

EDF training challenges for the French Nuclear Fleet

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For EDF Group: 3 strategic priorities for the development of nuclear energy

With 58 NPPs in operation in France , 82 within the EDF Group,
EDF has 3 priorities

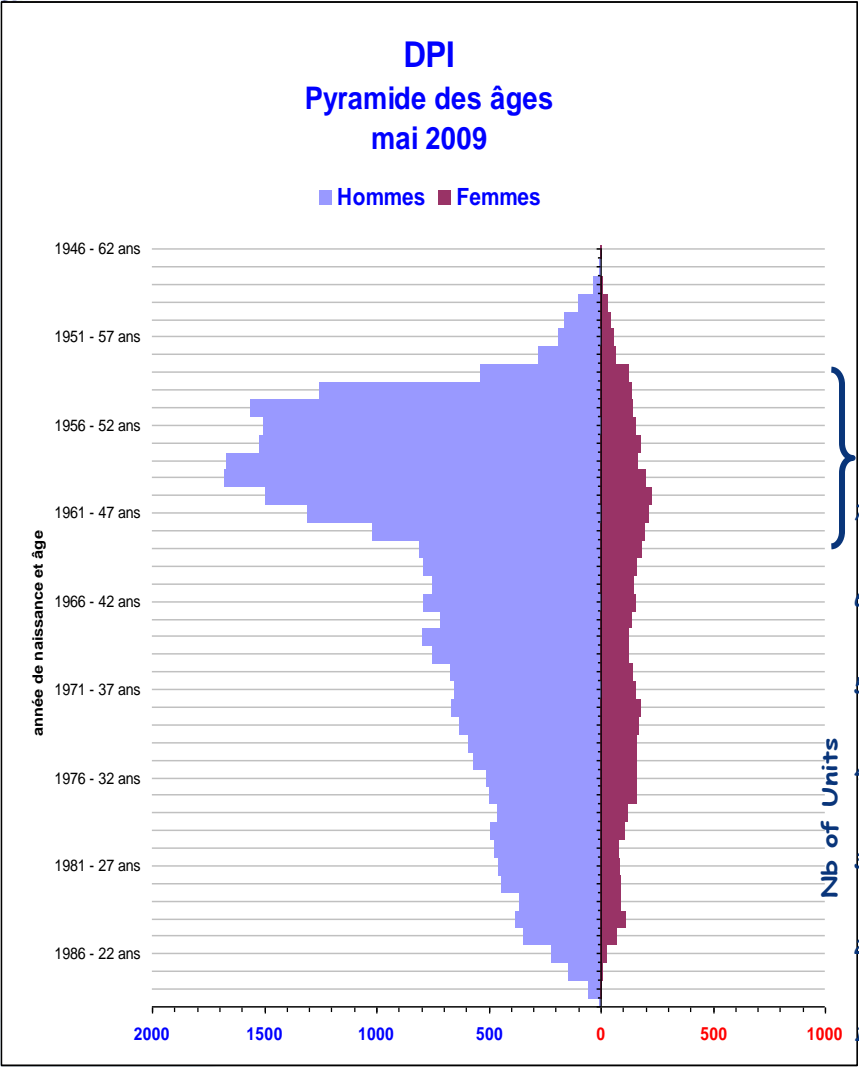
- ◎ **Continuing safe and efficient nuclear fleet Operations:**
ongoing improvement in safety and extended operation for NPPs,
learning from each year of experience.
- ◎ **Participate in the global development of nuclear power:**
 - **In France**, construction of EPR at Flamanville 3,
 - **Internationally**, participate in the global nuclear development
with priority for countries where we have historical links
- ◎ **Prepare for the longer term**
by supporting international research programmes on Generation IV
reactors.



