

***Expanding the U.S. Nuclear Infrastructure  
by Building a New Uranium Enrichment  
Facility***

**Pre-application Meeting with the NRC  
May 21, 2007**

- ▶ **Michael McMurphy, Executive Sponsor**
- ▶ **Sam Shakir, General Manager, Strategic Enrichment Program**
- ▶ **Nicolas DeTurckheim, Project Director, George Besse II**
- ▶ **George Harper, Technical Director**
- ▶ **Bob Poyser, Project Manager, Site Selection**
- ▶ **Antoine Genevois, Project Legal Council**
- ▶ **Jim Curtiss, Winston & Strawn**
- ▶ **Tyson Smith, Winston & Strawn**

- 1. Overview of AREVA** **Michael McMurphy**
- 2. AREVA's Enrichment Operation** **Nicolas DeTurckheim**
- 3. Why the U.S. Needs Additional Enrichment Capacity** **Sam Shakir**
- 4. Overview of the New U.S. Project** **George Harper**
- 5. The Project Structure** **Sam Shakir**
- 6. Site Selection** **Bob Poyser**
- 7. International Government Agreements** **Jim Curtiss**
- 8. Licensing Approach** **Sam Shakir**
- 9. Tails Management** **Sam Shakir**
- 10. Proposed Pre-Application Schedule** **Sam Shakir**
- 11. Wrap Up** **Sam Shakir**

# ***Our Long Term Business Objectives***

- ▶ **Meet our strategic business plan of expanding the U.S. commercial nuclear infrastructure to ensure safe and secure supply of CO2 free nuclear energy**
- ▶ **Provide domestic US supply to meet the growing demand for enrichment services**
- ▶ **Our aim:**
  - ◆ **Build a new enrichment facility in the U.S. using the ETC centrifuge technology**
  - ◆ **Start production in 2013**
  - ◆ **Initial plant capacity of 3 million SWU per year**

- ▶ **Key considerations for this significant investment in US infrastructure**
  - 1. Short and predictable licensing process**
  - 2. Customer commitments to plant output**
  - 3. Supportive host state and community**
  - 4. Access to US tails disposal route**

**1. Overview of AREVA**

**2. AREVA's Enrichment Operation**

**3. Why the U.S. Needs Additional Enrichment Capacity**

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**11. Wrap Up**

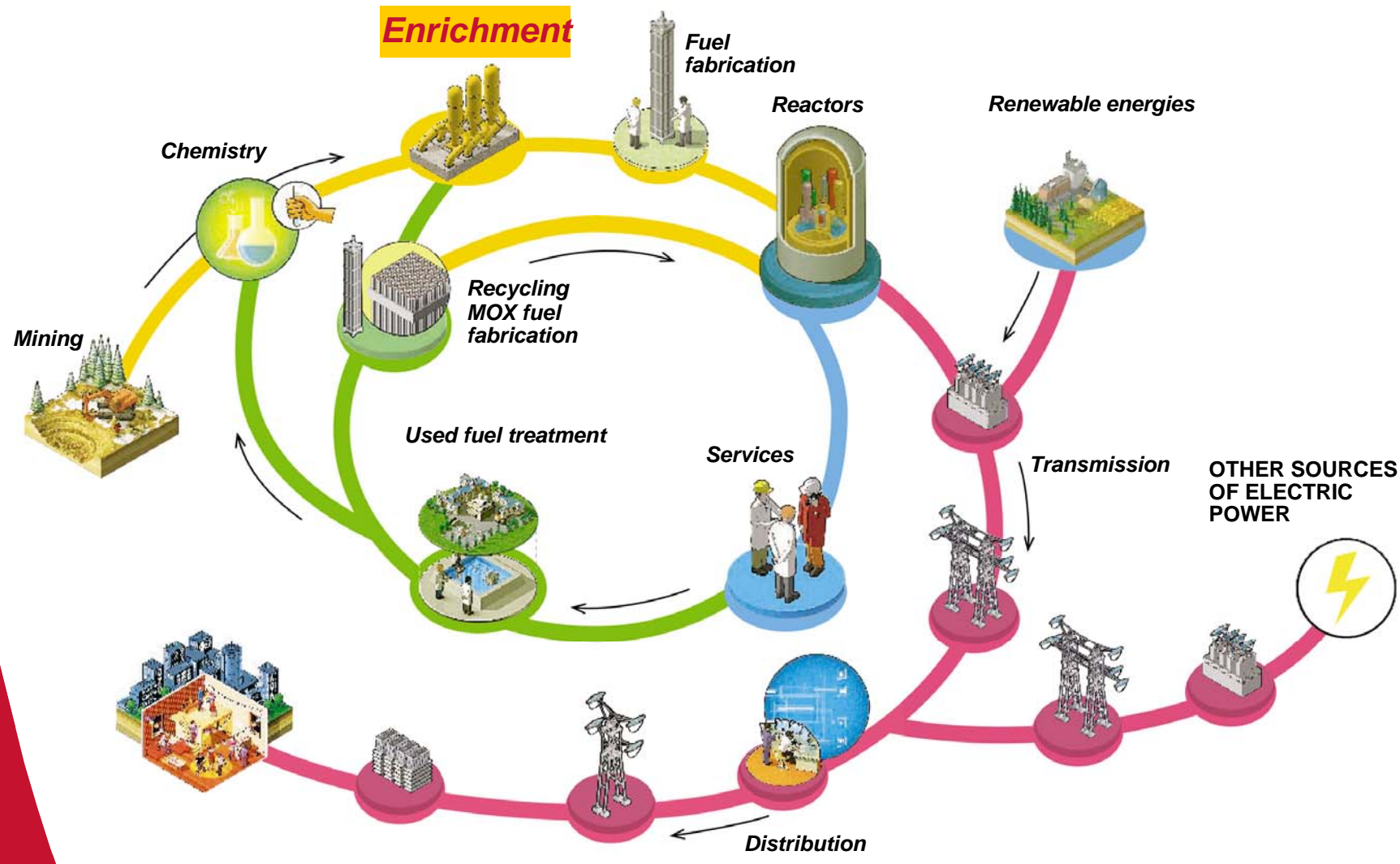
▶ **World leader in the energy business**

- ◆ **Number 1 in the entire nuclear cycle**
- ◆ **Number 3 in electricity transmission and distribution**

▶ **Our mission**

- ◆ **Enabling everyone to have access to ever cleaner, safer and more economical energy**

# An integrated offer serving energy professionals



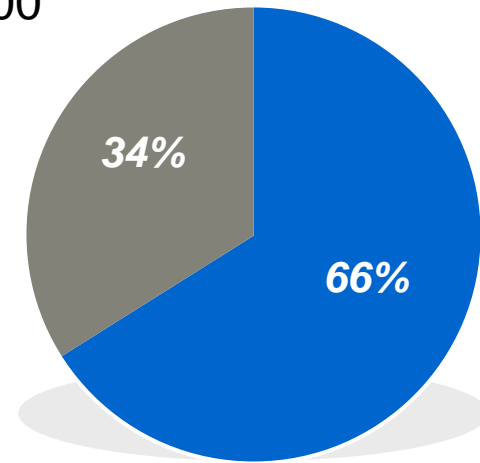
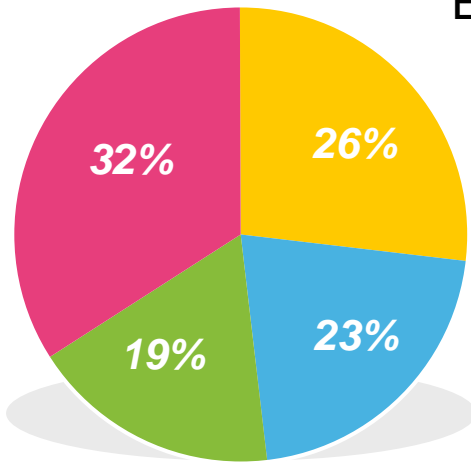
Front End Division
Reactors and Services Division
Back End Division
Transmission & Distribution Division



**Sales revenue by division**  
(in %)

**Sales revenue by business**  
(in %)

Total sales: \$14B  
Employees: 61,100



- Front End Division
- Back End Division
- Reactors and Services Division
- Transmission & Distribution Division

