

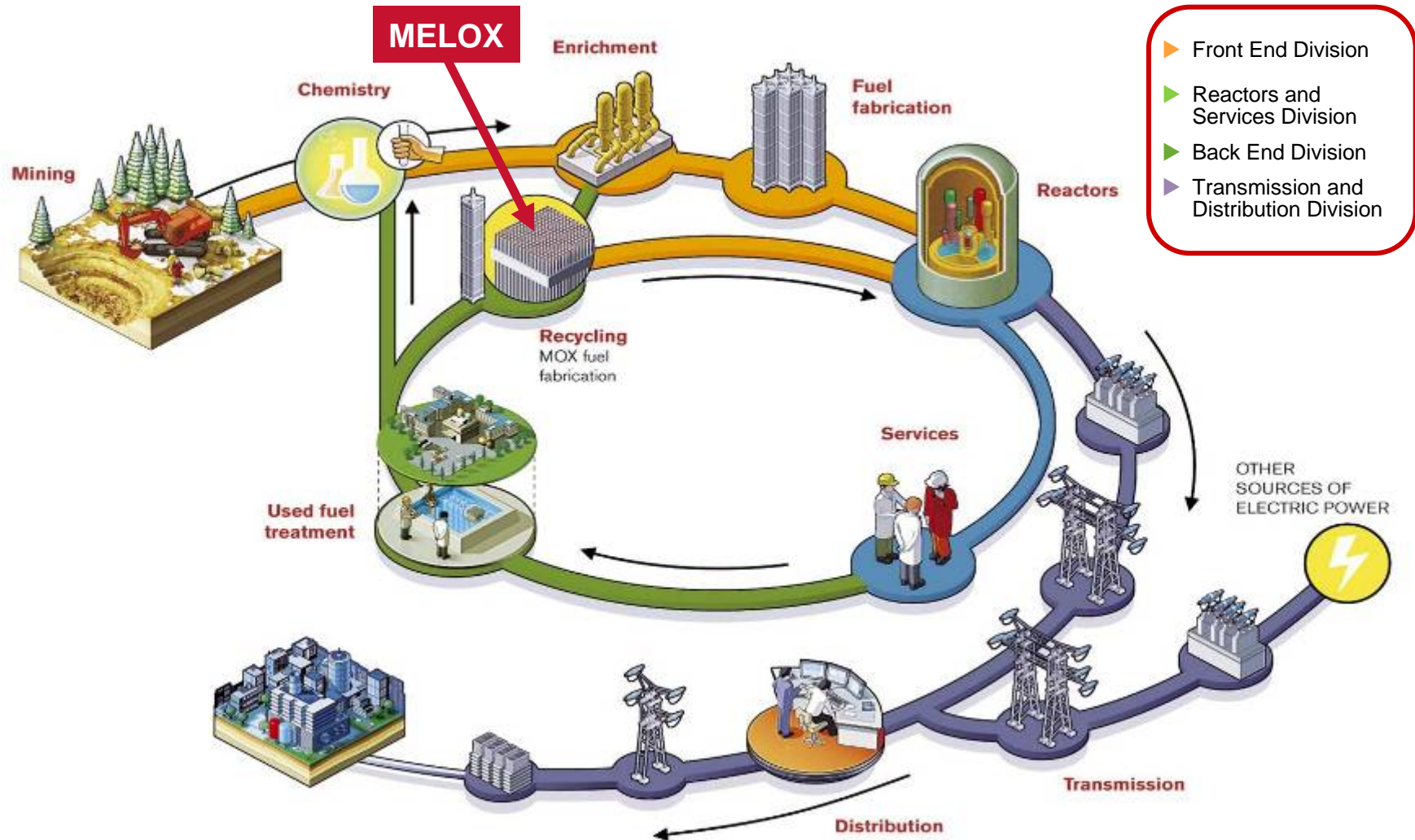
# The MELOX Plant

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# *The MELOX plant*



# Energy: our core business



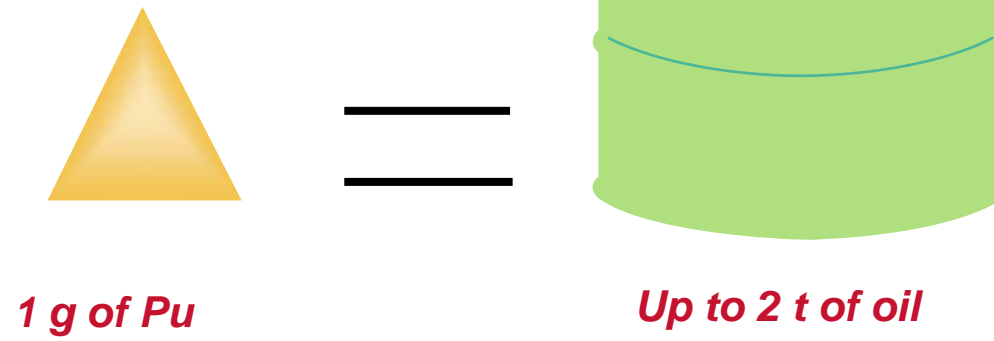
## *The treatment and recycling option...*

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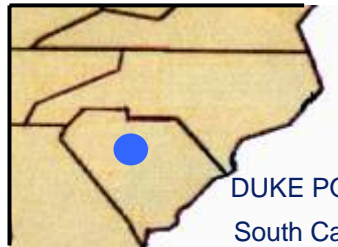
- ▶ Recovers reusable materials with very high energy potential and even today ensures major savings of natural uranium and oil through the use of MOX fuel:
  - ◆ generating more than 10% of France's electricity with nuclear power.
  - ◆ reducing natural uranium consumption by more than 10% in France.
