



# **A New Era of Fuel Supply**

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Mining & Front End Sales

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# Complete Fuel Cycle Coverage

*from Front End to Back End*

Diagram\_Green\_EN



*AREVA invests in the means to provide  
nuclear fuel security of supply to our customers*

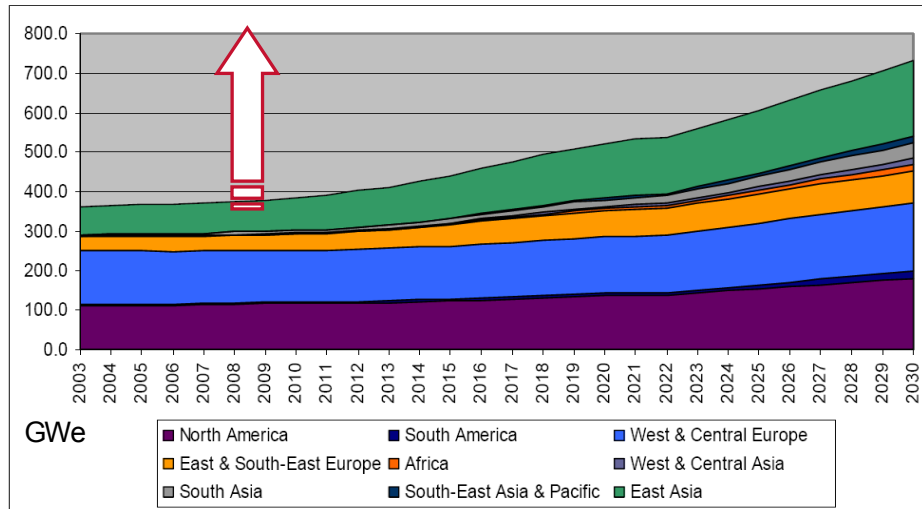
# Market Outlook:

## Increasing demand for uranium and related supply risk

### ► Increasing Demand

*Rapid growth in Asia:* To meet future needs China, Japan, South Korea and India are already securing large quantities of U and services under LT contracts and industrial partnerships.

*Evolution of nuclear generating capacity by region, GWe (WNA upper scenario, 2009)*



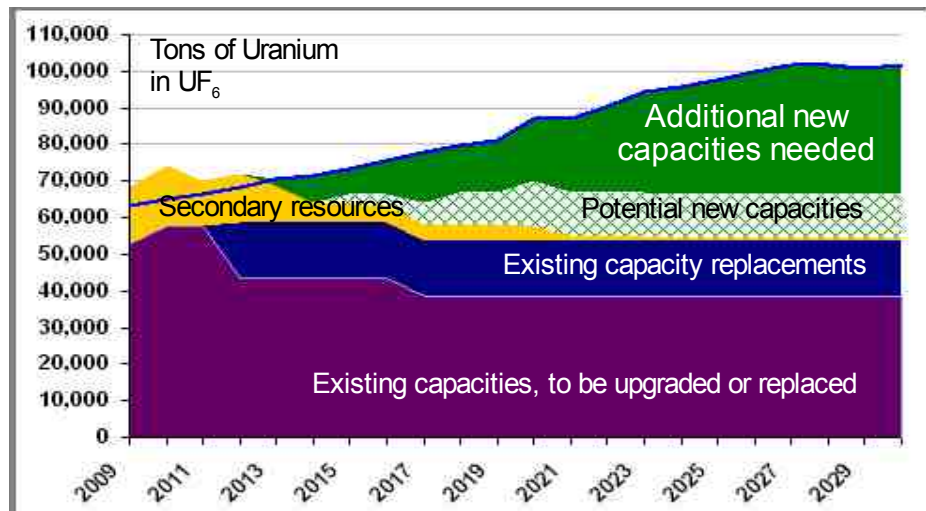
~350 GWe of generating capacity to be built

### ► Long-term Supply Risk

Future reactor needs require replacement of existing capacity and the adding of new capacity across the fuel cycle...far from met.

*Ex. Need for new additional Conversion capacity through to 2030 is estimated at 40 – 45 kt U in UF<sub>6</sub>*

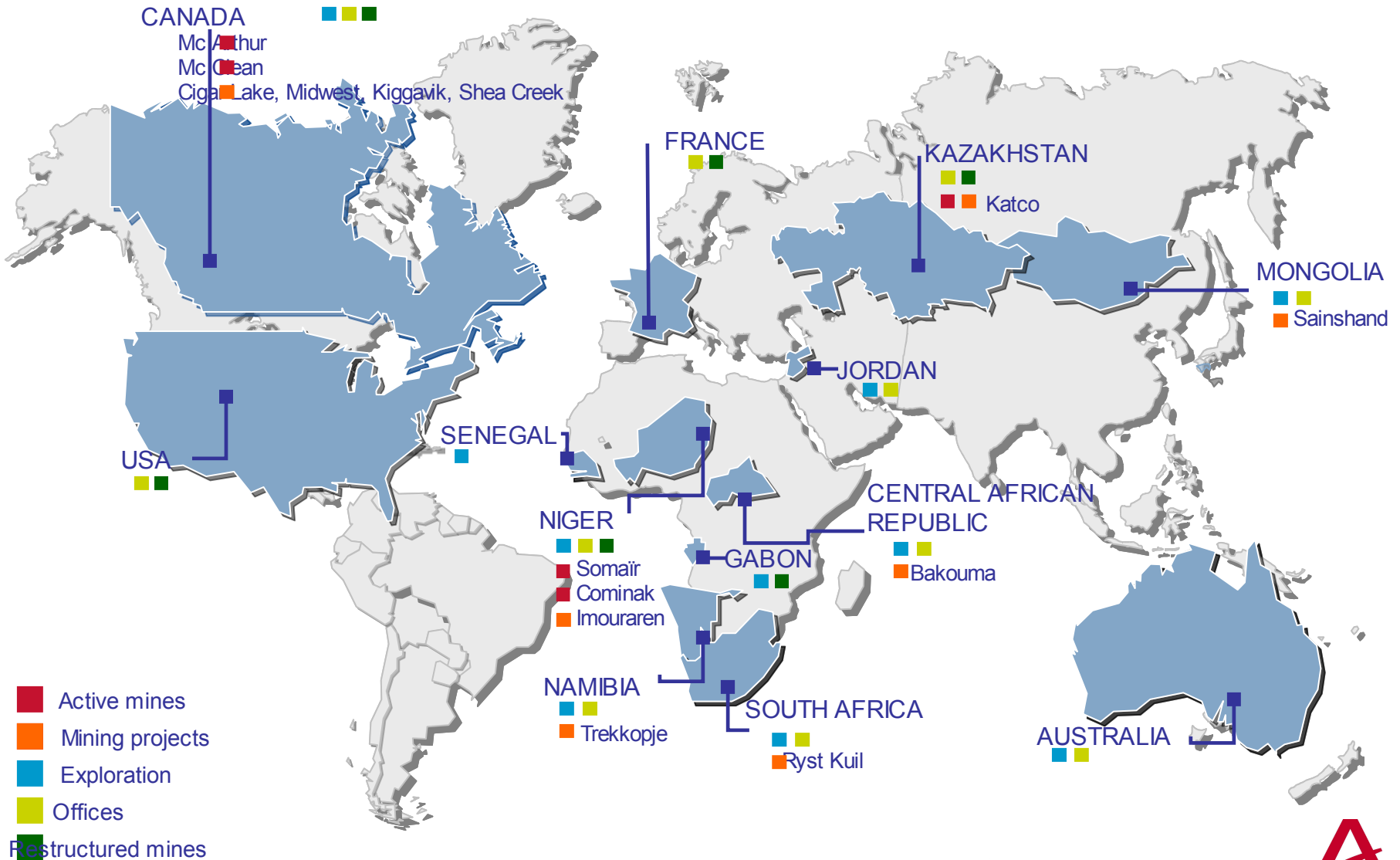
*Equivalent reactor needs, t of Uranium in UF<sub>6</sub> (WNA ref. scenario, 2009)*