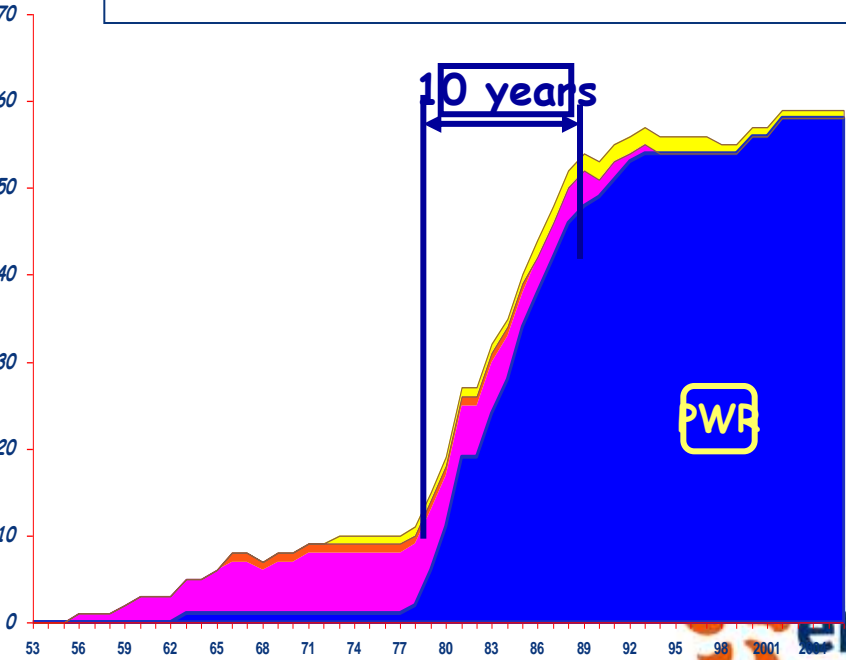
Renewing / Upgrading skills, a necessity and an opportunity for EDF

- ⊙ **~~ 36,000 people currently involved in nuclear within the EDF Group**
- ⊙ **~~ 40% of Managers and Engineers expected to retire**
over a period of about 10 years **~~ 2008-2017,**
in EDF **Generation, Engineering, R&D, ...**
- ⊙ **Development of new projects out of France :**
→ **~~ 800/1000 additional engineers in the coming years**
- ⊙ **Renewing the Group's skills and expertise by recruiting**
→ **more than 5,000 engineers for nuclear over the next 10 years,**
→ **in France and UK, and also in/for other countries**

EDF Generation population pyramid



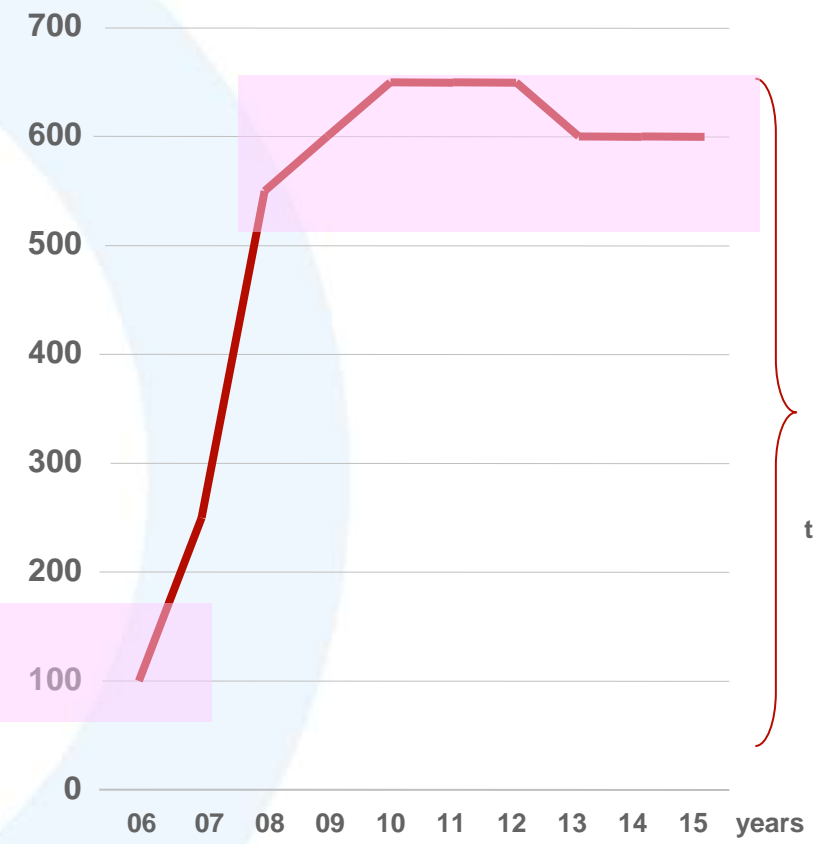
Construction & Commissioning
of the French PWR Fleet



