



AREVA

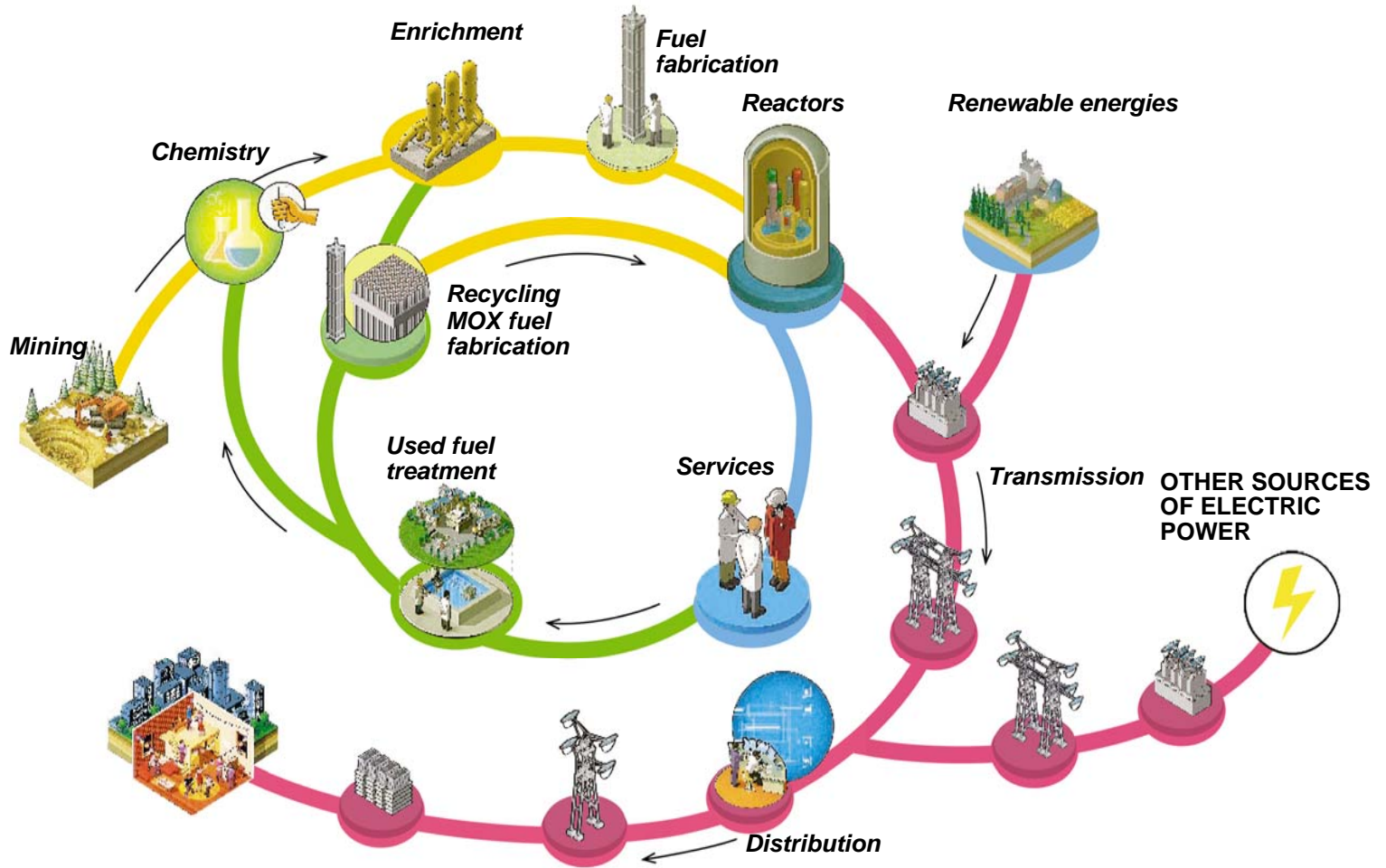
***The French Nuclear Program:
A showcase for Energy Independence***

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**American Enterprise Institute
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A global partner with proven technology

- » No. 1 integrated nuclear vendor
- » No. 3 in electricity transmission & distribution



AREVA: a strategic position in CO2 free energy technologies

Global energy issues

- ▶ Limited resources
- ▶ Strong economic growth
- ▶ Demographic growth
- ▶ Increase of energy needs
 - ◆ To be doubled by 2050
- ▶ Climate Change



***We will need all sources of energy available,
but there is no solution without Nuclear.***

The French case

A successful nuclear program

An aggressive strategy to reduce energy dependency

- ▶ **1970's in France – A tense context!**
 - ◆ Increase of electricity demand by 7% per year
 - ◆ Limited energy resources
 - ◆ First oil crisis in 1973

- ▶ **To decrease French energy dependency, launch of a large nuclear program**
 - ◆ 58 reactors, built in 20 years
 - ◆ Development of a global fuel cycle industry
 - Uranium supply
 - Conversion and Enrichment of Uranium,
 - Nuclear fuel fabrication,
 - Recycling of nuclear spent fuel

- ▶ **Strong R&D National Laboratory support: CEA**

The result of a strong and consistent political will

► Main achievements:

◆ Energy independence and security of supply

- Rate of energy independence in France: 50% (vs 23% in 1973)
- French nuclear program = Kuwait's oil production

◆ Reduction of the energy bill

- 20 B Euros saved per year, compared to 1973
 - Avoided importation of gas, oil...