~40 kt of U in UF<sub>6</sub>

# Mining:

*A worldwide diversified uranium producer...*

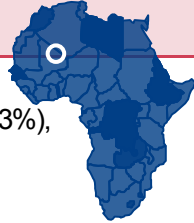


# Mining:

... with new mines and extensions under development

## AREVA Key Projects

### Imouraren



Mine operator: AREVA

Shareholders: AREVA (57%), State of Niger (33%),  
KEPCO (10%)

Resources: 198 300 tU

Planned production<sup>(1)</sup>: 5,000 tU / yr

Investment<sup>(1)</sup>: > €1Bn

April 2006: Project launched

May 2008: Feasibility study completed

2010: Start of construction

2013/ 2014: Start of production



### Katco



Mine operator: KATCO

Shareholders: AREVA (51%), Kazatomprom (49%)

Resources: 54,400 tU

Planned production<sup>(1)</sup>: 4,000 tU / yr

Investment<sup>(1)</sup>: > €400M

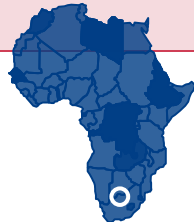
April 2004: Start of commercial production  
after 3 years of pilot operations

2009: Production of 3,100 tU

2012: Production capacity of 4,000 tU



### Trekkopje



Mine operator: AREVA

Shareholder: AREVA (100%)

Resources: 45,500 MTU

Planned production<sup>(1)</sup>: 3,000 tU / yr

Investment<sup>(1)</sup>: > €700M

July 2007: UraMin acquisition

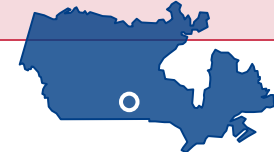
April 2008: Feasibility study complete

End of 2008: Start of construction

2012: Start of production



### Cigar lake



Mine operator: Cameco

Shareholders: Cameco (50%),  
AREVA (37%), third parties

Resources: 135,000 tU

Planned production<sup>(1)</sup>: 6,000 tU / yr

Investment<sup>(1)</sup>: > €1 Bn€

2013/ 2014: Start of production



Note: <sup>(1)</sup> Production and Capex figures are 100% basis

# Front End current industrial footprint :

## *Ensuring an integrated supply of services*

France: AREVA NC Pierrelatte chemical facility



- ▶ Chemical support activities: Defluorination, Denitration, Cylinder maintenance..

France: Comurhex Malvesi & Pierrelatte conversion facilities



- ▶ Active since 1959
- ▶ Capacity: 14,000 tU per year
- ▶ Adaptable to a wide range of uranium concentrates

France: Georges Besse Enrichment Facility



- ▶ Active since 1979
- ▶ Capacity: 10.8 million SWU per year
- ▶ Highly flexible industrial facility

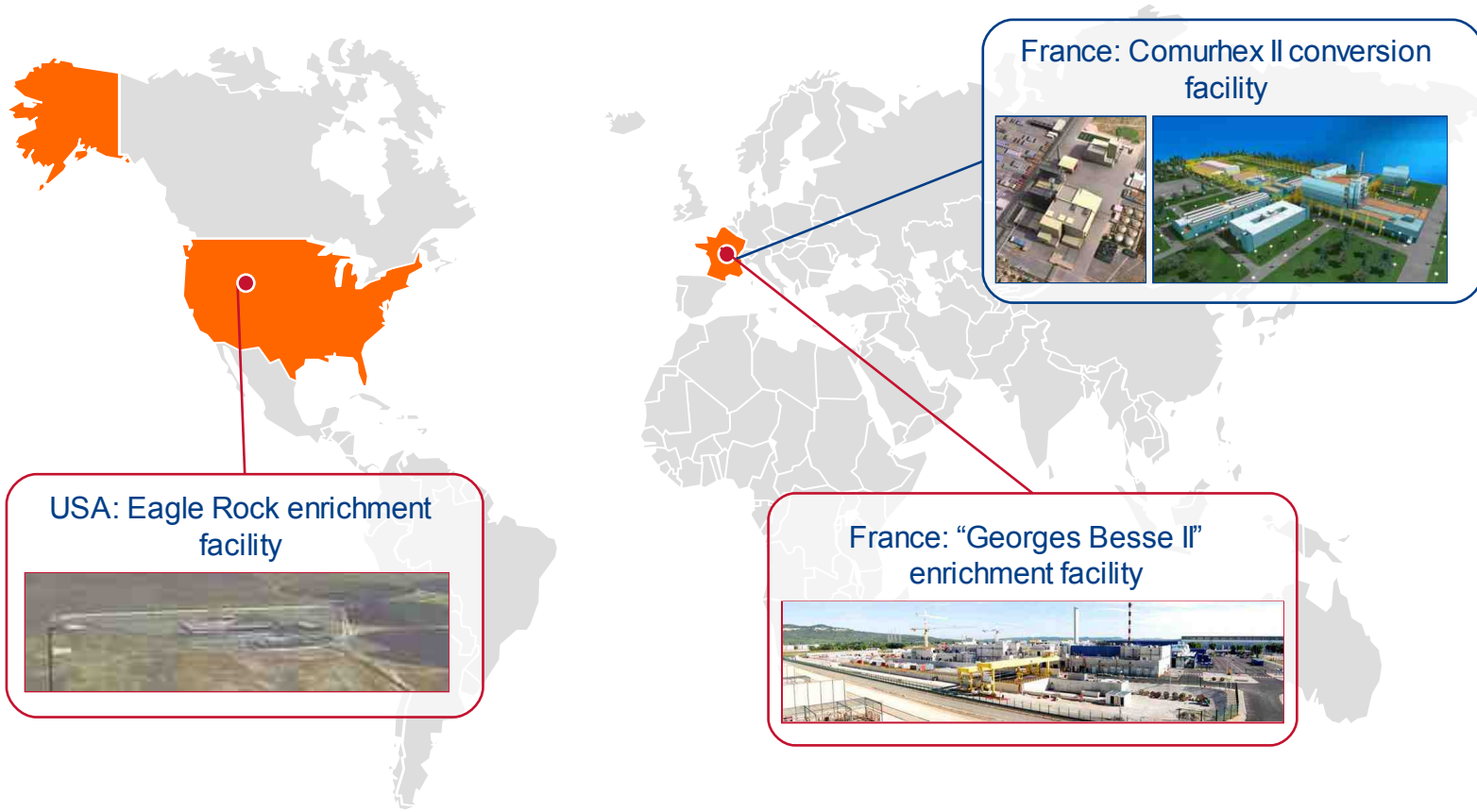
Fuel Fabrication: 16 manufacturing facilities in France, Belgium, Germany, US and Japan

