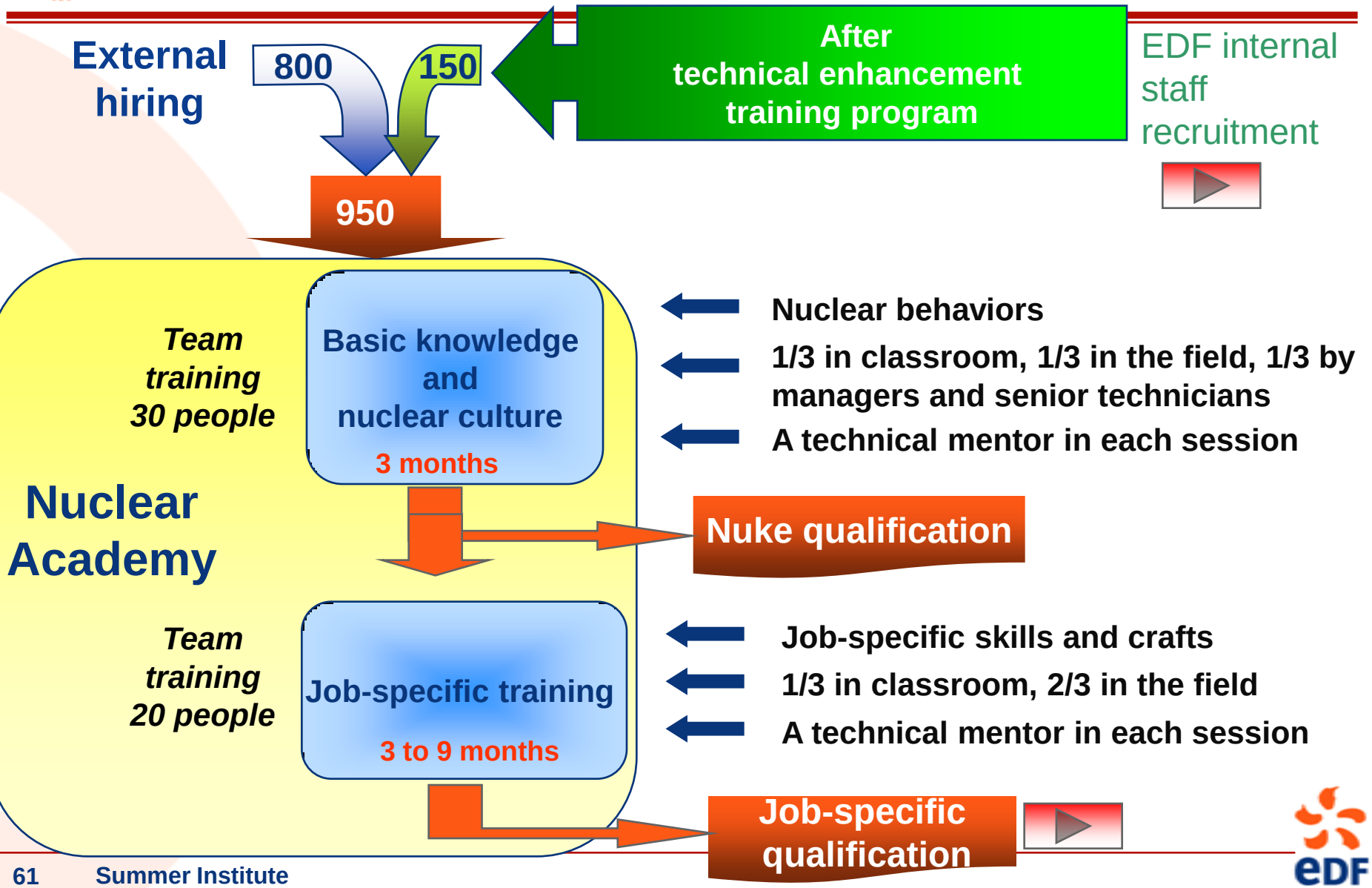
- Adapting skills to evolving needs while renewing them.
- Promptly transferring the experience of senior staff to more junior staff.
- Maintaining safety culture at its current level.
- Attracting young people to a technology that was introduced in the late 70's.
- Remaining mutually supportive within the EDF Group (which redeploys staff).