- Nuclear
- Transmission and Distribution

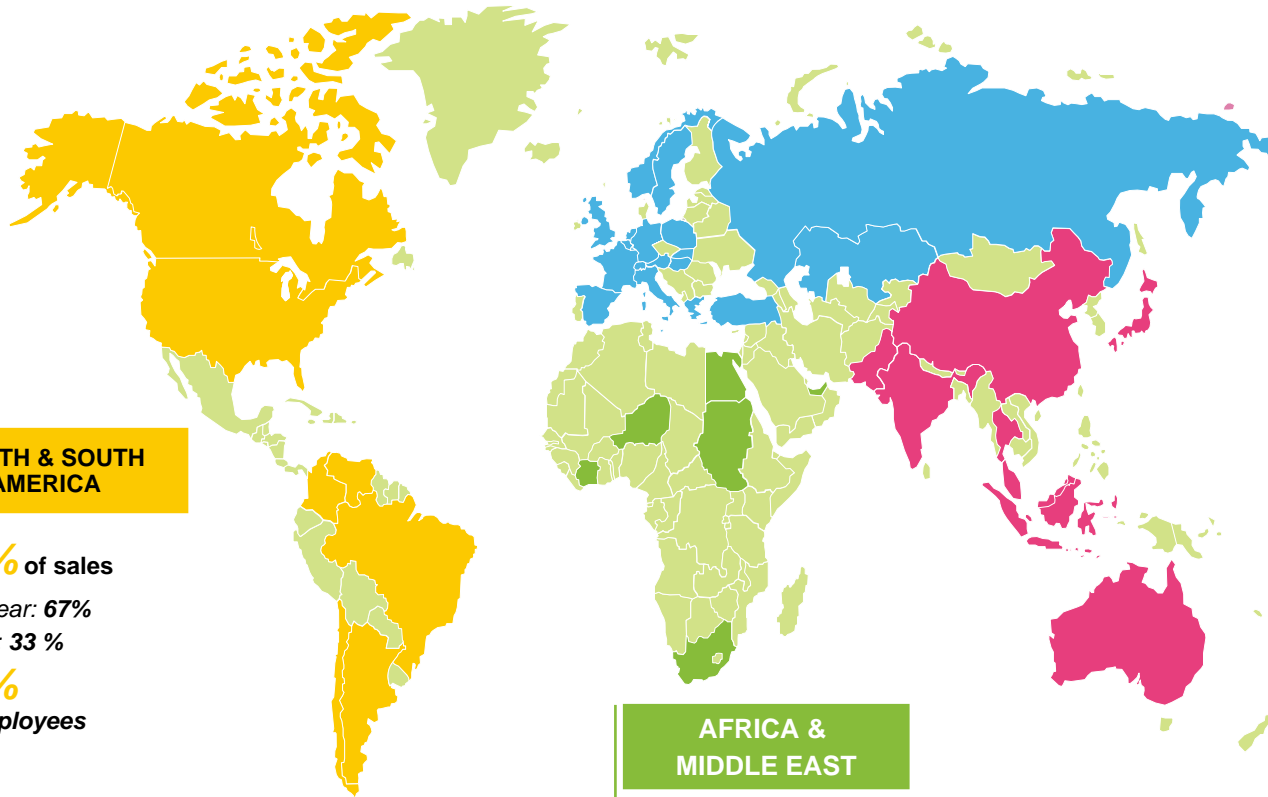
# AREVA across the globe

**41 countries**

Production & Manufacturing

**100 countries**

Marketing & Sales



**NORTH & SOUTH AMERICA**

**17%** of sales

- Nuclear: 67%
- T&D: 33%

**12%** of employees

**EUROPE & CIS**

**62%** of sales

- Nuclear: 76%
- T&D: 24%

**73%** of employees

**ASIA-PACIFIC**

**14%** of sales

- Nuclear: 47%
- T&D: 53%

**11%** of employees

**AFRICA & MIDDLE EAST**

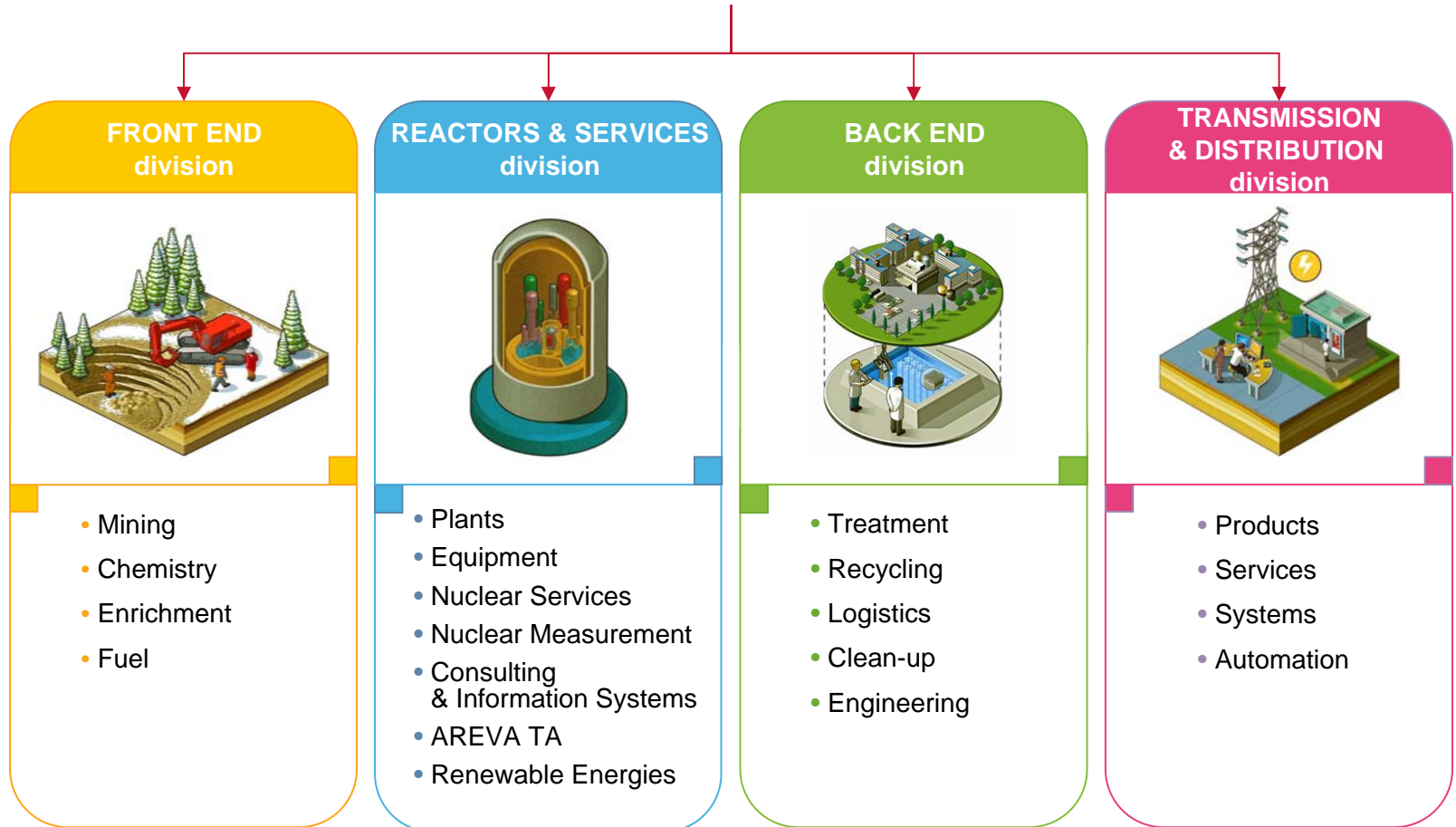
**7%** of sales

- Nuclear: 9%
- T&D: 91%

**4%** of employees

Production & manufacturing ■ ■ ■ ■

# Organization of the group



- ▶ All of the activities leading up to the generation of nuclear power:
  - ◆ Uranium exploration and mining
  - ◆ Uranium conversion and enrichment
  - ◆ Nuclear fuel design and fabrication

**\$3.8B**  
Sales

**11,995**  
Employees



# Reactors and Services division

- ▶ Design and construction of nuclear power plants and of biomass plants
- ▶ Inspection, servicing and retrofitting of all reactor types
- ▶ Heavy component design, manufacturing and replacement

**\$3B**  
Sales

**14,936**  
Employees



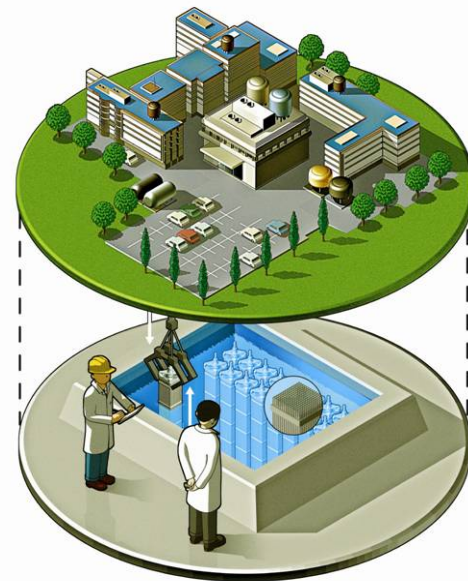
- ▶ Solutions for used fuel treatment and recycling of reusable materials
- ▶ Solutions for used fuel storage
- ▶ Facility decommissioning at the end of service life