- ▶ 6 Fuel manufacturing plants in Europe and in the USA
- ▶ 8 Component plants in Europe (including Zirconium activities)
- ▶ Several JVs and technology transfers in Asia
- ▶ Industrial footprint optimization required in Europe and in the USA

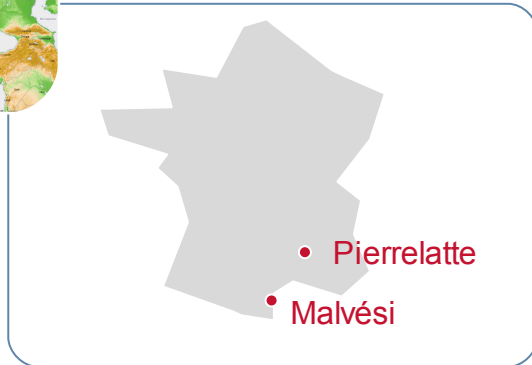
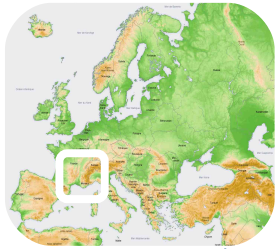


# Major facilities under construction :

*Ensuring an integrated supply of services*



# AREVA has decided to invest in conversion : COMURHEX II



## COMURHEX II

Investment: > € 600M

Extendable Capacity: 15,000 tU per year,  
extensible to 21,000 tU **only with market support**

Start of Construction: 2009

Start of Production: 2012

Nominal Capacity: 2014

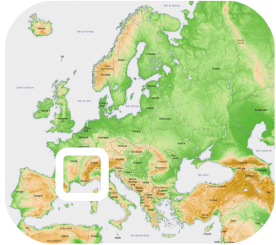
- ▶ All conversion facilities worldwide are old
- ▶ AREVA is the first to invest in a brand new conversion facility
- ▶ Same basic process as Comurhex, with technological innovations to respect stringent environmental and safety standards
- ▶ Maintain UF6 production close to enrichment (GBII)
- ▶ **February 2007:** Project officially approved by AREVA Executive Committee





# GEORGES BESSE II

*AREVA is renewing and extending its capacities*



## GEORGES BESSE II

Investment: € 3B

Capacity: 7.5 million SWU per year

Hot commissioning in the coming months

Nominal capacity reached by 2016

## Customers have taken minority stakes in GBII

▶ A fruitful partnership through the entrance of different utilities

◆ 5%



◆ 2,5%



◆ 2,5%

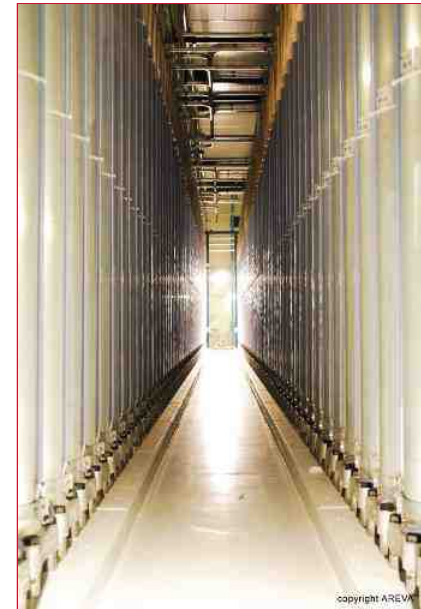


▶ On-going discussions with other utilities

▶ 90% of capacity already sold through 2020 !



**Strong Customer Support**



copyright AREVA

# Georges Besse II

## Key Project Milestones

- ▶ **September 2006:** Start of civil engineering works of the South Unit
- ▶ **February 2008:** Delivery of the CAB (Centrifuge Assembly Building) to ETC
- ▶ **March 2008 :** Delivery of the first Cascade hall to ETC
- ▶ **March 2009:** Start of civil engineering works of the North Unit
- ▶ **March 2009:** Installation of the centrifuges in the first Cascade Hall
- ▶ **November 2009:** First cascade rotation at nominal speed
- ▶ **End 2010:** Commissioning of the first cascade
- ▶ **2016:** Full production (7.5 MSWU)



UF6 annexes



Control Room

# Eagle Rock: An Enrichment Facility for the US market



EREF

Investment: 2.5 Billion \$

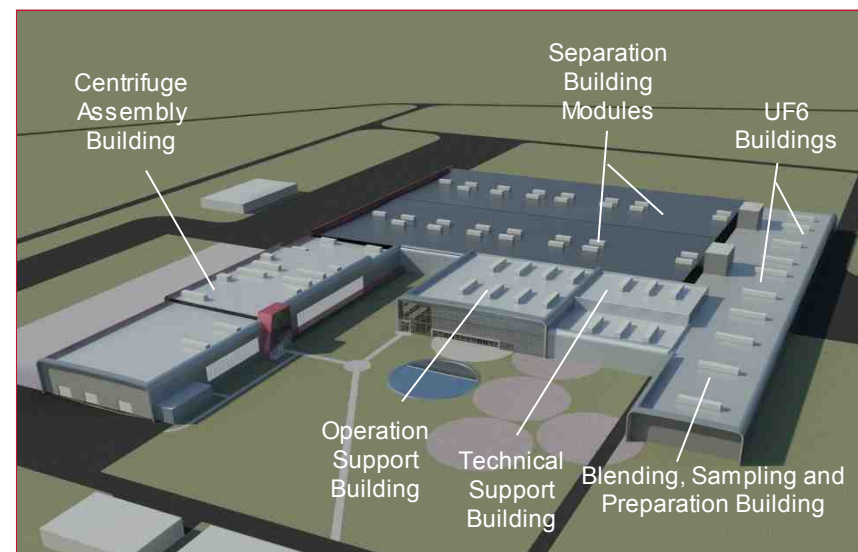
Capacity: 3.3 million SWU per year

Commissioning: 2014

Nominal capacity reached by 2018

- ▶ ETC centrifuges similar to GBII
- ▶ A proven and reliable centrifuge technology, already licensed by the NRC
- ▶ Oct 09: NRC publishes a schedule assuming final license can be issued by early 2011
- ▶ Mai 10: first loan guarantee for a front end project in the US obtained by AREVA
- ▶ 50% of capacity already sold until 2025