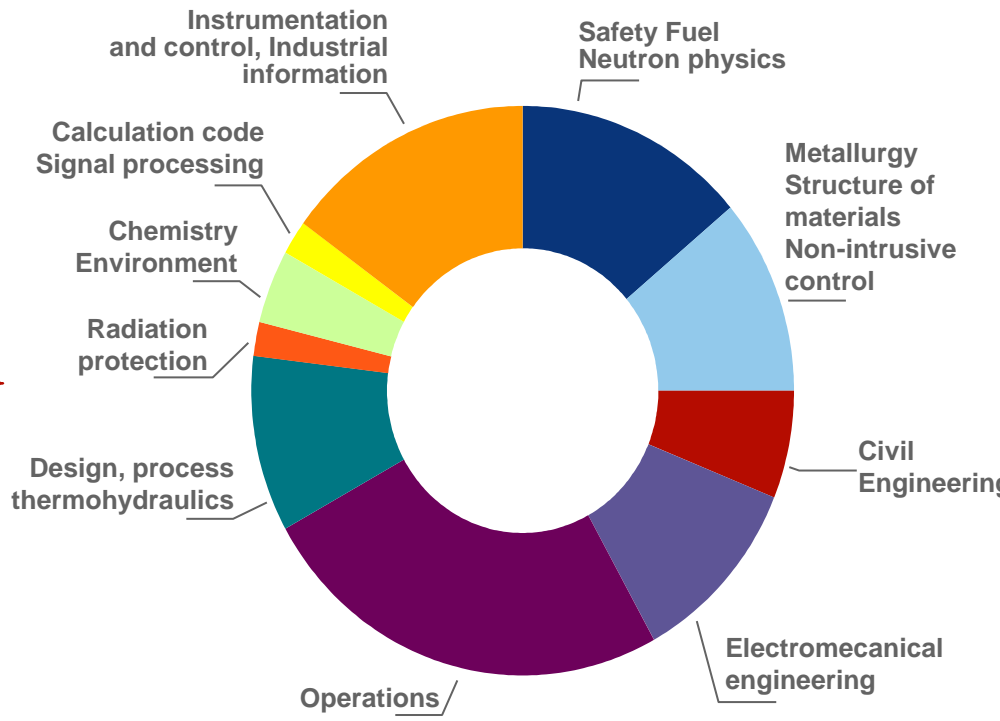


Since 2008, a 4-5 fold increase in recruitments of graduates in EDF nuclear sector, in a number of different areas

Graduates Recruitments



First position for young graduates





Developing skills: a mix of Education and/or Training

- ◎ **Before recruitment: use of Academic Education**
 - Master's degree, Engineering schools,...
 - Directly out of school, technicians...

- ◎ **After recruitment:**
 - initial training and integration
 - continuous vocational training
 - specialized training
 - specific operator's training (initial qualification, periodic training, ...)
 - on the job training
 - ...