**\$2.5B**

Sales

**10,697**

Employees



# Transmission & Distribution division

- ▶ Design, manufacturing and installation of high and medium voltage equipment and systems
- ▶ Development and installation of grid control systems

**\$4.8B**

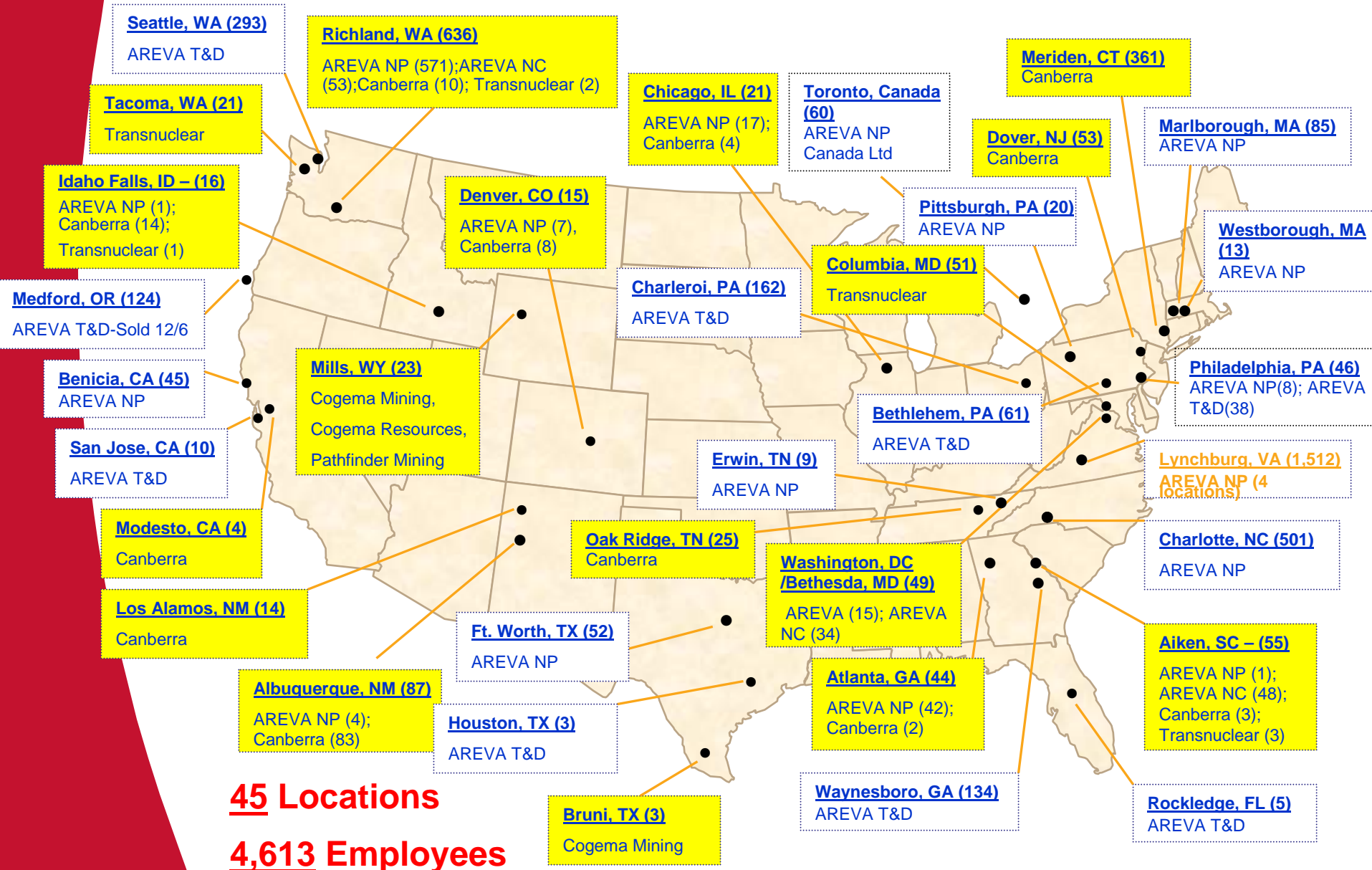
Sales

**22,988**

Employees



# U.S. Locations



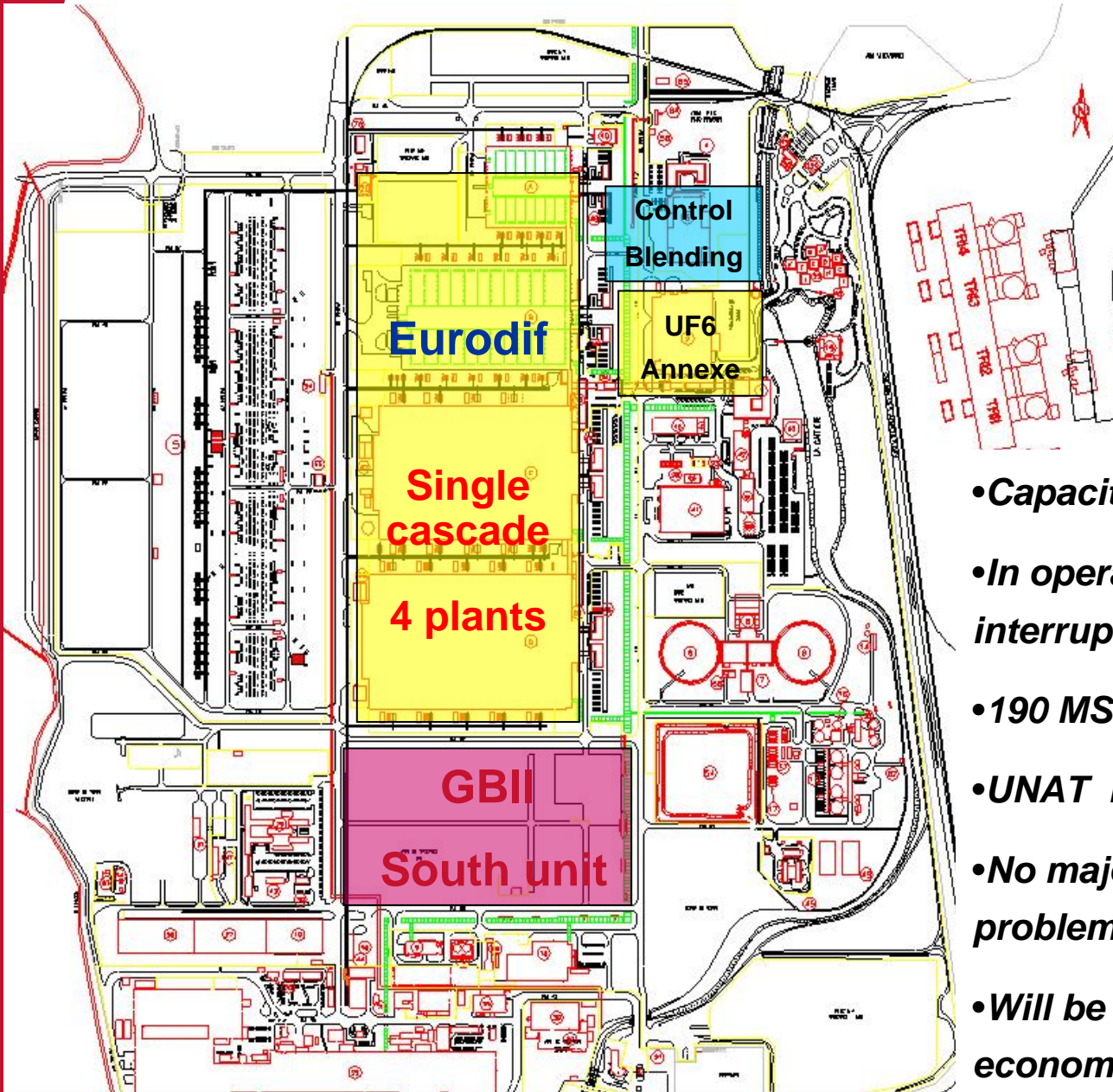
**45 Locations**  
**4,613 Employees**



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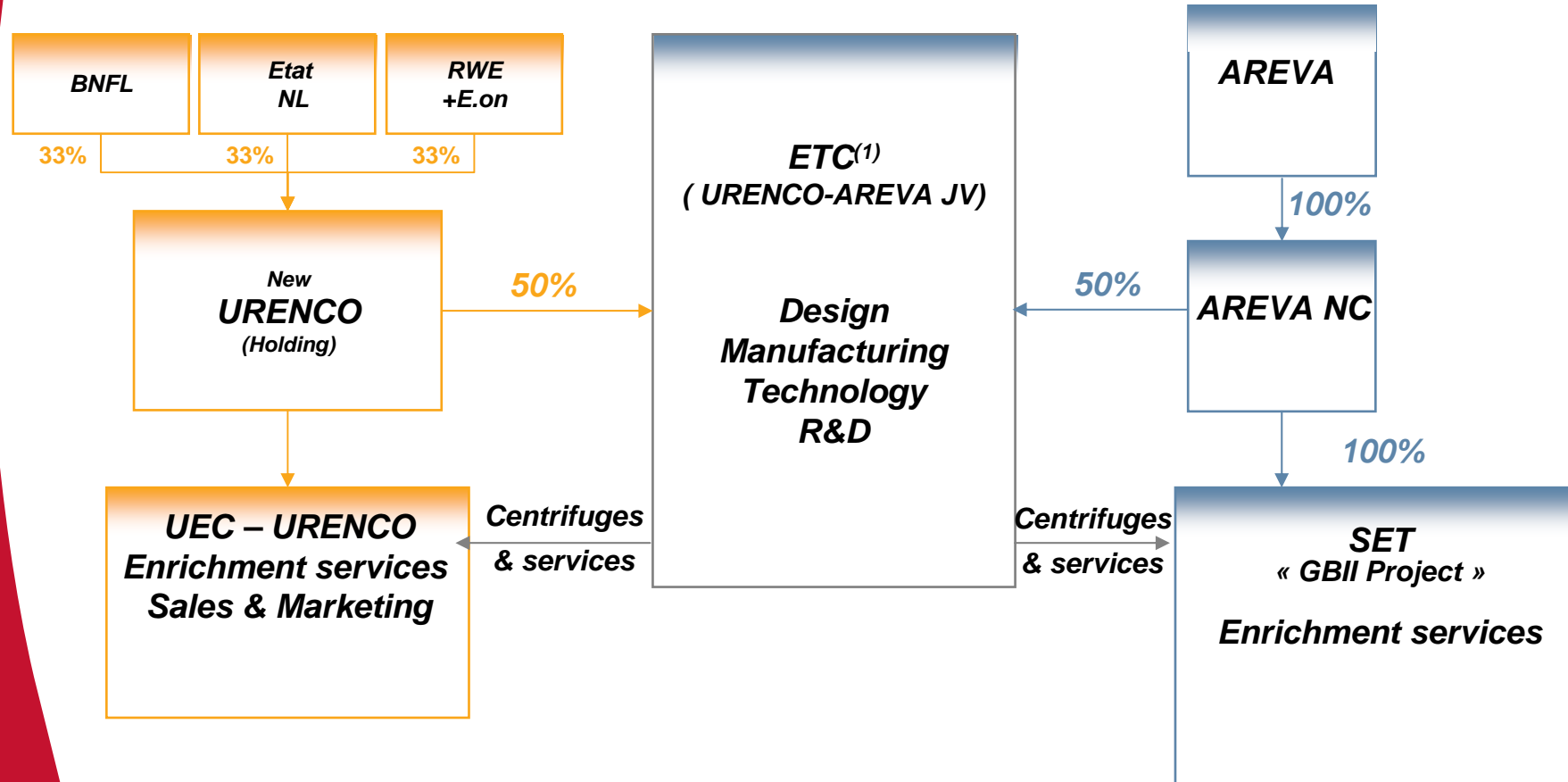
- ▶ **1973: establishment of EURODIF, AREVA's affiliate in enrichment business**
- ▶ **1974: Start construction of the GB-I plant, based on gaseous diffusion technology**
- ▶ **1979: Start commercial operation and supply the first SWU**
- ▶ **1982: Completion of GB-I**
- ▶ **1984: First supply of SWU to US utilities**
- ▶ **Today: 190 million SWU have been supplied, including 26 million SWU to US market**

# The Eurodif Enrichment Plant



- **Capacity 10.8 MSWU/yr**
- **In operation for 29 years without interruption**
- **190 MSWU produced**
- **UNAT maximum 5%**
- **No major technical or safety problems**
- **Will be decommissioned due to economical effects (electricity)**

# The Creation of ETC Joint Venture Between AREVA and URENCO



(1) Enrichment Technology Company

## **An investment ...**

- ▶ **... essential to the global SWU supply demand balance**
  - ◆ **At least 7.5 MSWU in a context of increasing demand**
  
- ▶ **... based on the best existing technology**
  - ◆ **A worldwide reference technology that will be implemented in all enrichment facilities within 10 years**
  
- ▶ **... with a modular capacity to adapt to market future needs**
  - ◆ **7.5 MSWU to 11 MSWU**

- **AREVA - URENCO signature** **November 2003**
- **Preliminary safety report** **June 2004**
- **Public hearing** **September 2004**
- **Technical safety approval by ASN** **June 2005**
- **Public inquiries** **June 2006**
- **Cardiff treaty (F UK D NL) ratification** **July 2006**
- **Start of construction** **September 2006**
- **GBII Nuclear license 8.2MSWU/yr -Max 6%** **April 2007**
- **1st cascade on line** **1st half 2009**