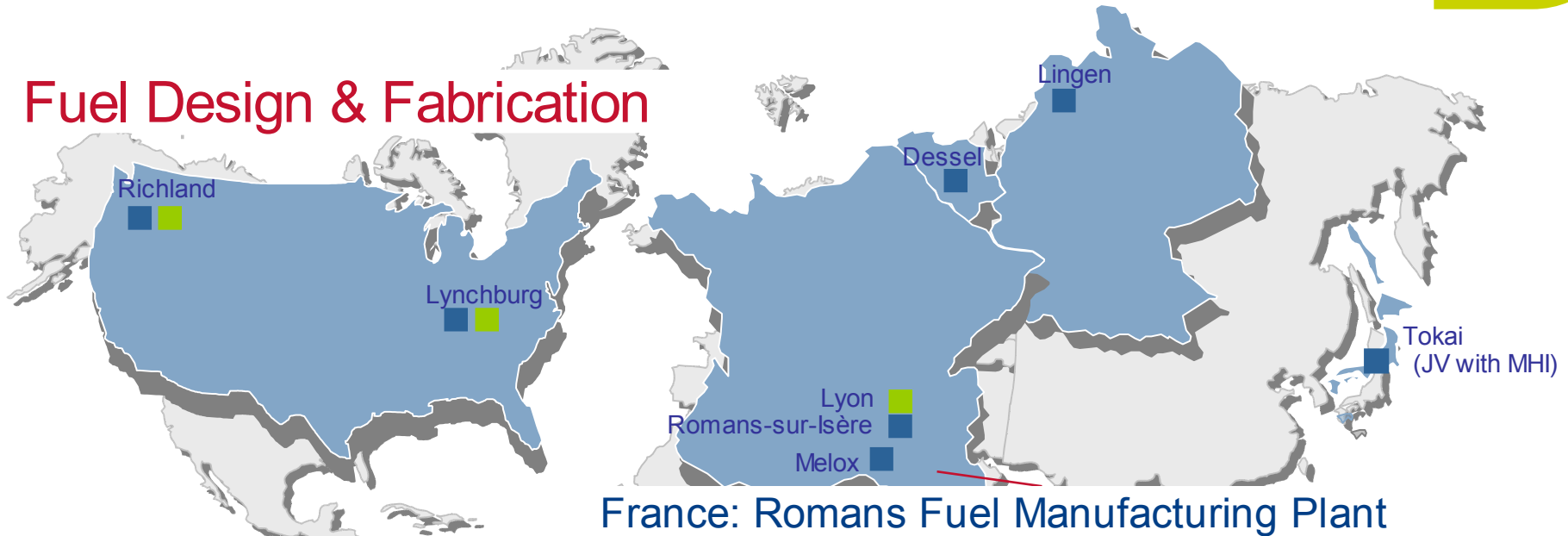
▶▶ GBII little sister in the US will benefit from GBII engineering team experience



# AREVA Fuel Activities:

*Largest plant capacity worldwide, renewed and ready for growth*

## Fuel Design & Fabrication



## » Investments

▶ Over €100M invested to modernize the Romans facility

◆ Targeted licensed capacities:

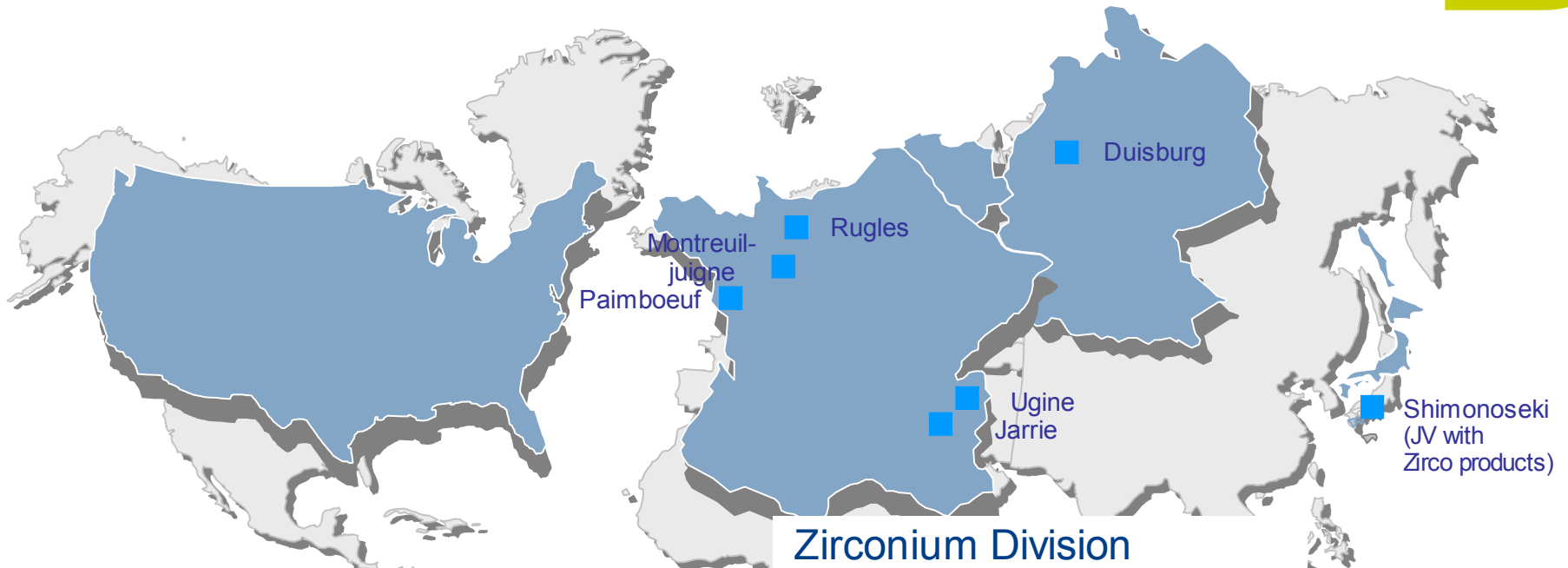
1,800 t of Powder

1,400 t of Fuel Assemblies



■ Fuel Manufacturing Plants  
■ Design and Sales

# Zirconium Product Manufacturing: *Strengthening the overall fuel supply chain*



## » Investments



- ▶ Investment of over € 100M to develop our Zirconium industrial tool
- ▶ Acquisition of a 1/3 stake in Zirco Products (Japan)
- ▶ *Increased Capacity (→ 7500 km), Reliability and Throughput on main production facilities*