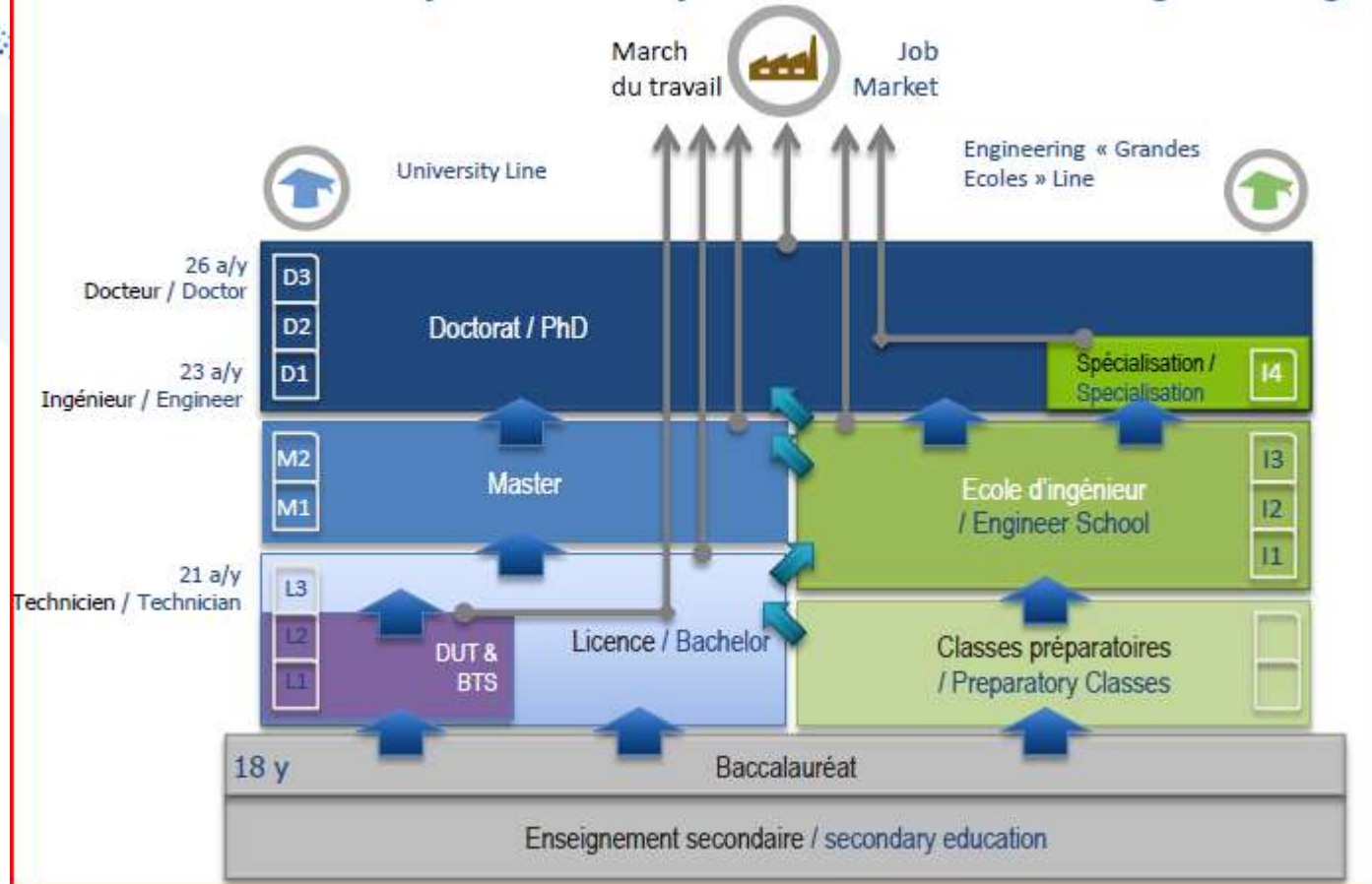
- ◎ **Possible different needs/trainings for other actors (# Owner/Operator)**
 - Designers and suppliers
 - Authorities and TSOs
 - Research organizations
 - ...

Initial academic education



LEADING THE ENERGY CHANGE

French Education system in Physical Science and Engineering



EDF RECRUITS at several level of qualification:

- worker (high school diploma, 18-20 years),
- technician (high school diploma + 2 years, 20-22 years),
- engineer (university or engineer school diploma, 23 years)



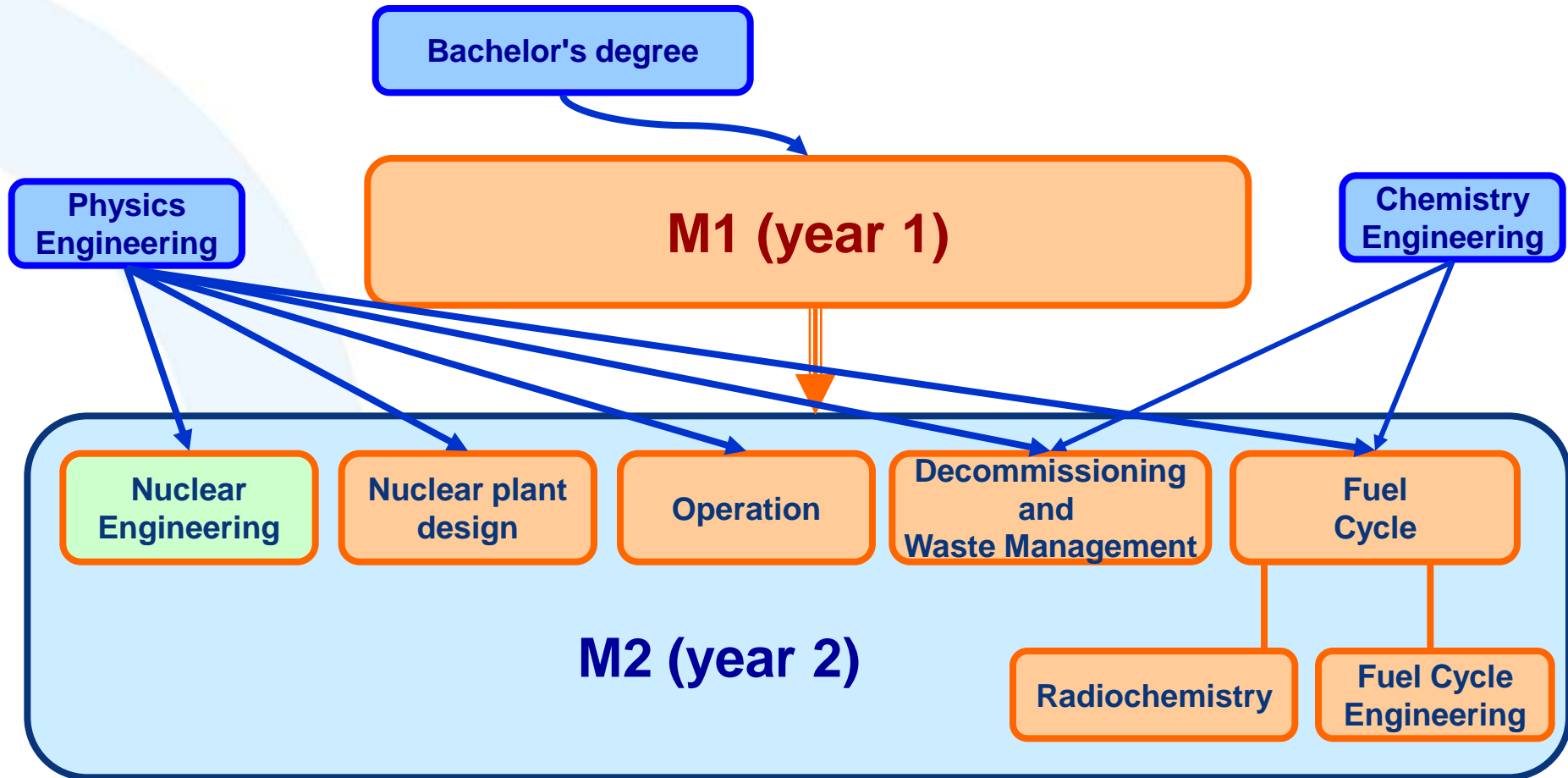
EDF's commitment and initiatives in Strengthening initial academic education