Creation of the ARC project

(Skills renewal project)

4. Focus on the Nuclear Training Academy

4.1 – General sequence (numbers: 2008)



4. Focus on the Nuclear Training Academy

4.2 – Recruiting EDF internal employees

- In order to replace internal staff **AND** meet nuclear requirements, a process has been implemented :

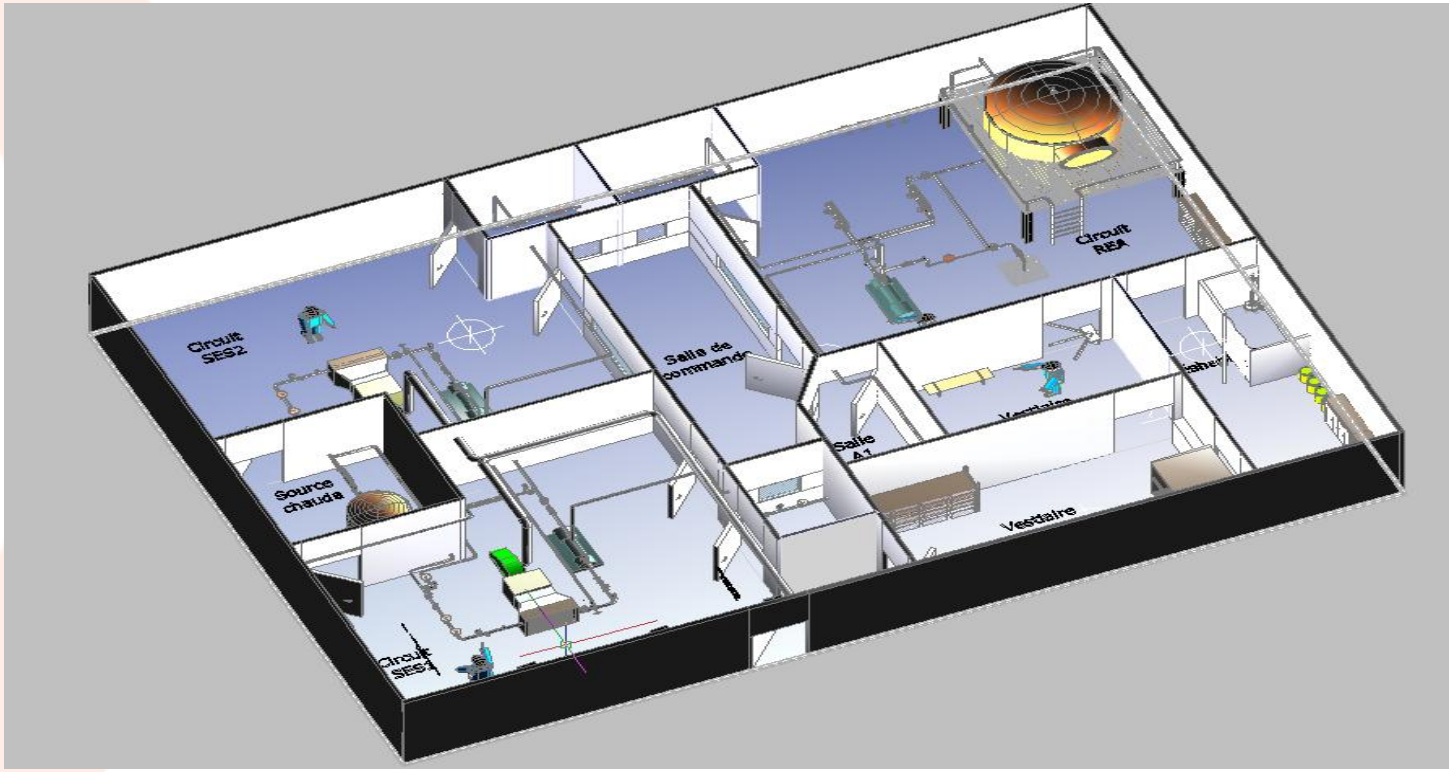
- EDF applicants :
  - Are evaluated by their potential and motivation, and not by their skills
  - Take cognitive tests
  - Are interviewed by several NPP staff in regional meetings
  - Follow an individual Technical Enhancement Training Program (ETTP) to acquire the same competencies as external recruits
    - Ranging from 1 month to 9 months depending on the initial level
  - Start the nuclear training academy in the same way

    as an external recruit does

4. Focus on the Nuclear Training Academy

4.4 – Flow loop maintenance simulator

- Effective roll-out of Nuclear Academy Program at each plant
- On-line training and testing for periodic training
- Flow loop maintenance simulator on each plant



Chapter 6

1. The EDF nuclear fleet in France
2. STEP 2010 (Striving Towards Excellence in Performance)
3. Plant life extension management
4. Expanding the EDF Group's global business
5. Securing new skills for the future
6. **Preparing tomorrow's leaders**
    1. The leadership development initiative
    2. Leadership and management
    3. The search to align all employees
    4. The leadership behaviors