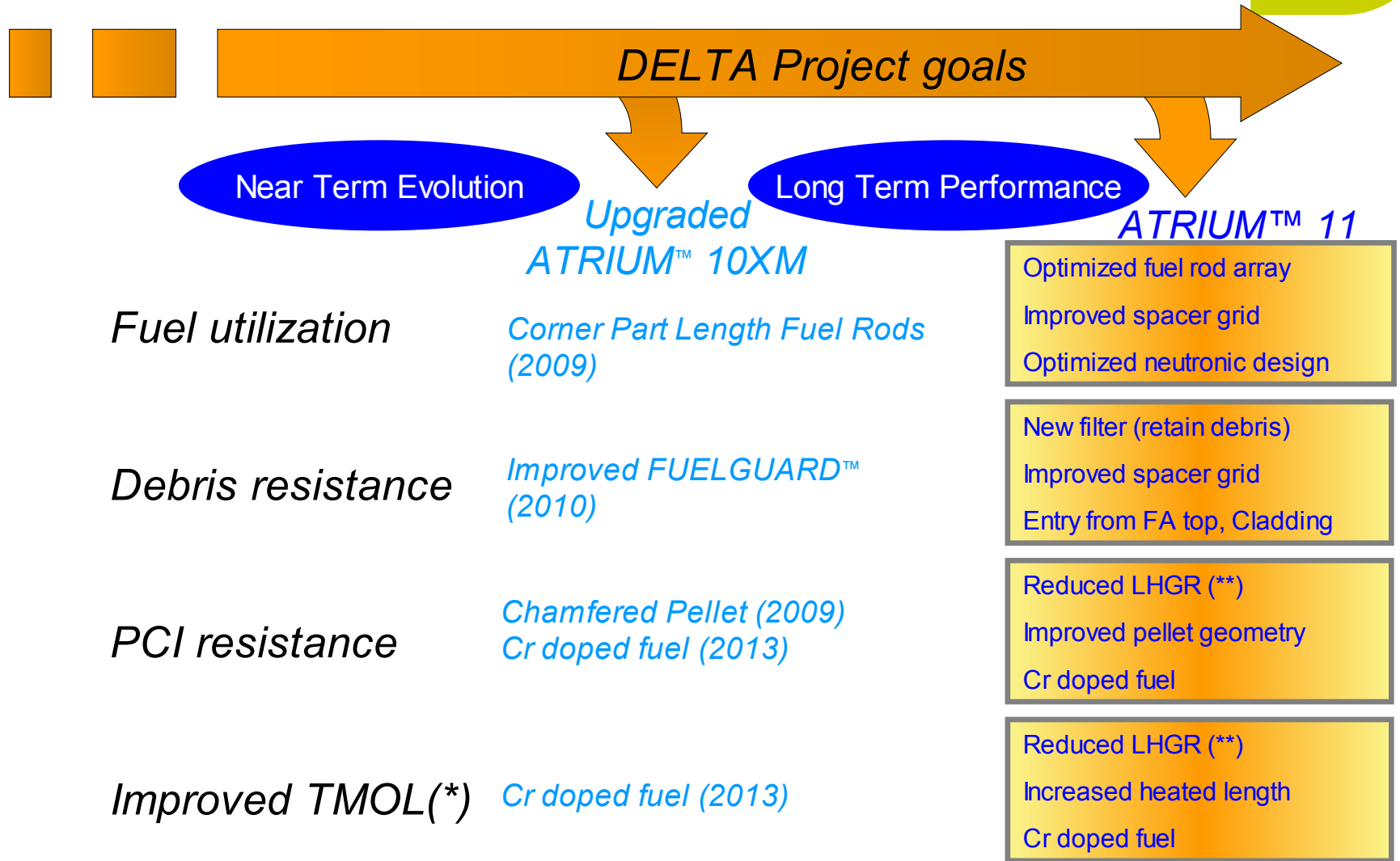
# Fuel Assembly Development:

*A commitment to excellence for all our customers*

- ▶ *R&D programs to meet current and future customer needs and expectations*
- ▶ *Improvement in Fuel Assembly Modeling*
- ▶ *Introduction of next generation products*
  - ◆ *BWR Delta Project*
    - *Superior fuel utilization*
    - *Full robustness, easy handling & service friendliness*
  - ◆ *PWR GAIA Project*
    - *Fuel assembly reliability and robustness up to 70 MWd/kgU*
    - *Increased thermo-hydraulic performance*
    - *Operational flexibility*