- ◎ **Dialogue and partnerships established with the best universities and “grandes écoles” in France and abroad**
 1. **Strengthening and structuring the energy curriculum in engineering schools**
 2. **Establishing post-Master professional certifications (*mastères spécialisés*) with the best Universities and engineering schools (e.g.: nuclear safety, radiation protection, etc.)**
 3. **Funding Chairs, to help link Research and Education**
 4. **Establishing an International Master of Science “Nuclear Energy” to attract French and foreign students (2-year teaching programme in English)**

With a vehicle to support financing



Master of Science in Nuclear Energy Paris - France



www.master-nuclear-energy.fr



Master of Science in Nuclear Energy Paris - France

M1 (1st year)

- ⊙ Core courses
 - Nuclear physics
 - Fluid dynamics and heat transfer
 - Material science
 - Overview of energy technologies
 - Instrumentation & Control
 - Electrical engineering
 - Chemical engineering
 - Economics, management
- ⊙ Language and Culture courses
- ⊙ Student project and internship (~ 10 weeks)

M2 (2nd year)

- ⊙ Core courses :
 - Nuclear safety and radioprotection
 - Project and risk management
 - Computer design and simulation
 - Environmental issues
- ⊙ Choice between 5 majors :
 - Nuclear engineering
 - Nuclear plant design
 - Nuclear operations
 - Nuclear fuel cycle
 - Decommissioning and waste management
- ⊙ Training sessions on EDF simulators
- ⊙ Master's thesis and internship
 - within an industry company
 - within a research lab

All courses in English



In-house professional vocational training



Developing skills: in-house Education and/or Training

- ◎ **EDF developed a comprehensive organization and program**
 - Progressively, over time, along with the development of NPPs
 - Mostly based on internal means
- ◎ **A large organization**
 - ~ 3 million hours of training per year
 - ~ 650 different courses (200 Process; 450 Operation/Maintenance)
 - ~ 980 persons, including ~ 750 teachers
 - based mainly on 19 training centers,
with full scope simulators, located at each NPP site
- ◎ **A significant commitment**
 - ~ 10% of total labor cost for nuclear sector

