



GRAND CARÉNAGE

Long-term operation

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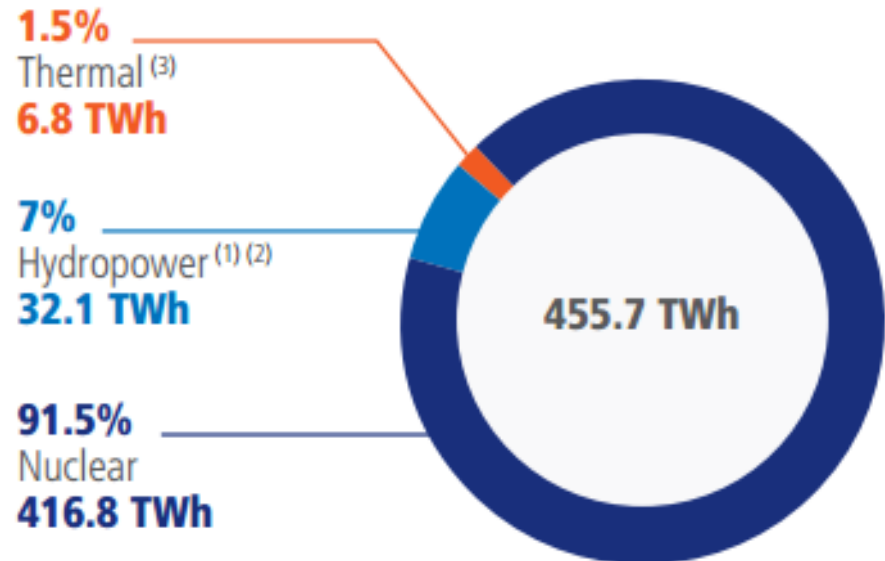
Atoms for the Future
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NUCLEAR AT THE CENTER OF THE FRENCH ENERGY MIX

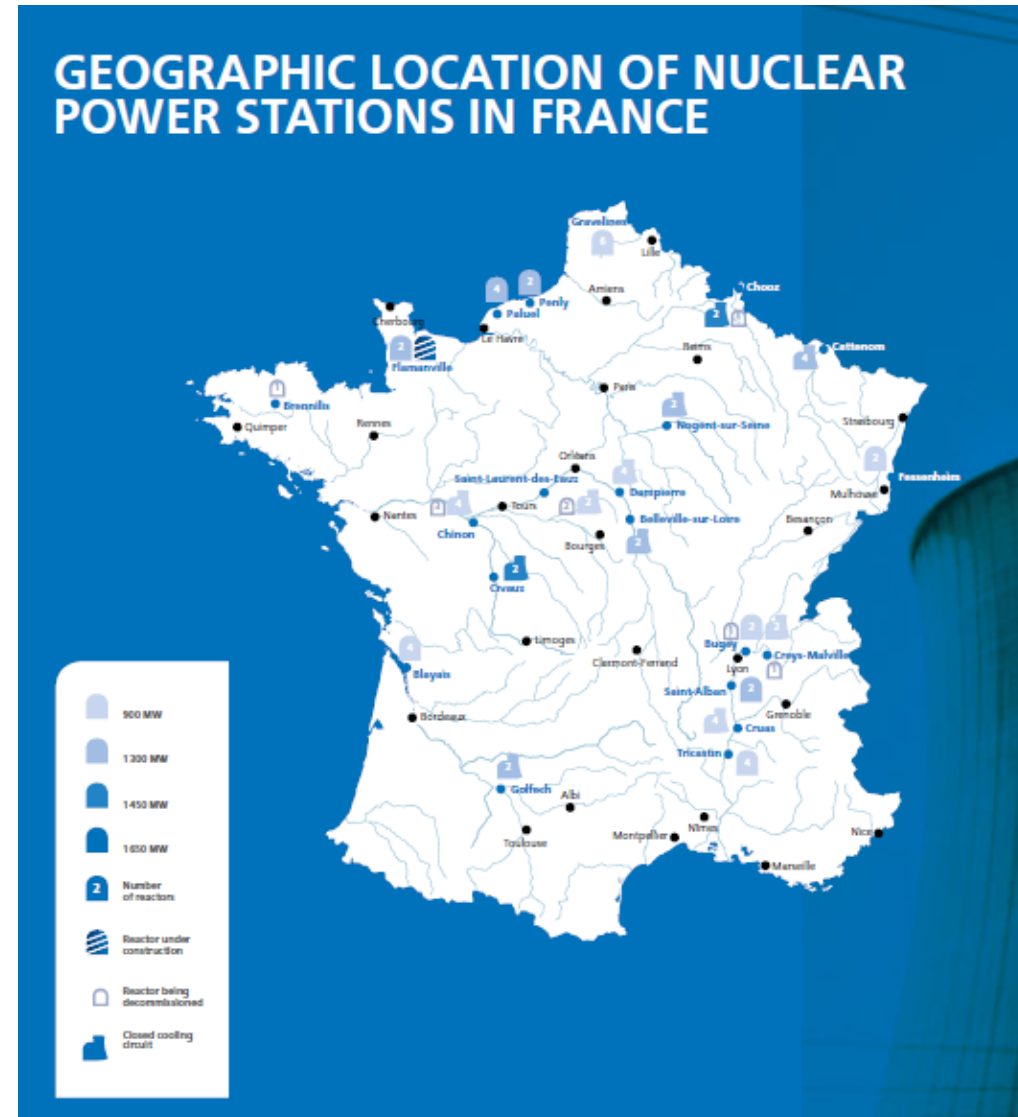
- **Nuclear in France: a strategic choice made in the 70's**
 - Independence from energy importations
 - Price stability
- **Nuclear at the heart of a balanced and complementary energy mix.**
 - 91% of EDF's generation
 - 77% of France's electricity generation
- **An electricity source that is:**
 - Safe
 - Low-carbon
 - Competitive