# BWR Product Development Continuous improvement philosophy

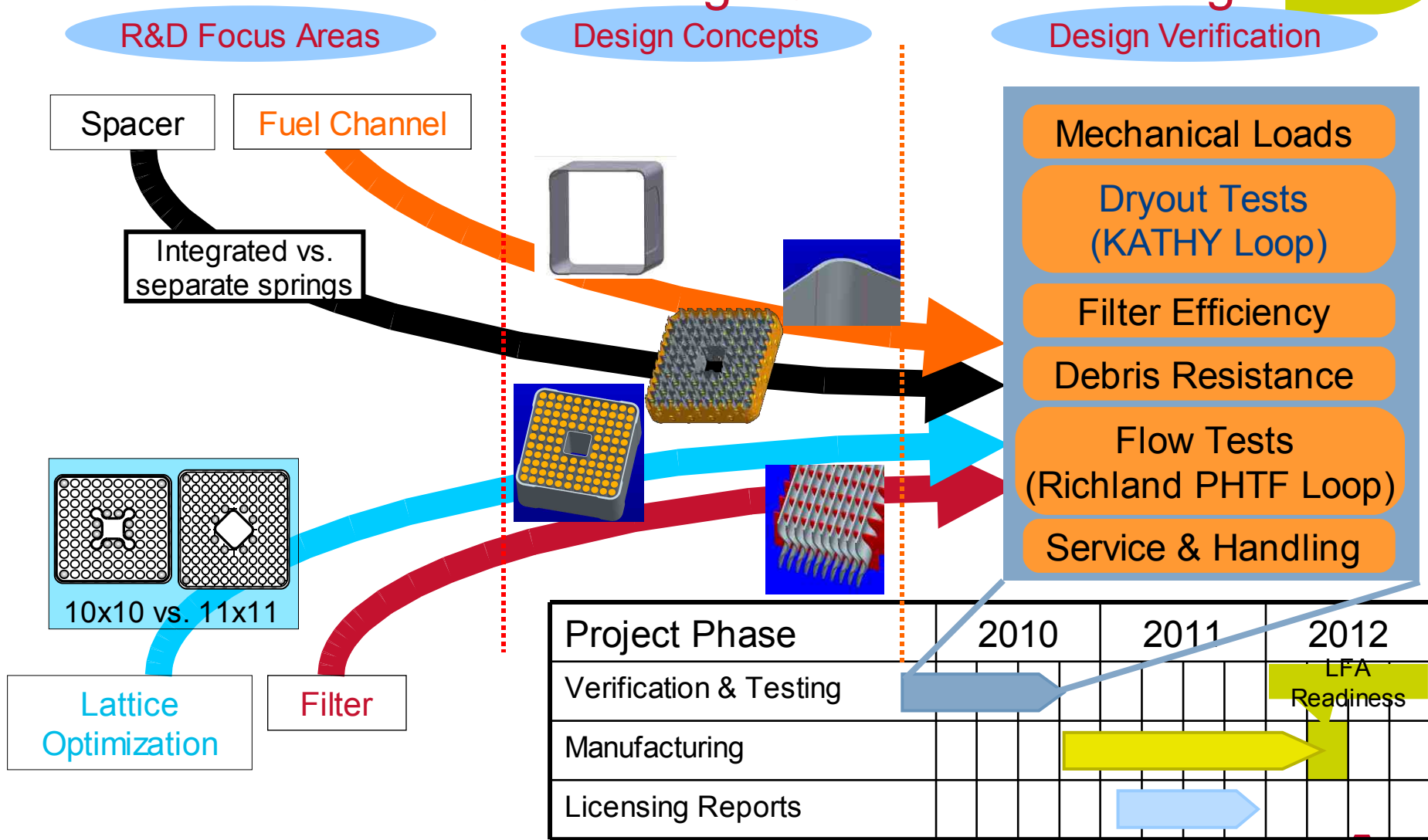


(\*) Thermal Mechanical Operation Limit

(\*\*) Linear Heat Generation rate

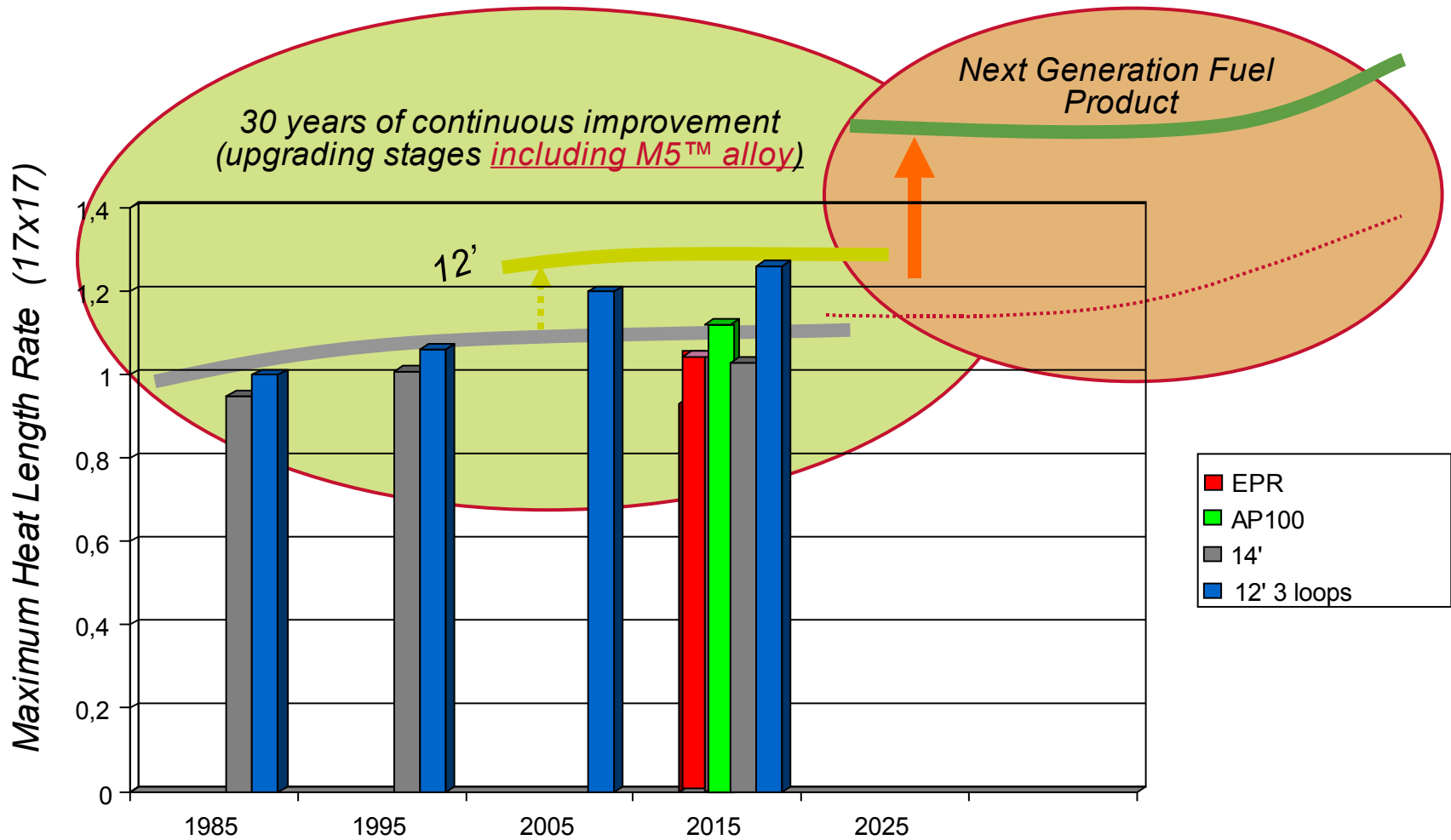
# ATRIUM 11

## Reference Design Under Final Testing





# GAIA project: A leap in performance

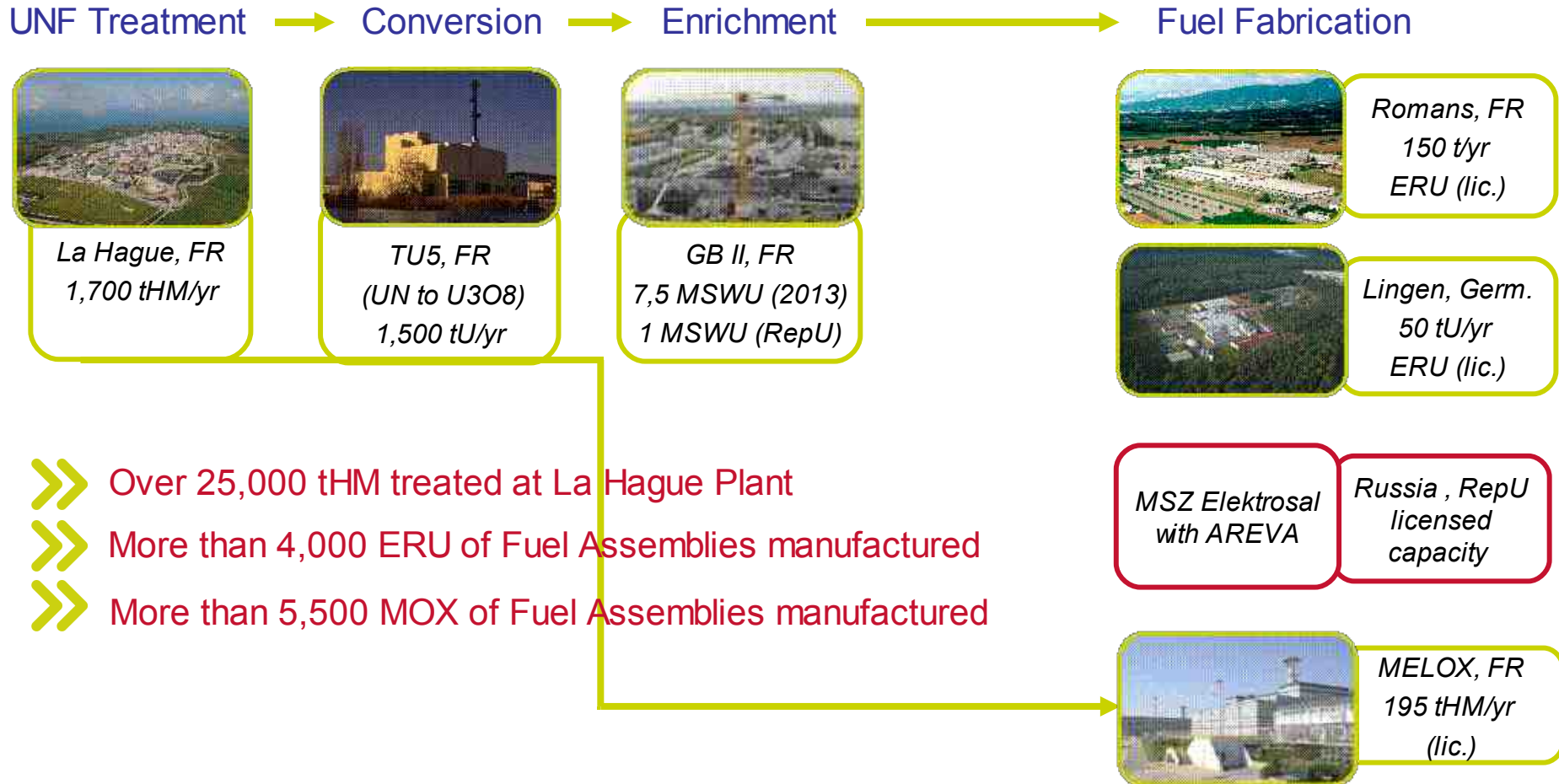


→ More flexibility in operation and more demanding operating conditions



# Recycling Used Nuclear Fuel:

*Comprehensive offer reducing Front End worldwide demand*



# Recycling

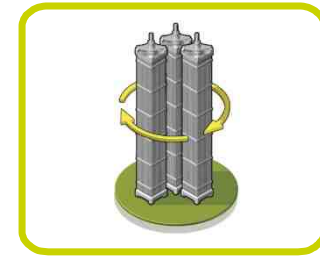


400 000 t  
*of used fuel  
in 2030*

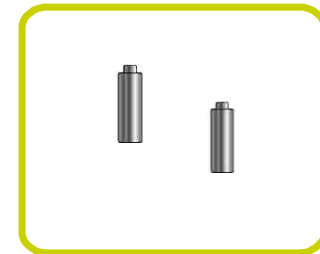


Interim storage  
solutions

*EV-Sud Est Habog*



Experience  
MOX – RepU fuel