  - ◆ avoiding the high cost of enriching natural uranium.
  
- ▶ Reduces spent fuel quantities: 7 UOX → 1 MOX
- ▶ Diminishes the quantity and toxicity of high-level nuclear waste:
  - ◆ waste volume reduction by a factor of about 5.
  - ◆ waste radiotoxicity reduction by a factor of 10.
  
- ▶ Contributes to non-proliferation of plutonium.
- ▶ Contributes to the reduction of excess weapons-grade plutonium inventory.

# *Plutonium's high energy potential*

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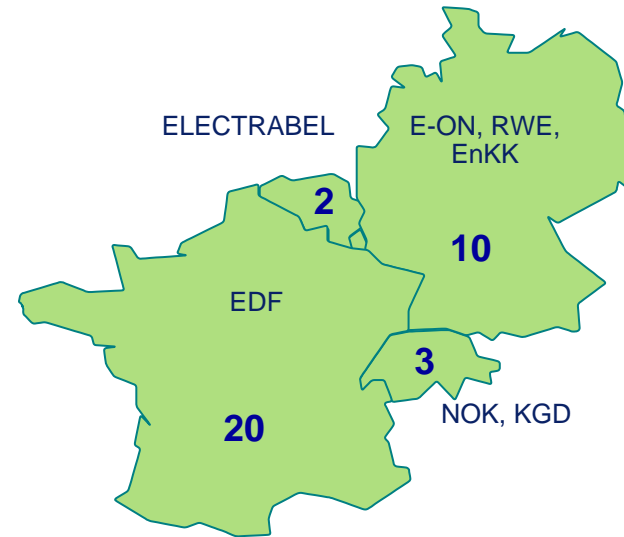
# Panorama of MOX loadings worldwide