Ch.6 1. Leadership development initiative

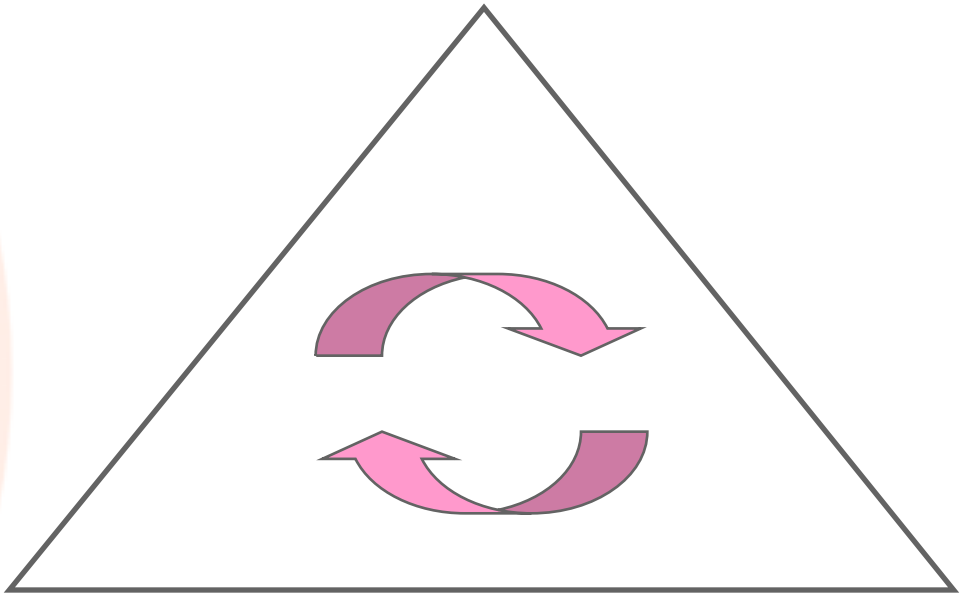
- 2002-2004 : Implementation of Total Quality Management system within the Nuclear Operations Division.
- 2005-2007 : Improvements have been made in the following areas :
  - Managerial dialogue.
  - Management methods (plants, corporate).
  - Legacy evaluation and assessment.
  - Effective managerial practices: presence in the field, project management, management networks, etc.).
  - Working methods (time loops, etc.).
- 2008 : an additional dimension to be developed in an increasingly demanding environment : **leadership**.

2. Leadership and management

2.1 An indivisible whole

A manager who conveys meaning

Leader, coach, trainer, etc.



Resources

Manages, communicates, delegates, motivates, etc.

Order giver

Recognized above all for his technical excellence …

2. Leadership and management

2.2 Different objectives

Leadership supports change

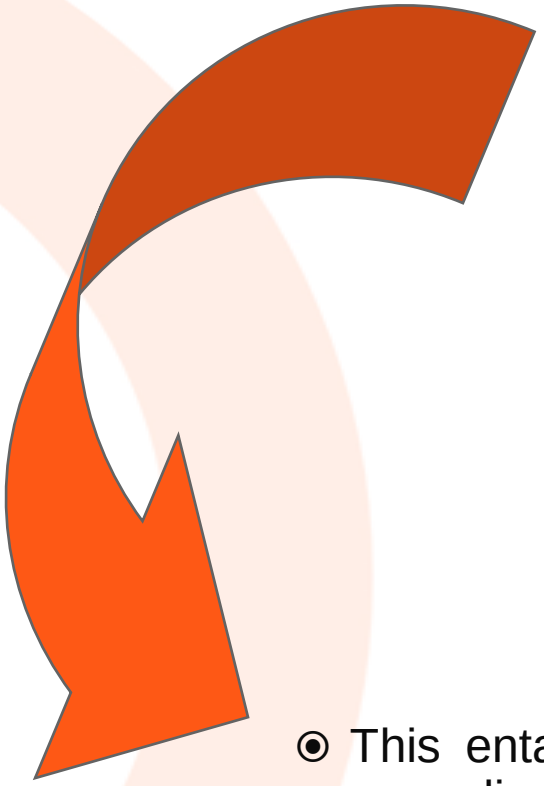
- It **sets a course** that represents a vision of the future.
- It aims **to align** everyone with this course, for the benefit of the vision.
- It seeks **to motivate** the entire staff.

Management manages complexity

- It plans, set objectives and allocates resources.
- It organizes, creates jobs, recruits staff, delegates responsibilities and provides training.
- It verifies the achievement of objectives and resolves problems

3. Aligning the workforce

An essential component of leadership



Leadership supports change

- It sets **a course** that represents a vision of the future
- It aims **to align** everyone with this course, for the benefit of the vision
- It seeks **to motivate** the entire staff.

- This entails conveying **meaning** so that each person behaves according to expectations, even when there are **no guiding rules** and even when faced with **complex circumstances.**

Ch.6

4. The leaders behaviors

Within the Nuclear Operation Division

- Promoting and supporting the Group's ethical values

  Respect for the individual – environmental accountability – performance research – commitment to solidarity - the need for integrity

- Promoting and supporting excellence in the following areas :
  - Safety and radiation protection
  - Technical monitoring of generation equipment
  - Human performance
  - Housekeeping

  e.g. Through periodic comparisons with other organizations.

- Putting together effective and open-minded management teams.

  e.g. On a daily basis, encouraging mutually supportive behaviour within plants and between sites

- Securing staff commitment

  e.g. Visibly acknowledging the achievement of important improvement milestones

- Making employees accountable

  e.g. Making staff accountable by assigning clear responsibilities for key improvement areas

- Being present in the field