□ 4 MSWU/yr

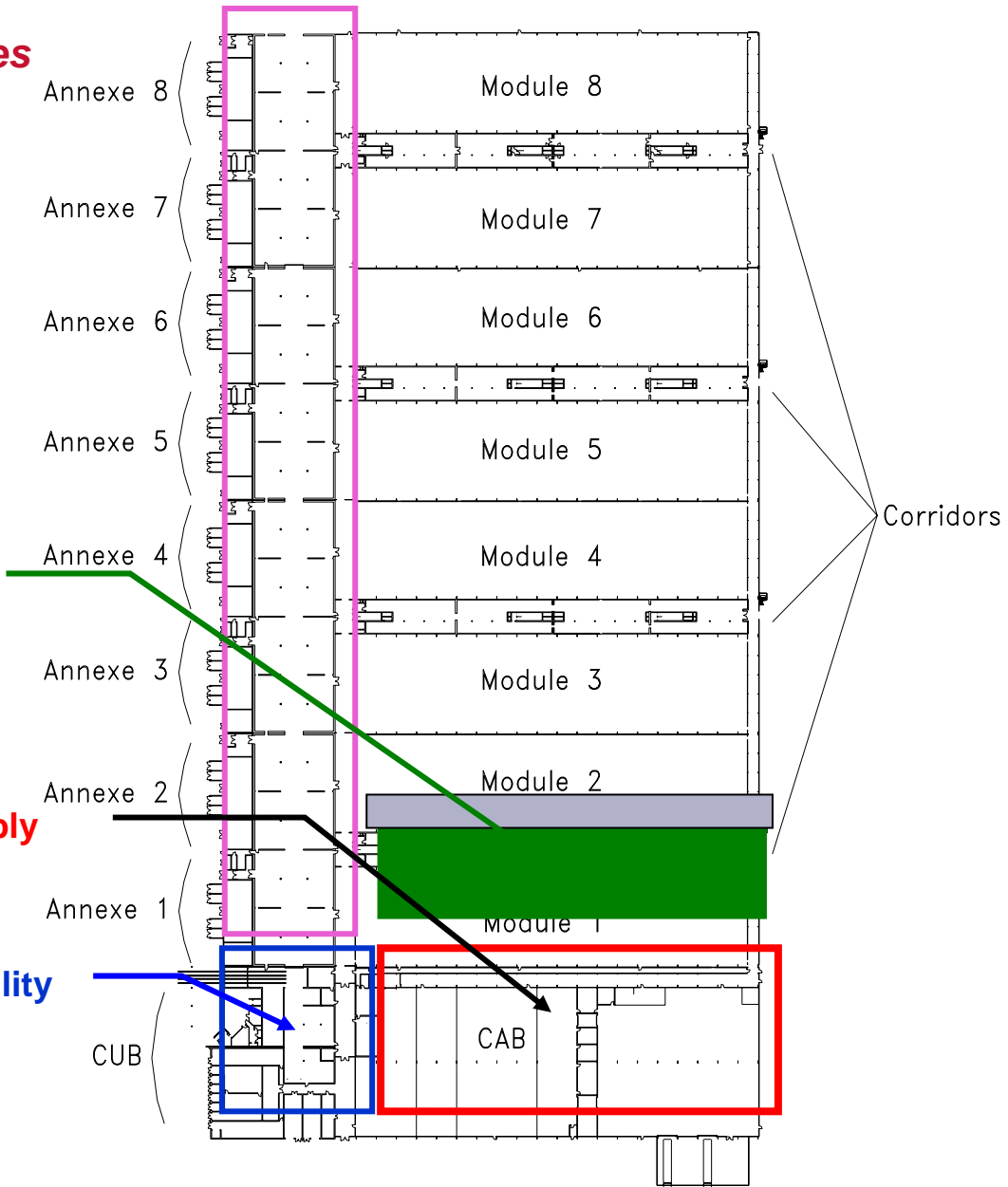
□ TC12 Centrifuges

□ U235 limit 6%

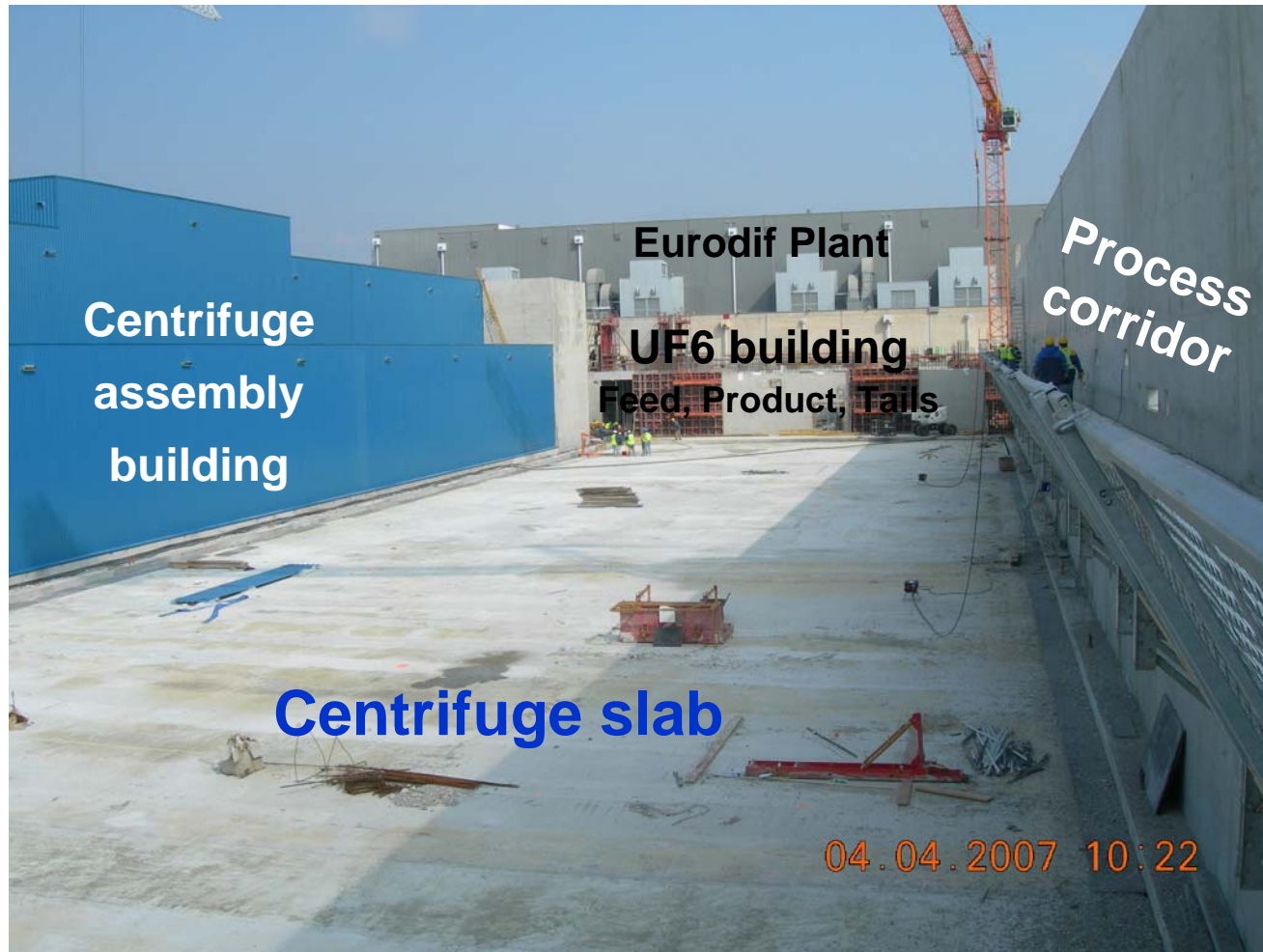
1 module  
(0,5 MSWU/yr)

Centrifuge assembly  
building

Centrifuge utility  
building









***5 Minute Video  
The GB II Project***

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# *Unbalanced Demand and Supply A Clear Market Argument*

- ▶ **US needs : 12.7 M SWUs to 15.5 M SWUs/year (WNA reference scenario)**
- ▶ **Today the US relies on imports for more than 90% of their enrichment needs**
- ▶ **Russian HEU provides 50% of the US demand, but the HEU agreement expires in 2013**
- ▶ **US domestic production:**
  - ◆ **NEF-LES (start up in 2009 but fully committed),**
  - ◆ **USEC ACP to replace GDP (No added capacity)**
    - **Only a small part of the current USEC GDP production is sold to US customers. The rest is exported to Asia**
- ▶ **The US demand is larger than the capacity of NEF + ACP + AREVA US plant.**
- ▶ **The shortfall has to be imported or be fulfilled by additional domestic capacity**

# *Additional Domestic Capacity is Necessary*

- ▶ **To cover some of the significant shortfall in domestic supply and reduce reliance on imports, an important US energy security objective**
- ▶ **Maintain a viable, competitive, domestic uranium enrichment industry**
- ▶ **To help the US achieve our non-proliferation objectives by being in a position to meet the needs of non fuel cycle countries that want to adopt or expand nuclear energy**
- ▶ **Building the US nuclear infrastructure to support and sustain a nuclear renaissance**

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- ▶ **Plant will be designed to enrich commercial natural uranium**
- ▶ **Plant initial capacity is 3 MSWU**
- ▶
- ▶ **Feed will comply with ASTM C 787-03, “Standard Specification for Uranium Hexafluoride for Enrichment”**



# *Overview of U.S. Plant*

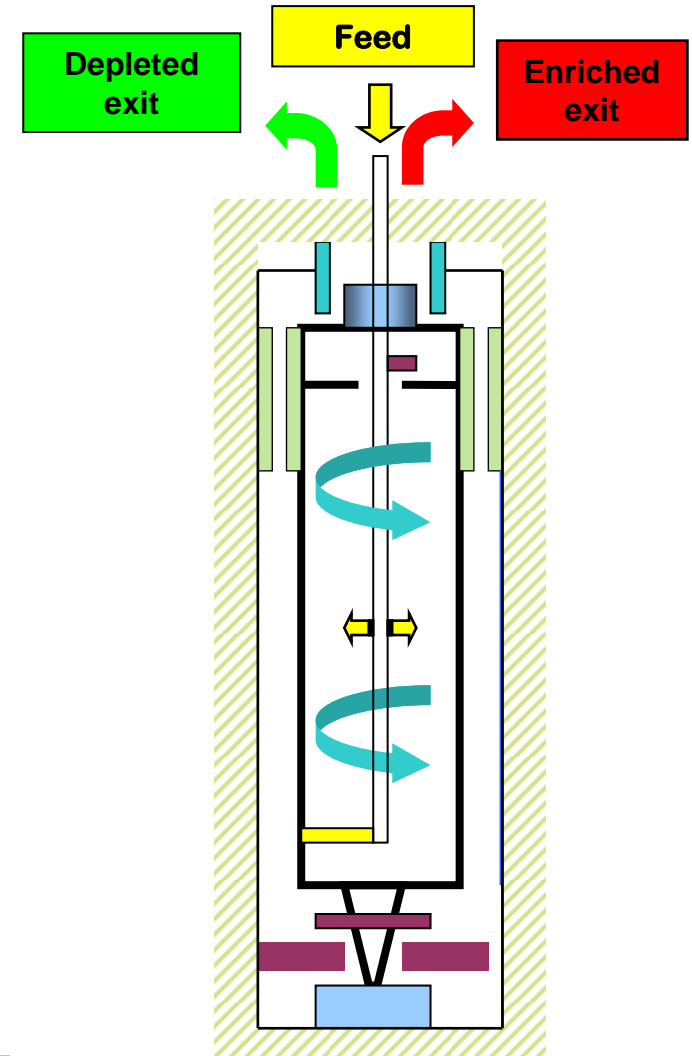
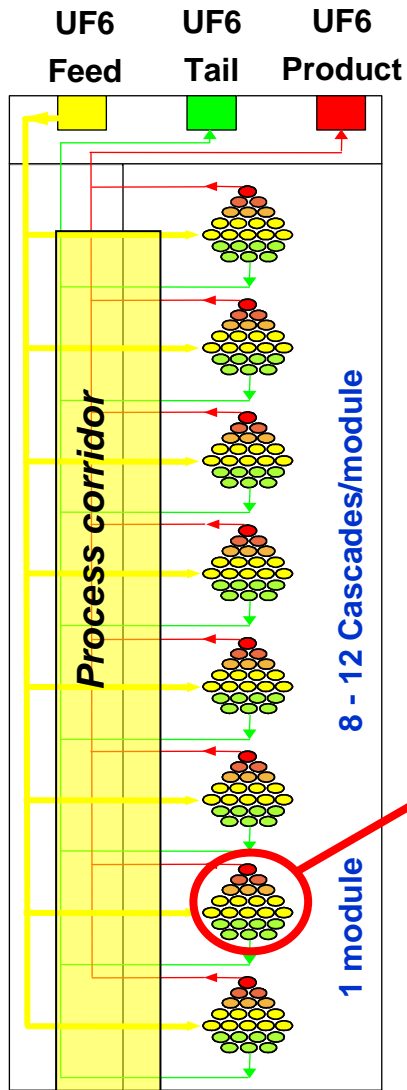