EDF ENERGY MIX IN FRANCE



EDF'S NUCLEAR FLEET APPROACHING THE AGE OF 40

- **The French nuclear fleet:**
 - 19 nuclear power plants
 - 58 pressurized water reactors
- **Age:**
 - An average of 34 years
 - First reactors reaching the age of 40
- **Fleet's lifespan:**
 - No technical or regulatory limitation
 - Every ten years a specific authorization must be granted by the regulator
- **Safety : continuous improvement policy**



FLEET LIFE EXTENSION : PART OF THE ENERGY TRANSITION PROCESS

▪ Life extension:

- is consistent with France's commitment to fight climate change (COP 21)
- is in line with the French Energy Transition Law
- allows to take full advantage of the existing fleet
- creates the best conditions to prepare for the future



FLEET LIFE EXTENSION: A TECHNICALLY VIABLE AND SAFE OPTION

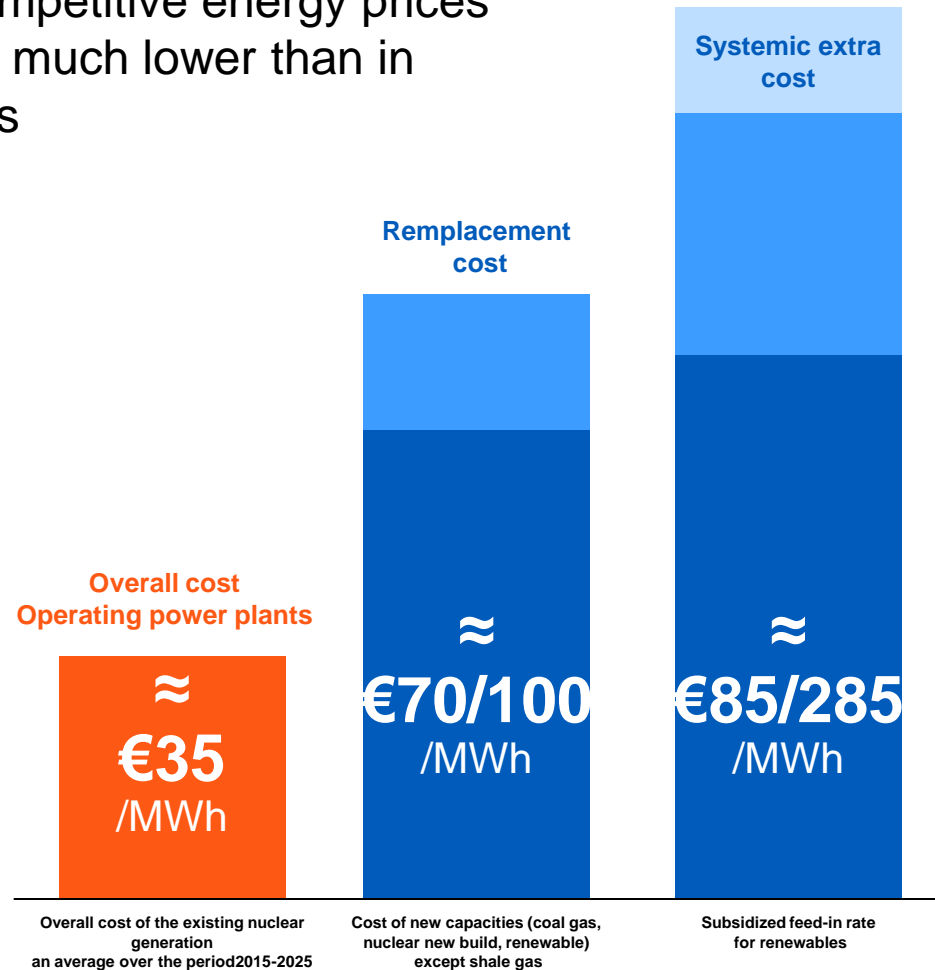
- **Safety: continuous improvement policy**
 - Learning from every experience to continuously heighten NPPs' safety level
- **Extensive studies confirms the viability of life extension**
 - Every component is replaceable, except for the reactor vessel and confinement vaults
- **A solution in line with international trend**
 - 45 out of 65 US pressurized water reactors have been authorized to operate till the age of 60



FLEET LIFE EXTENSION : AN ECONOMICALLY BALANCED OPTION

▪ Advantages for the country

- Preservation of competitive energy prices
- Cost per MWh are much lower than in alternative scenarios



FLEET LIFE EXTENSION: EDF'S APPROACH

- **Grand Carénage : major overhaul program:**
 - Major refurbishing and modernization works (2014-2025)
- **Main characteristics:**
 - Maintenance fully integrated into the long-term outage schedule
 - 20 major projects that will be rolled out progressively
 - Designed to take into account lessons learnt and optimization



FLEET LIFE EXTENSION: MAIN WORKS

- **The refurbishing or replacement of large components** reaching their lifespan limit (steam generators, main transformers, turbines)
- Further modifications to **strengthen safety level**
- **Components' qualification** for safe operation over 40 years



FLEET LIFE EXTENSION : IMPACT ON THE ECONOMY

- In terms of workload, Grand Carénage is **comparable to nuclear new build**
- **Significant economic stimulation**
- **110 000 direct and indirect jobs**
- **Over 3000 additional workers involved** in the peak of activities at a single site



THANK YOU