DUKE POWER  
South Carolina

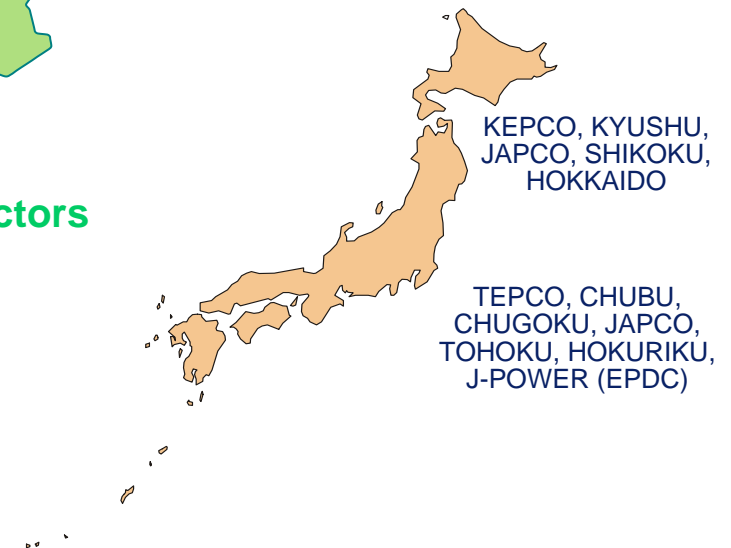
## In United States

- 4 fuel assemblies were loaded in the Catawba core in South Carolina in June 2005



## In Europe

35 “moxified” reactors



## In Japan

- Delivery of 60 MOX fuel assemblies to TEPCO in 1999 and 2001
- 11 utilities committed to loading MOX
- Chubu Epco has signed a contract for MOX fuel fabrication

## MELOX : key dates

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▶ **1990:** creation of MELOX plant (INB – licensed nuclear facility).

▶ **1995:** start-up of MELOX plant after gradual introduction of Pu in the production building.



▶ **1997:** first year of production at licensed capacity: 100 tHM.

▶ **1999:** beginning of MOX fuel fabrication for Japanese customers.

▶ **2000:** one-thousandth assembly fabricated.



▶ **2002:** beginning of product certification for German customers.

▶ **2003:** governmental decree allowing production to be increased to 145 tHM/year.



▶ **2004:** authorization request to increase the annual production to 195 tHM/year.

▶ **2005:** October 6: 10<sup>th</sup> anniversary – 1,000<sup>th</sup> ton of MOX.

▶ **2006 :** April 18 until June 17, public enquiry

## *MELOX, world leader in MOX production*

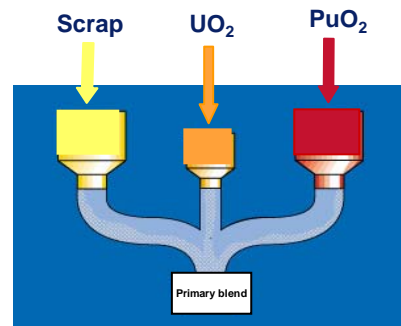
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- ▶ Production: for the entire year of 2005, MELOX produced 1,035 MTHM
  
- ▶ Customer countries
  - ◆ MOX fuel fabrication
    - France
    - Others: Germany, England, Belgium, Japan, Switzerland
  
  - ◆ Technology transfer: United States, Japan

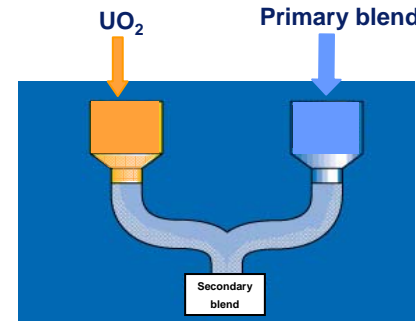


- ▶ MOX fuel fabrication for nuclear power plants in several countries
  - ◆ Multi-design fabrication lines
- ▶ The advanced, automated and flexible MELOX plant adjusts to market requirements (MOX fuel for PWRs and BWRs)
- ▶ Human Resources (at year-end 2005)
  - ◆ 721 MELOX and AREVA NC employees on site
    - 56% shift workers
    - 44% standard working hours
  - ◆ Approximately 400 subcontractor jobs