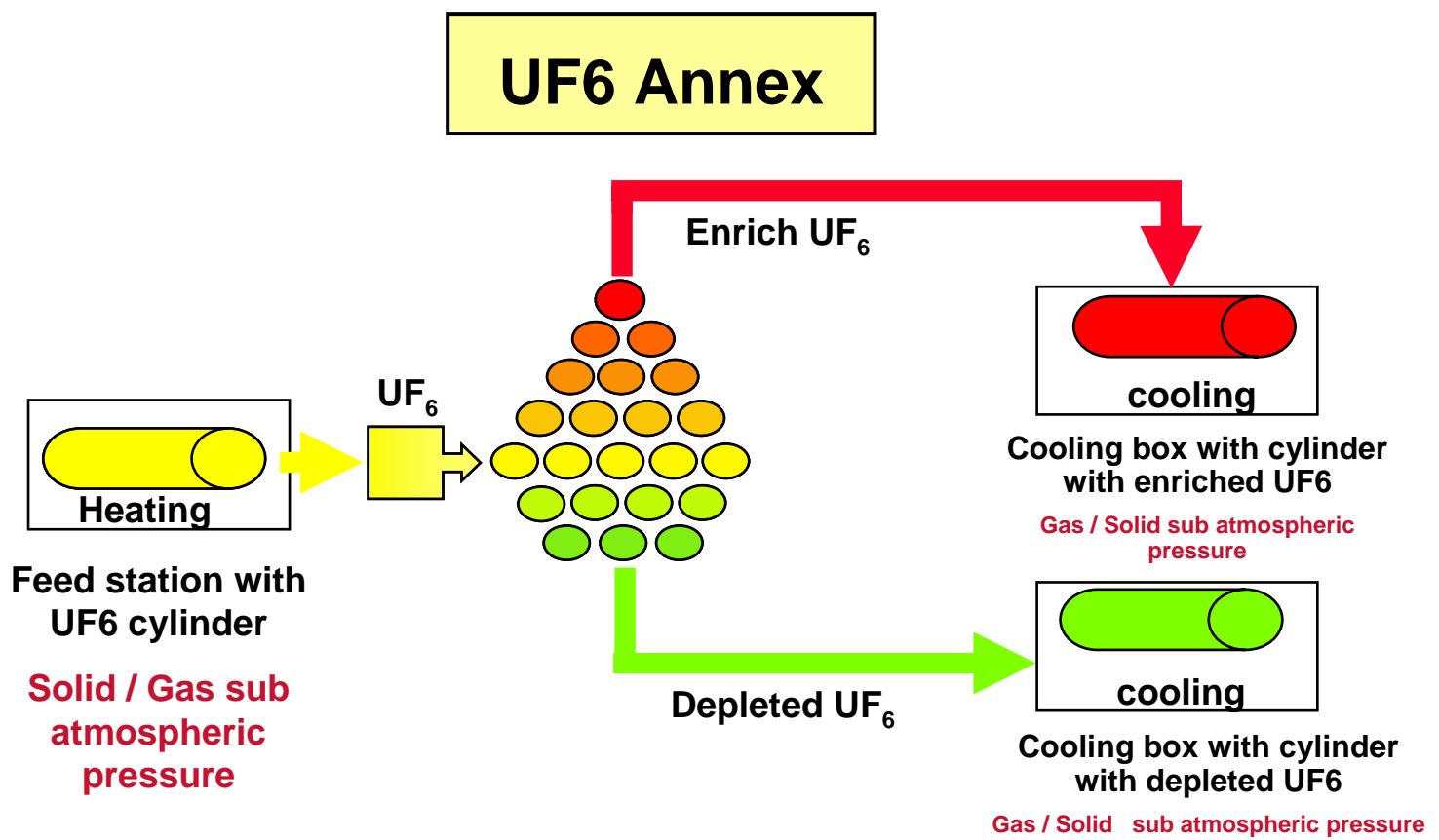
# *Overview of U.S. Plant*

- ▶ **Each module will have a service life of 20 years as estimated by ETC**
- ▶ **The cascades will be earthquake resistant to a specified level for investment protection**



# Separation Module





# Overview of U.S. Plant

## ▶ Main plant structures

- ◆ Centrifuge Assembly Building (CAB)
- ◆ Utilities, Control and Service Building
- ◆ Centrifuge Modules
  - Hall of 8 – 12 cascades
  - UF<sub>6</sub> Annex for feed and take-off operations
  - Half an inter-module corridor
- ◆ Blending and Liquid Sampling Area
  - Includes laboratory

# Overview of U.S. Plant

- ▶ **Main plant structures (continued)**
  - ◆ **Cylinder Receipt and Dispatch Building**
  - ◆ **Electrical Equipment Room**
  - ◆ **Cylinder Storage Yard**
    - **Empty UF<sub>6</sub> cylinders**
    - **Feed Cylinders**
    - **Tail Cylinders**

# *Overview of U.S. Plant*

- ▶ **Utilities required for operation and CAB support**
  - ◆ **Cooling water**
  - ◆ **Compressed air**
  - ◆ **Nitrogen**
  - ◆ **Demineralized water**
  - ◆ **Potable water**
  - ◆ **Electrical distribution**

# *Overview of U.S. Plant*

## ▶ **UF<sub>6</sub> Cylinders**

- ◆ **Feed and tail cylinders will be of 48-inch type**
- ◆ **Either 48Y or 30B cylinders will be used for product take-off**

# *Overview of U.S. Plant*

## ▶ **Cylinder Logistics**

- ◆ **Receipt, shipment, weighing and overpacking operations will be performed in the CRDB**
- ◆ **Liquid sampling of all Product cylinders**
- ◆ **Leak tests on 30B cylinders prior to filling**
- ◆ **Leak tests on 30B cylinder needle valves prior to shipment**

# Overview of U.S. Plant

## ▶ Operation

- ◆ Plant operation and staffing will be developed using input from ETC and GB II
- ◆ Installation and start-up tests
  - Factory acceptance tests (FAT) at manufacturers
  - Site acceptance tests (SAT) by suppliers
  - Integration tests by main contractor, suppliers and operator
  - UF<sub>6</sub> tests by operator with ETC for cascades
- ◆ Radiological protection integrated into design through ALARA principle



# Overview of U.S. Plant

## ▶ Safety

- ◆ Based on 10CFR70, precedent and design principles of NEF and GBII plants

## ▶ Inspections

- ◆ NRC
- ◆ IAEA
- ◆ Supported by precision scales, autoclaves for homogeneous sampling and physical traceability of nuclear materials

# Overview of U.S. Plant

## ▶ Decommissioning Strategy

- ◆ Dismantling, decontamination and disposal defined for each type of equipment
- ◆ ETC responsible for centrifuges and piping

## ▶ Training

- ◆ Theoretical and practical training by ETC for core team at GBII Plant
- ◆ On-site training at AREVA U.S. Plant
- ◆ Simulator
- ◆ Centrifuge assembly training by ETC

# *Overview of Technology*

- ▶
- ▶
- ▶ **CAB facilities and utilities will be supplied by AREVA based on ETC specifications**
- ▶ **Tools required to assemble, check and assess centrifuges will be supplied by ETC**
- ▶ **ETC responsible for conveying components and assembling centrifuges in CAB**
- ▶ **ETC in charge of centrifuge transport from the CAB to modules and installation**