L'UFPI

980 PEOPLE
750 INSTRUCTORS



ONE TRAINING DEPARTMENT ON EACH NPP

ONE NATIONAL TRAINING CENTRE FOR MAINTENANCE AND TECHNICAL SUPPORT TRAINING

29 TRAINING DPTs
22 LOCATIONS



IG THE ENERGY CHANGE



EDF's in house vocational training

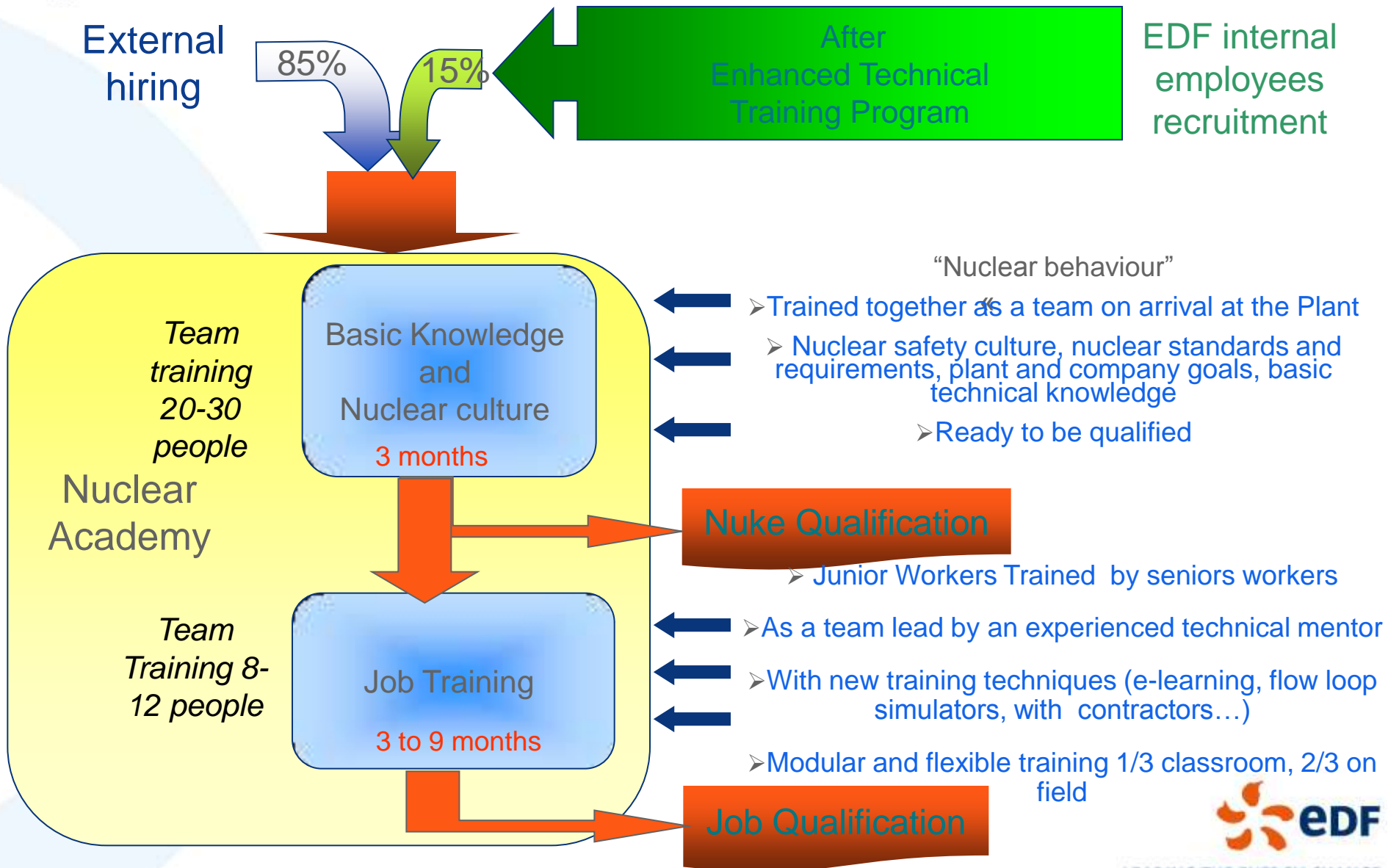
➔ On the job training

- ✓ A very important part of the skills build-up
- ✓ Nuclear skills, is also a "collective skill"
not just a sum of individual skills

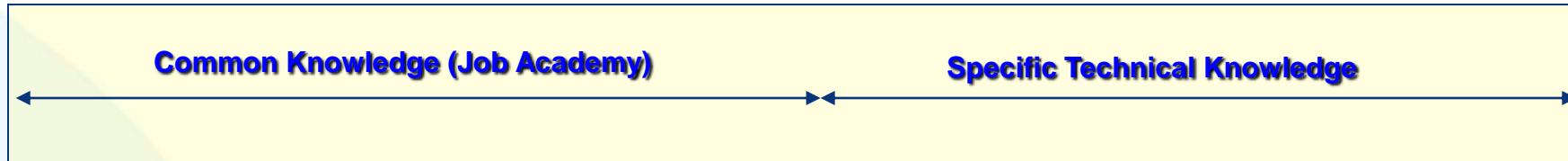
➔ Vocational training organization

- ✓ An Academy for Operations, (1st year).
- ✓ An Academy for Engineering, (1st year).
(adapted according to initial academic education)
- ✓ Nuclear education and training courses for people in charge of Operations (operators, safety engineers,...).
(both initial education and training, as well as periodic training)
- ✓ Specific and specialized courses in a variety of domains,
to train /accompany personnel during their professional career.