# Key advantages of the advanced MELOX high-throughput process



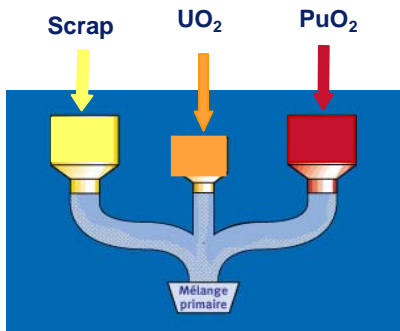
**1** Preparation of primary blend



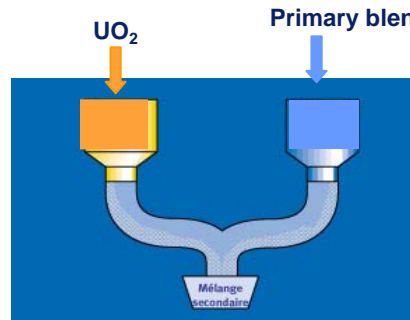
**2** Preparation of secondary blend

- ▶ Powder blending is the key to the MELOX process
- ▶ The MELOX process allows an on-line recycling of almost all scrap
- ▶ The performance and reliability of the MELOX process are recognized worldwide
- ▶ More than 30 years of PWR and BWR operating experience have demonstrated the high quality of MOX fuel fabricated by the AREVA group
- ▶ MOX fuel behavior in the reactor is similar to  $UO_2$  fuel in normal and off-normal conditions

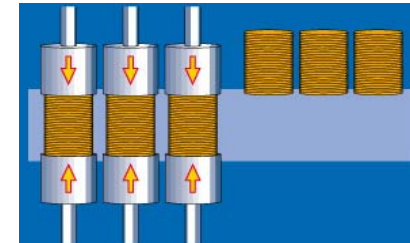
# Recycling: the advanced MELOX high-throughput process