Standardized canisters  
for waste

# Main takeaways



*Mining*



*Chemistry*



*Enrichment*



*Fuel*



- ▶ *Better integrated than our competitors*
- ▶ *Global Lead and Expertise to supply **customized solutions***
- ▶ *Support customers with a variety of innovative offers*



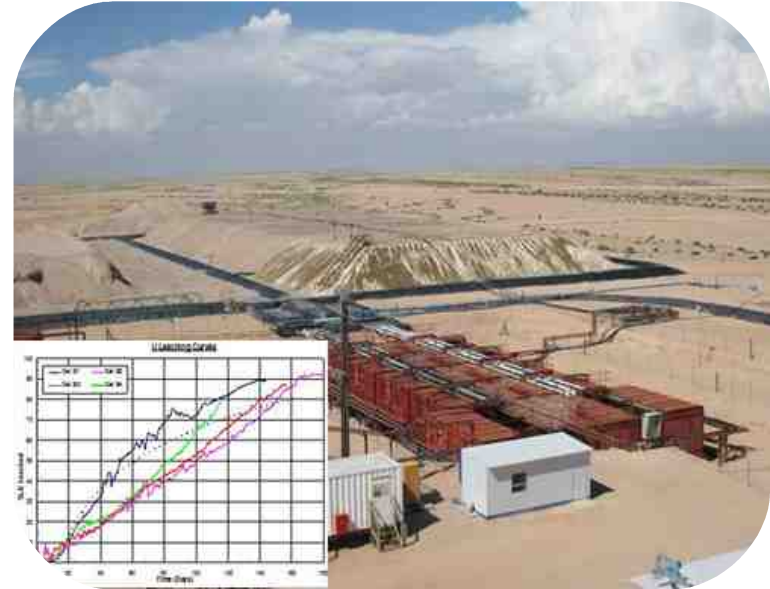
*Good position to **fuel the growth**, with the required market support*

# Appendix



# Trekkopje - An industrial success on track

First alkaline heap leaching uranium project



## Trekkopje

100kt of ore mined per day  
250 000 t of reagents per year  
1000 employees (mine & plant)  
750 MUSD total investment



# Trekkopje infrastructures

## Key challenges

Water supply (17 million m<sup>3</sup>/year)

Electricity (60MW /year)