◆ CO2 emissions deeply reduced

- In France, > 325 Mt CO2 saved thanks to the nuclear program
- One of the lowest CO2 emissions per capita: 6,2 Mt/year
 - Denmark: 8,9 / Germany: 9,8...2 champions of renewable energy!

Reaping the benefits of a consistent strategy

▶ Main achievements:

◆ Competitiveness

- 3 euro cents / kwh produced, including recycling of nuclear spent fuel and decommissioning of nuclear facilities

◆ A flawless operation record

- 1000 reactor-years of experience
- Excellent safety records for 15 years

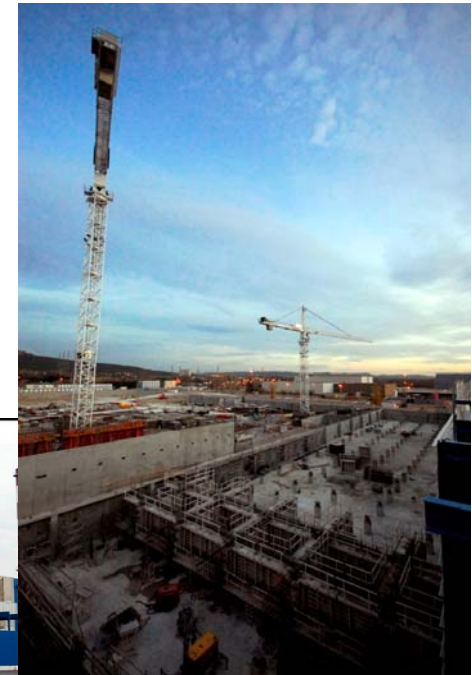
◆ More than 100,000 direct jobs

In France, 77% of the electricity comes from nuclear

A successful program that continues

► New facilities under construction

- First French EPR – Evolutionary Power Reactor - in Flamanville
- New AREVA enrichment facility – Georges Besse II – in the south of France



Recycling of nuclear spent fuel

Recycling – Principles and advantages

- ▶ **96% of the materials in used fuel assemblies are recyclable**
- ▶ **Main steps in recycling:**
 - ◆ **Isolate energy-rich materials (Uranium and Plutonium) for recycling**
 - ◆ **Package final waste in a highly stable and safe form**
- ▶ **Key advantages of recycling:**
 - ◆ **Preserves natural resources**
 - ◆ **1 gram of Pu = 100 grams of U = 1 metric ton of oil**
 - ◆ **25% of Uranium saved per year**
 - ◆ **Reduces by a factor of 5 the volume of waste**
 - ◆ **Reduces by a factor of 10 its radiotoxicity**
 - ◆ **In France, costs only 6% of kWh rate**

The French experience and AREVA's know how

▶ **AREVA's La Hague Plant commissioned in 1966**

- ◆ 40 years experience
- ◆ Proven technologies
- ◆ Cost well known , based on commercial contracts



▶ **Capacity of the plant: 1,700 MTHM/year**

▶ **Since initial operation, more than 20,500 MT have been reprocessed**

- ◆ Power generation equivalent of 420,000,000 metric tons of oil

▶ **Recovered material stored and then shipped to the MELOX facility (South of France) for fabrication into MOX fuel and recycling**

▶ **Fission product and actinide residues are vitrified into a highly stable glass form for later disposal in a deep geologic repository.**

Applying the French experience in the US

- ▶ **The EPR technology already chosen by 5 US power companies for their future reactors**
 - ◆ Constellation Energy (Maryland); Ameren (Missouri); Amarillo (Texas); PPL (Pennsylvania); AEHI (Idaho)
- ▶ **AREVA's project to build a new enrichment plant in the US, to help revitalize U.S. infrastructure**
- ▶ **Renewed U.S. interest in nuclear spent fuel recycling**
 - ◆ Repository optimization through waste reduction
 - ◆ Energy Security and Resource conservation
 - ◆ Cost effectiveness
 - ◆ Promotion of nonproliferation objectives
- ▶ **Nonproliferation project: MOX Fuel Fabrication facility under construction at the Savannah River Site (SC)**
 - ◆ Based on fuel treatment and recycling facilities

Conclusion

- ▶ **There will be increasing global demand ...and competition...for energy resources**
- ▶ **Consistent political will in France to develop nuclear energy has demonstrated its value for energy security**
- ▶ **Nuclear energy is:**
 - ◆ **Competitive, with stable generation costs**
 - ◆ **Available as large baseload provider, contributing to energy security**
 - ◆ **A high-density source of energy, occupying a small space**
 - ◆ **A “low carbon” alternative**
- ▶ **Nuclear has other benefits for the future**
 - ◆ **Development of new applications: hydrogen, desalinization, fuel cells...**

An inescapable part of the solution for our energy future