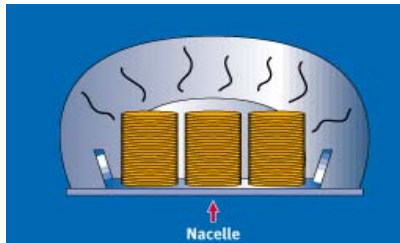
1 Preparation of primary blend



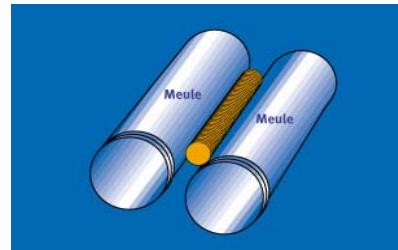
2 Preparation of secondary blend



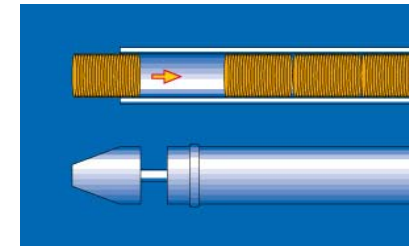
3 Pressing or pelletizing



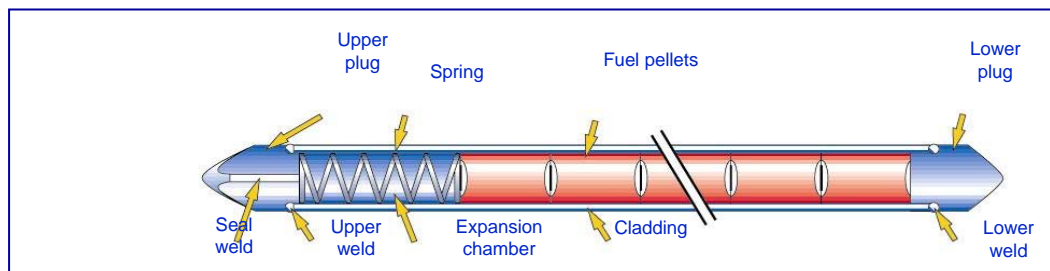
4 Sintering



5 Grinding



6 Rod cladding

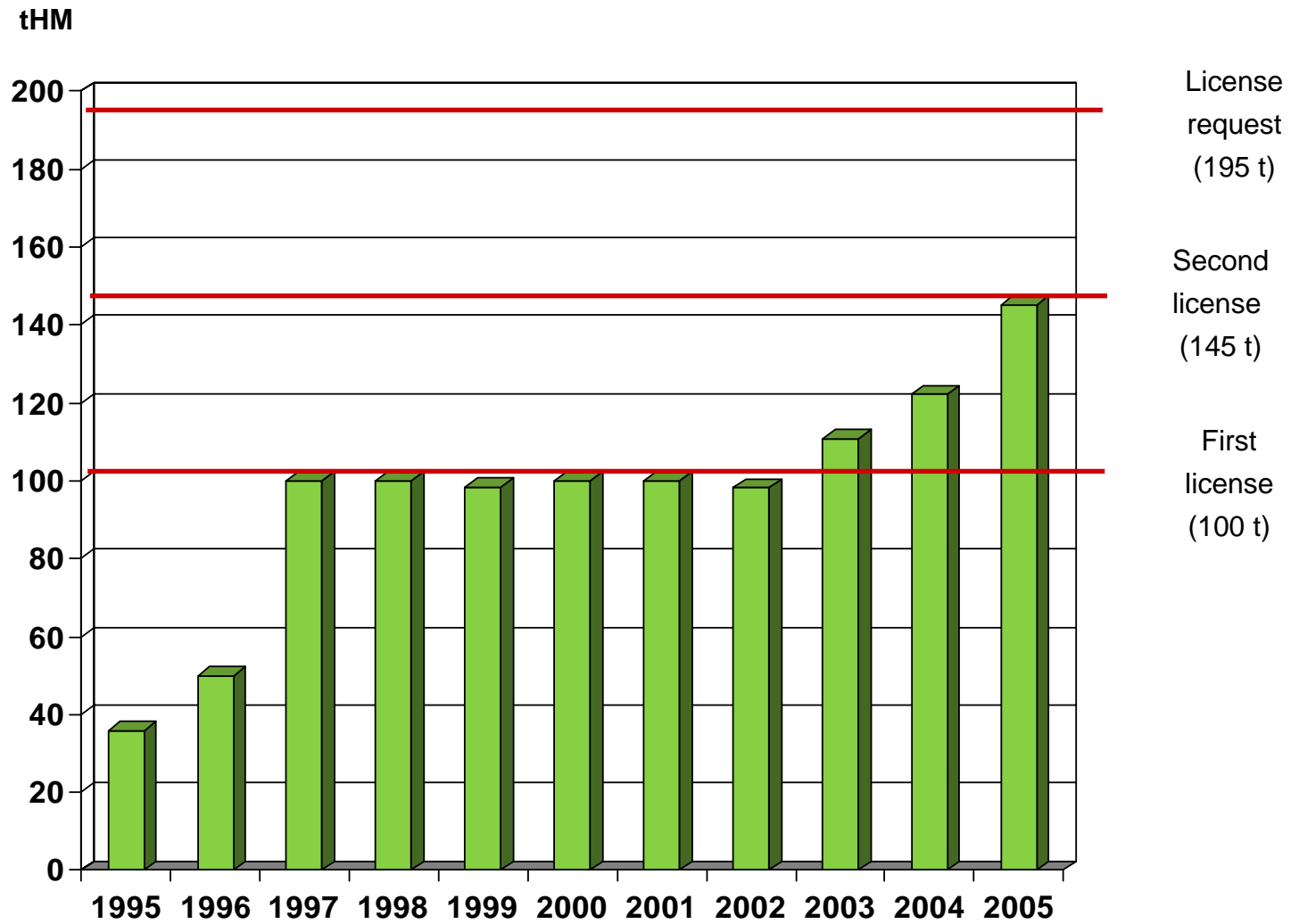


Light water reactor fuel rod