# ***Building on Existing Experience***

- ▶ **We have a good starting point**
  - ◆ **Reference plant – (Almelo vs GBII)**
  - ◆ **Licensing precedent exists today**
  - ◆ **Leverage publicly available licensing data from recent NRC licenses (ISA Summary, ER, SAR, etc..)**
  - ◆ **US based AREVA resources with licensing experience**
  - ◆ **Experience of NRC with ETC technology**

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# *A Partnership Structure*

- ▶
- ▶
- ▶
- ▶ **This US company will be the applicant for the license and ultimately the license holder for the enrichment facility**
- ▶ **The US company will be formally in place by Q3 2007**

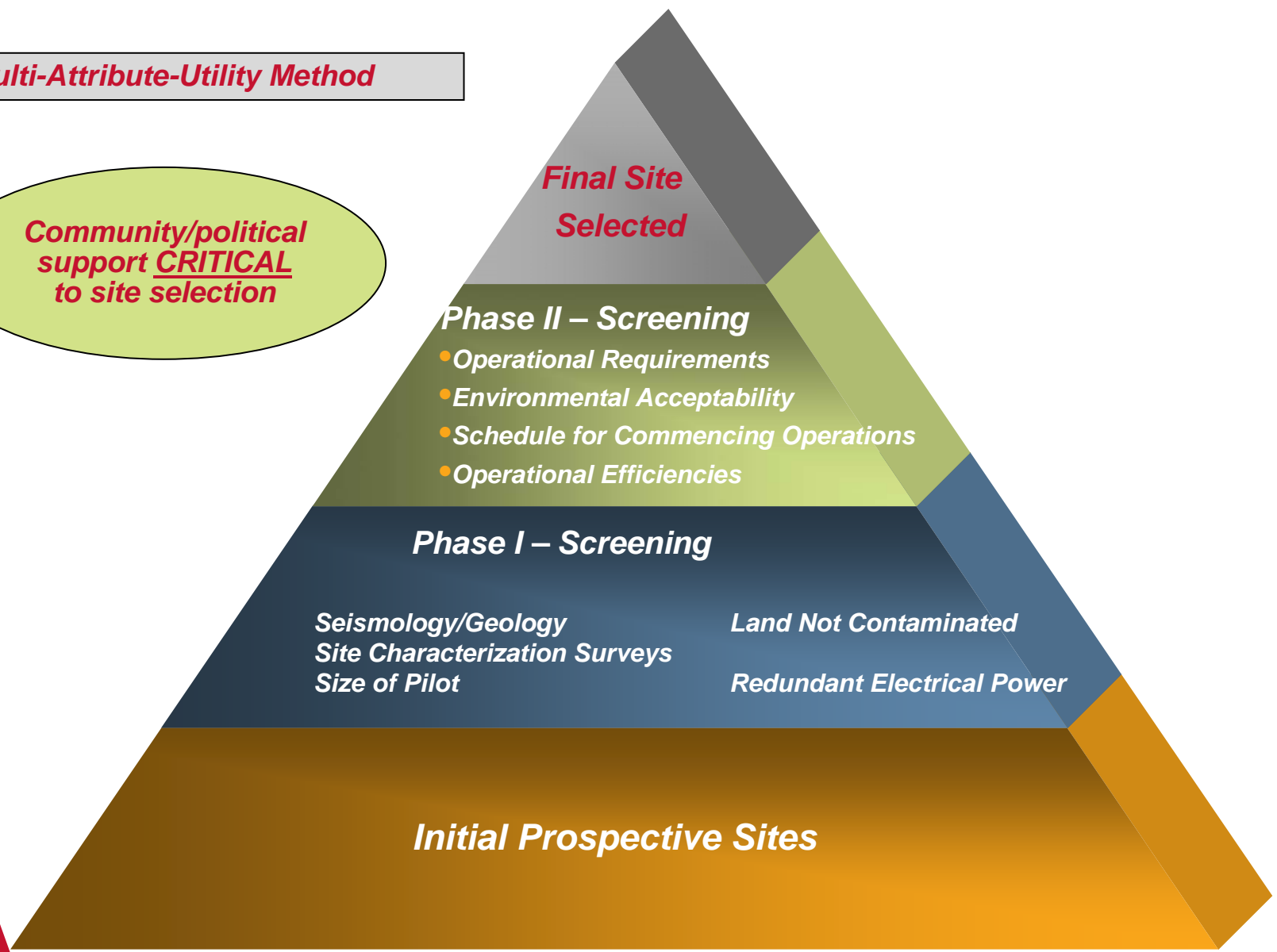
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- ▶ **Aim: Select a site by end of 2007**
- ▶ **Status: Award contract to perform site selection study in next 30 days**
- ▶ **Follow 10 CFR 51 requirements**
- ▶ **Utilize a multi attribute utility method**
  - ◆ **EPRI Siting Guide**
  - ◆ **NUREG-1520**
  - ◆ **NUREG 1478**
- ▶ **Incorporate lessons learned from LES and other nuclear facility site selection activities**

» **Multi-Attribute-Utility Method**

**Community/political support CRITICAL to site selection**



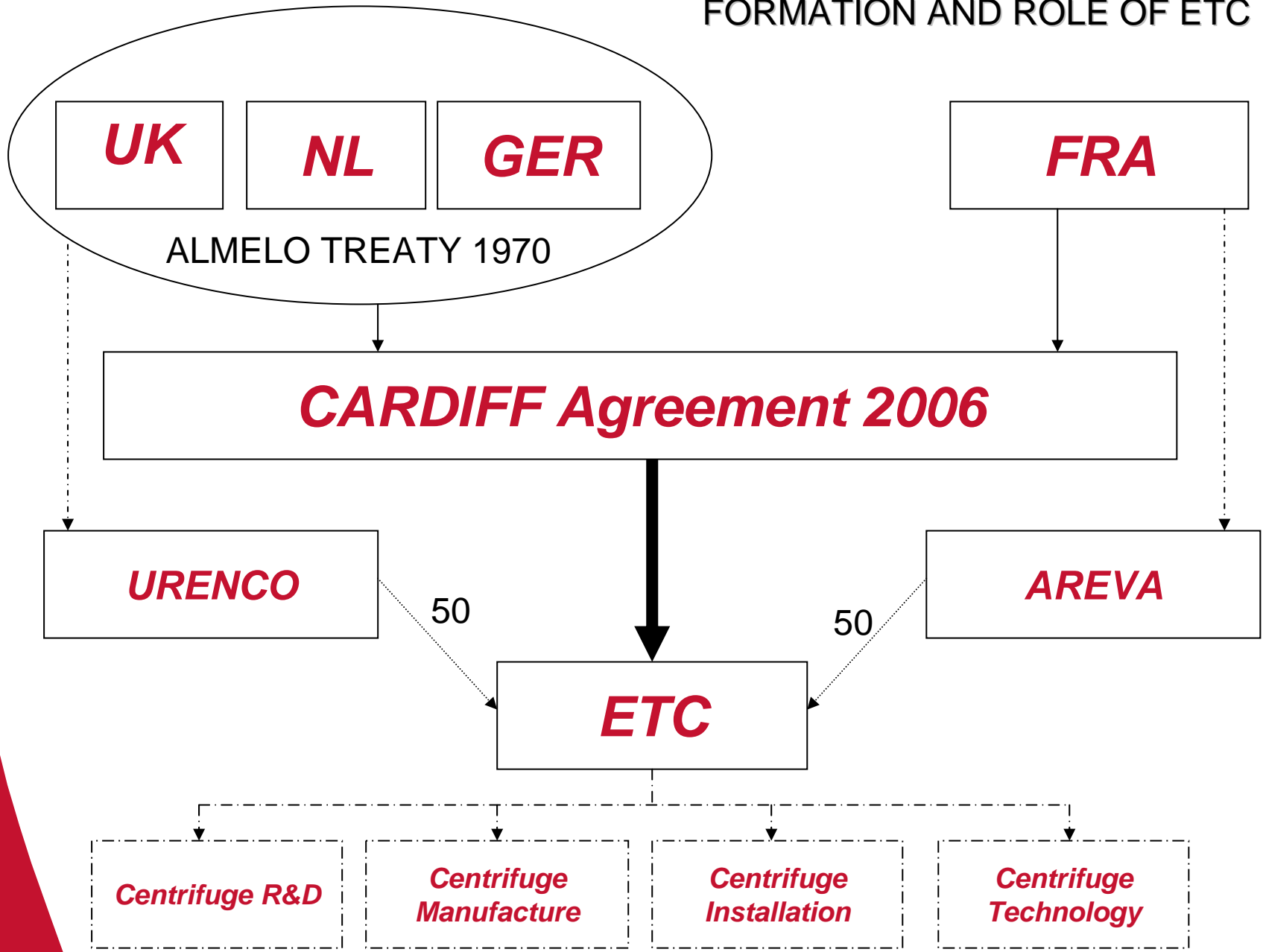
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- ▶ **As with LES's National Enrichment Facility, the proposed AREVA facility would be subject to and would abide by the all applicable U.S. laws and regulations, including export licenses and controls of sensitive nuclear technology.**
- ▶ **Maximize use of the existing international agreements to facilitate a framework consistent with the framework used by LES and to expedite the project schedule.**