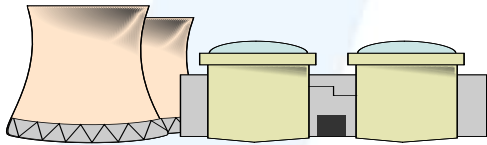
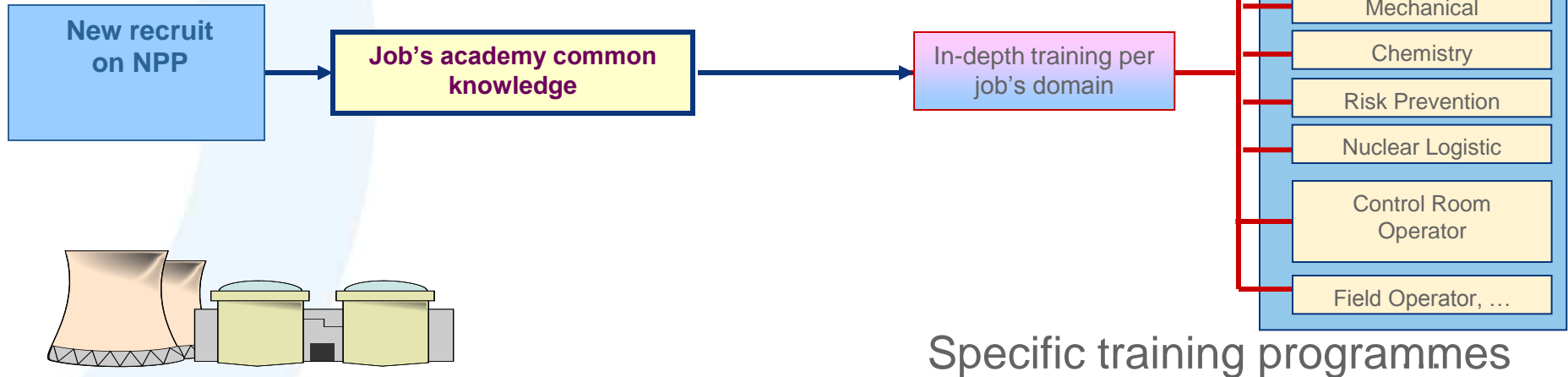
Nuclear academy programme in 19 NPPs



Job's academy: Common technical knowledge



The same initial training course for all the new comers

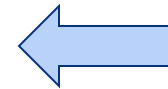


Specific training programmes

Job's academy Common technical knowledge

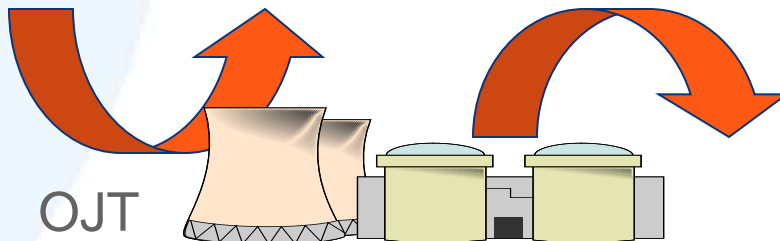
AK SC

- EDF Group
- Regulation, organization and stakes of a NPP including the emergency plan (PUI)
 - Nuclear safety
 - Quality
 - Industrial Safety and Radiation Protection
 - Fire prevention
 - Environment
 - Waste
 - Reliability of work practices
 - Human performance
 - NPP's process
- + continuing assesment / improvement files



NPP's
managers
+
UFPI
instructors

Local
requirements
may be included



OJT



The Facilities Available ...

Chantier-école de Gravelines



Simulateur Palier P4 - Cattenom



Simulateur
Palier N4 - Chooz

Valves workshop





The Facilities Available ...



PWR scale model



The Facilities Available ...



Valves Workshop



Diesel Workshop



Pump Workshop



The Facilities Available ...