7 Assembly fabrication

# MELOX production

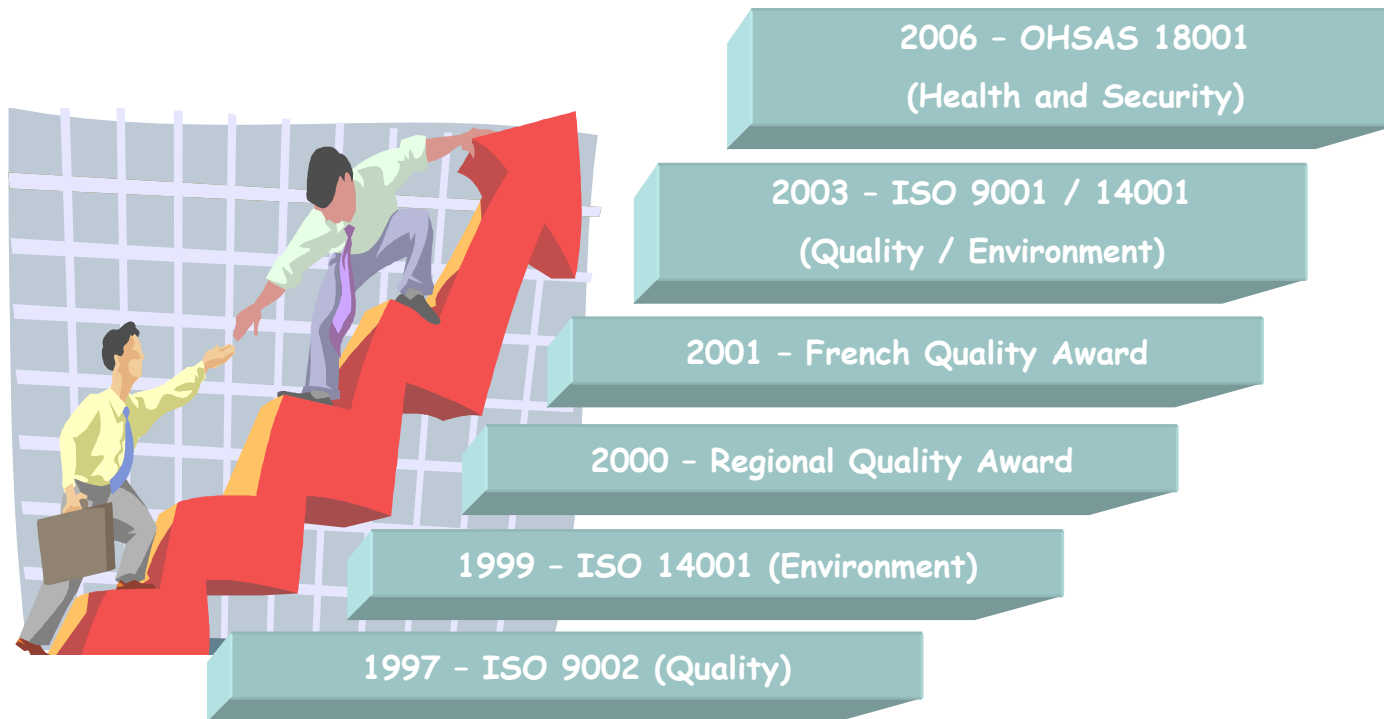


# Total Quality Management at MELOX: striving for excellence

- ▶ Continuous improvement to achieve customer satisfaction
- ▶ Employee encouraged to participate in achieving MELOX performance objectives
- ▶ Constant attention to successful environmental integration