# Existing International Agreements

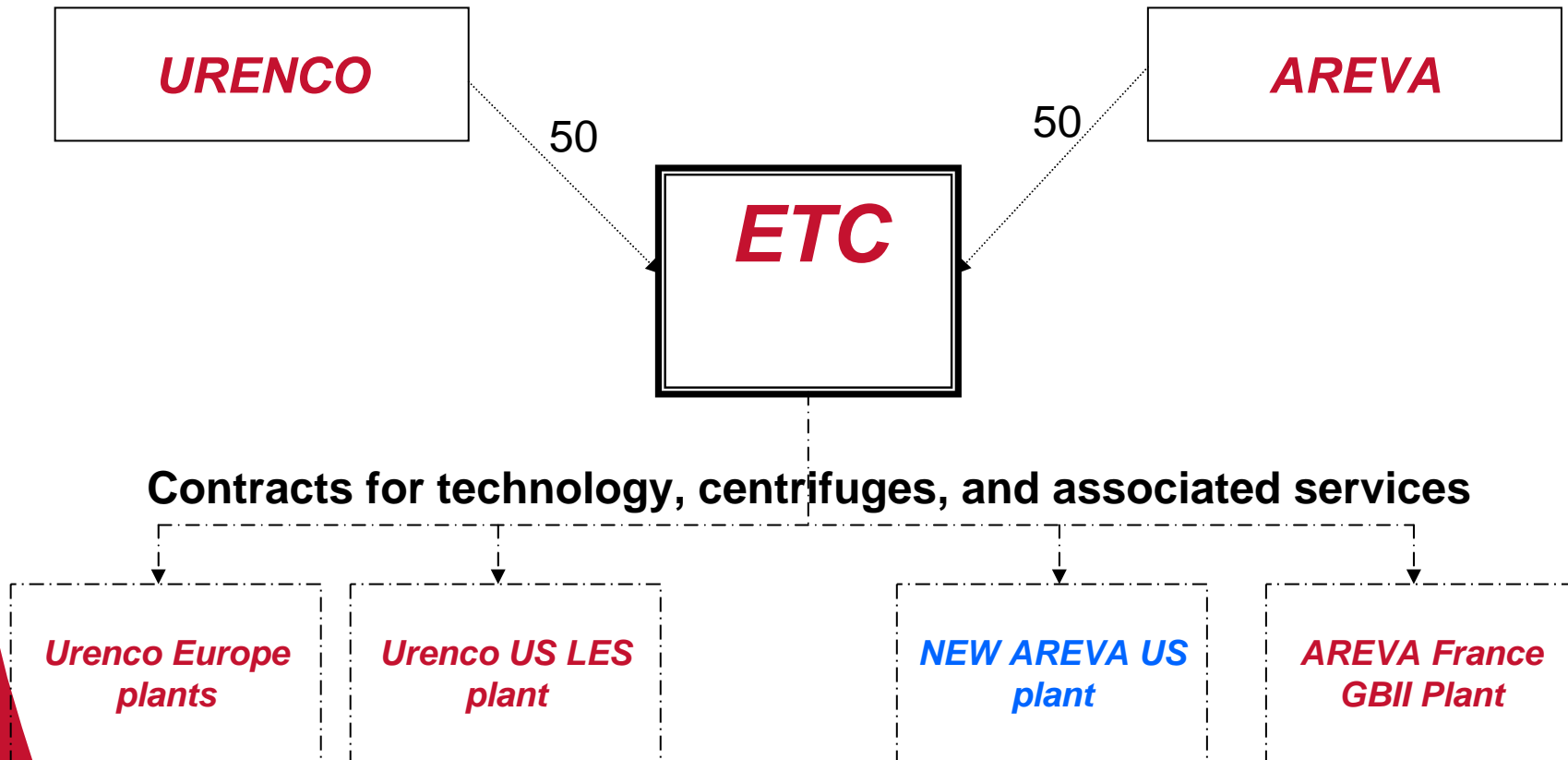
- ▶ ***Treaty of Almelo (1970)*** – This agreement permits the UK, Germany and the Netherlands to collaborate on and jointly develop centrifuge enrichment technology through Urenco.
- ▶ ***Washington Agreement (1992)*** – This agreement between the US and the parties to the Treaty of Almelo establishes a framework for the transfer of centrifuge enrichment technology into the US in connection with the construction of a uranium enrichment facility by Urenco.
- ▶ ***Cardiff Agreement (2006)*** – This agreement between France and the parties to the Treaty of Almelo establishes a framework for collaboration, through Enrichment Technology Company, Ltd. (“ETC”), with respect to all aspects of centrifuge enrichment technology previously held by Urenco.
  - ◆ The Agreement provides that the Cardiff Quadripartite Committee must approve a transfer of technology to a non-Cardiff country, including the U.S.
  - ◆ The Agreement recognizes the Washington Agreement and commits to honoring all its requirements.
  - ◆ The Agreement also explicitly recognizes that Urenco and AREVA may elect to develop additional enrichment facilities beyond those contemplated at the time of the Agreement.

# FORMATION AND ROLE OF ETC



# ETC PROJECTS

ETC, provider of centrifugation technology for all the projects











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- ▶
- ▶ **The project organization is being assembled**
- ▶ **A Licensing Manager will be assigned to the team in the next two months. That individual will become the NRC point of contact**
- ▶ **Interim Licensing Manager is Sam Shakir, AREVA NC Inc**

# *Applicable Regulations and Guidance*

▶ **Two main regulations:**

- ◆ **10 CFR 40: Domestic Licensing of Source Material**
- ◆ **10 CFR 70: Domestic Licensing of Special Nuclear Material**

▶ **10 CFR 40 and 10 CFR 70 require**

- ◆ **Compliance with 10 CFR 51 “Environmental protection regulations for domestic licensing and regulatory functions”**
- ◆ **Compliance with 10 CFR 95 “Facility security clearance and safeguard of national security information and restricted data”**

▶ **Guidance Documents:**

- ◆ **Regulatory Guide 3.25 “Standard format and content of Safety Analysis Reports for Uranium Enrichment Facilities”**
- ◆ **NUREG – 1520 “Standard Review Plan for a License Application for a Fuel Cycle Facility”**
- ◆ **NUREG – 1513 “Integrated Safety Analysis Guidance Document”**

# *Proposed Timeline*

- ▶ **Pre application review** Starting in May 2007
- ▶ **Site selection** Q4 2007
- ▶ **License application** Q2-Q3 2008
- ▶ **NRC Final Decision** Q2 2010
- ▶ **Site preparation** Q2 2010
- ▶ **Start construction** Q3 2010
- ▶ **First 0.5 MSWU production** 2013
- ▶ **Reach 3 MSWU/yr** 2017

# Application Schedule

- ▶ Pre application review: .....May 07-April 08
- ▶ Application submittal: .....June/July 2008
- ▶ Propose NRC complete technical/  
environmental review.....12-15 Months
- ▶ Complete hearings and NRC decision.....Q2 2010

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# *Tails Management Strategy*

- ▶ **Conversion and disposal of the byproducts by a private, commercial company**
  - ◆ A conversion facility will not be part of the enrichment plant license application
  - ◆ AREVA owns a conversion technology
  
- ▶ **DOE disposition of tails in accordance with Section 3113 of the USEC Privatization Act**
  
- ▶ **Both approaches were deemed “Plausible” in the LES license**

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- ▶ **June 07: International agreements**
- ▶ **Aug 07: Information Security**
- ▶ **Sep 07: Codes and Standards**
- ▶ **Fall 07: AREVA would like to invite the NRC to visit the GB II facility currently under construction to learn about the features of this facility which will be a reference facility for the US plant**
- ▶ **Additional meeting to be scheduled later as we progress through the initial phase of LA preparation**

- ▶ **Our aim is to expand our domestic nuclear infrastructure and to meet the increasing demand for enrichment services**
- ▶ **The project is strongly backed by the industry**
- ▶
- ▶ **The recent licensing of 2 enrichment facilities by the NRC provide an excellent starting point for this application**
- ▶ **AREVA will leverage it's financial strength and our large US based engineering and operational expertise to successfully execute this project**
- ▶ **Our expertise on the GB II facility adds to our confidence**
- ▶ **An assured and predictable licensing process is a key consideration**