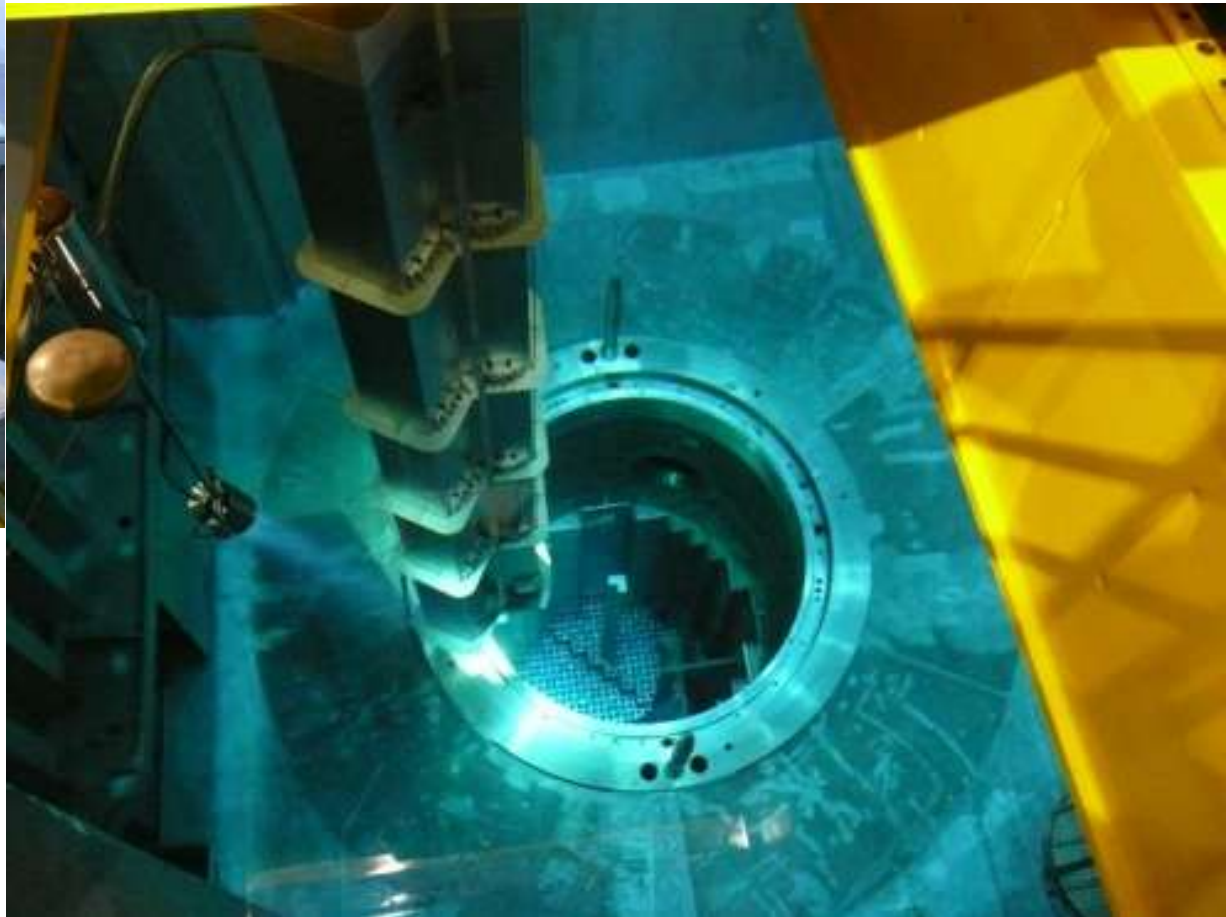




The Facilities Available ...



CETIC at
Chalon-sur-
Saône.





To conclude

- **A real need and strengthen education and training, to face the future of nuclear energy**
 - Developing and maintaining the proper skills is a real challenge, it has to rely on the capability of all the actors,

- **EDF is committed to contribute to this effort, and has launched a number of initiatives,**
 - Internally,
 - Towards the academic education system as well as the industry
 - Including human and financial support

- **a large and comprehensive in-house training organization**
 - designed to be effective for a large number of diversified needs
 - Which can be opened/adapted to other Operators/Entities within various type of agreements/contracts

- **the international Master in Nuclear Energy**
 - a significant contributor to an appropriate initial education, in line with the needs of Operators and Industry
 - open to students from France and other countries
 - Sponsored by EDF and benefiting from the French context and facilities
 - Is a main component of the International Institute for Nuclear Energy