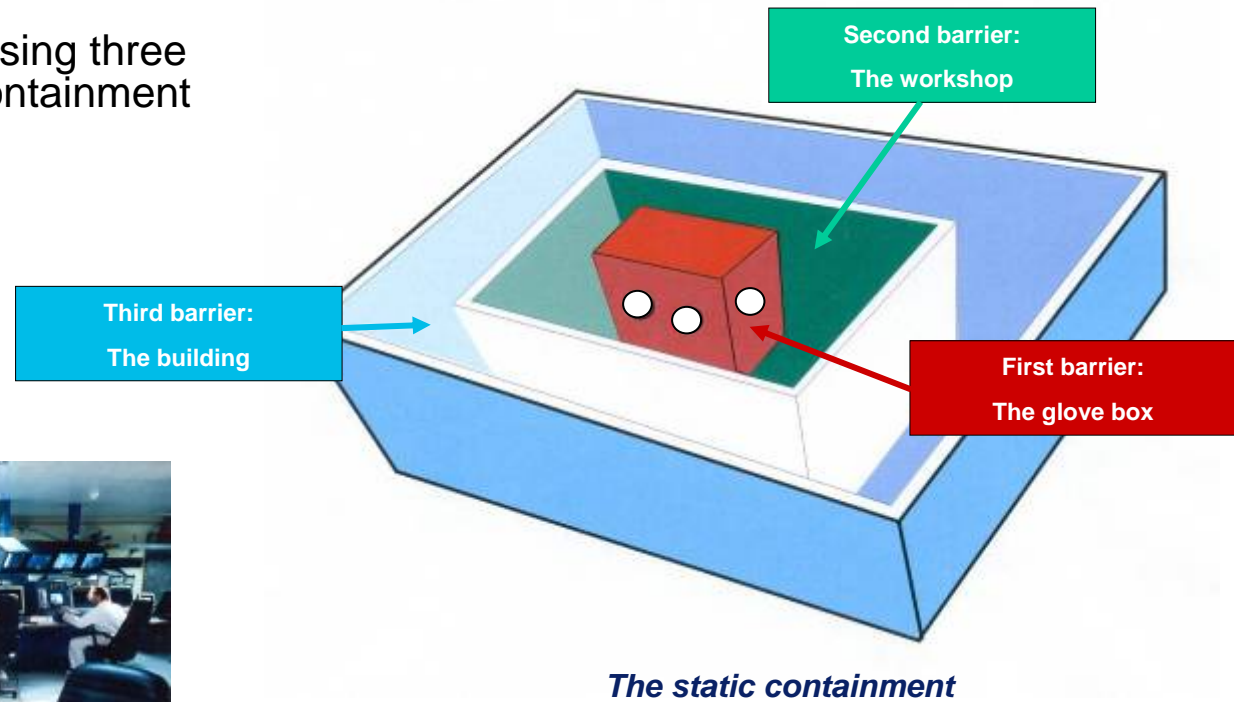


French Quality Award in 2001



▶ Prevention and control of nuclear materials dispersion and external exposure are based on:

- ◆ A confinement system using three barriers and dynamic containment (negative air pressure)



- ◆ High level of plant automation

## ***MELOX: a continuous and effective system of safeguards***

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- ▶ National and international organizations (Euratom, IAEA) monitor nuclear materials at AREVA NC's MOX fabrication plants
- ▶ Euratom worked with the French regulatory authorities and the plant operator during the MELOX design phase to develop the system of safeguards with the objective of "Continuous Inventory Verification"
- ▶ This system is specific to the plant characteristics
  - ◆ Control of inputs/outputs.
  - ◆ Independent, automatic measurements
  - ◆ Control of the annual inventory of nuclear materials
  - ◆ Sample analysis
- ▶ This system complies with IAEA requirements