Vanadium recovery



## Desalination plant

A concrete illustration of AREVA's social responsibility

Inaugurated on April 16<sup>th</sup> 2010

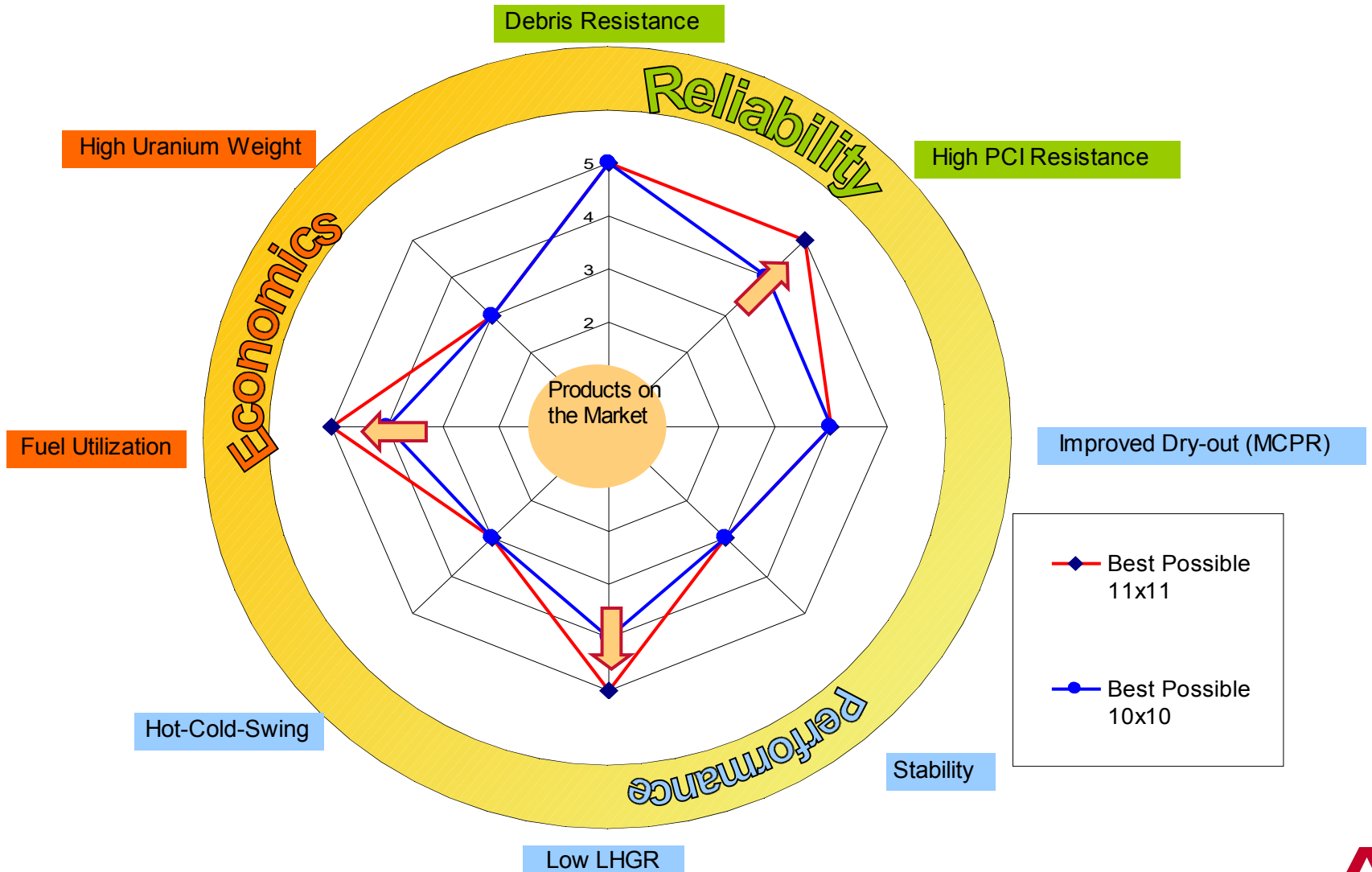
48 km pipeline

54 000 m<sup>3</sup> on site reservoir

250 MUSD investment



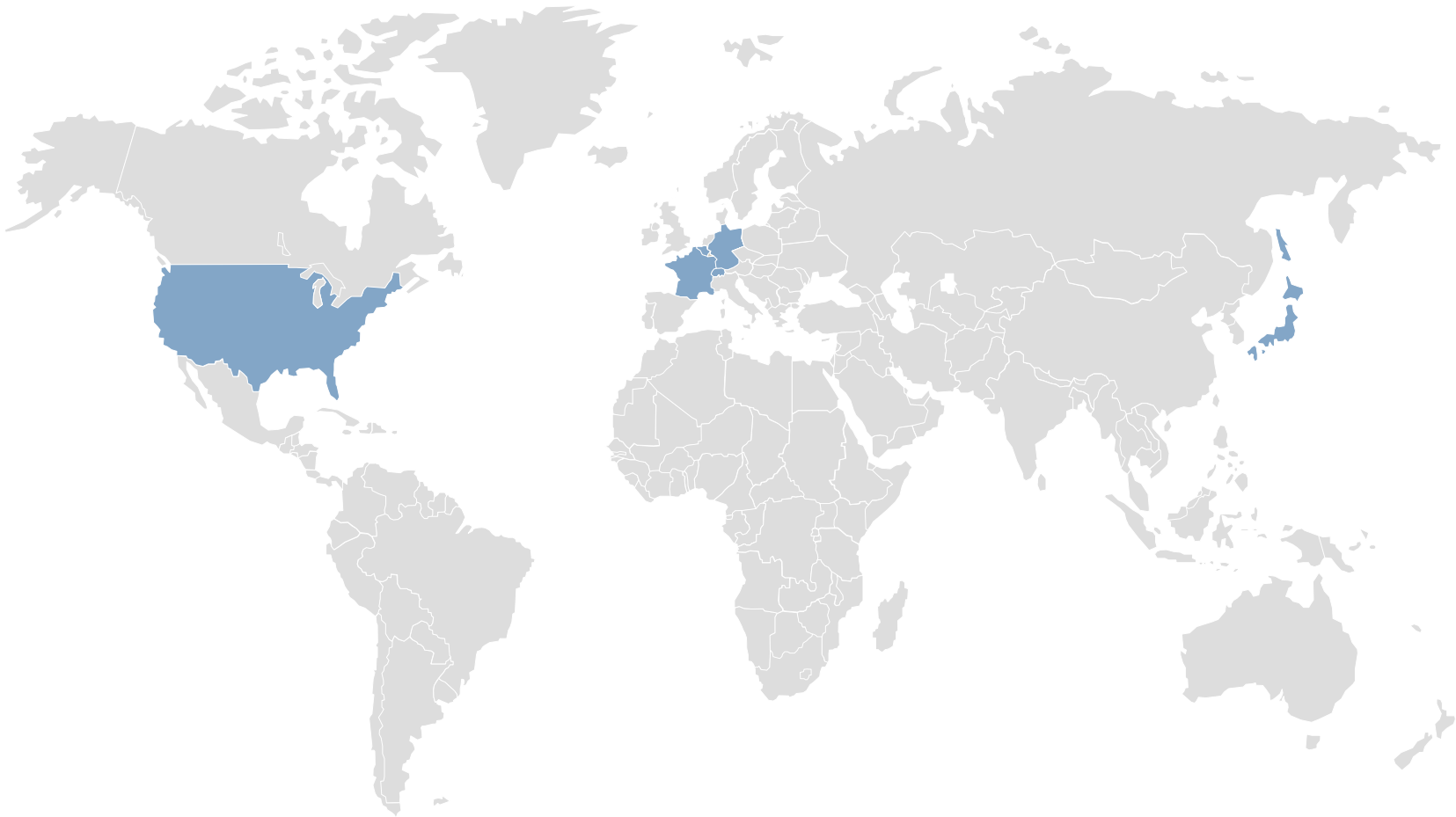
# Next Generation Product 11x11 vs. 10x10





# MOX Fuel worldwide:

*Over 36 reactors totalizing more than 5500 FAs as of Dec. 2009*



# ERU Fuel worldwide

*Over 30 reactors totalizing ~5200 FAs as of Dec. 2009*

