Bernard Bastide
AREVA Brazil and South America VP

University of Rio de Janeiro
III Semana da Engenharia Nuclear
AREVA presentation

AREVA EPR projects

ATMEA1 projects
AREVA presentation

- AREVA EPR projects
- ATMEA1 projects
AREVA Group
2012 Key Figures

€9.342Bn in Annual Revenues
€45.4Bn in Backlog
More than 50% of our 2012-2015 revenue is in backlog
Over 80% of the Group’s revenue from recurring business
4.8% of revenues in R&D spend

€10 billion investments already made in the last 5 years
Strong strategic action plan launched Dec.2011

47,000 Employees
51 Manufacturing Sites in 5 continents
8,000 Active Patents held

Luc Oursel
Chief Executive Officer

Paris
Global Headquarters
AREVA Group
Across the Globe

FRANCE
35% of revenue
63% of workforce

EUROPE AND CIS (outside France)
26% of revenue
19% of workforce
MANUFACTURING OPERATIONS
Belgium, Germany, Kazakhstan, Spain, Sweden, United Kingdom

NORTH AND SOUTH AMERICA
19% of revenue
12% of workforce
MANUFACTURING OPERATIONS
United States, Brazil, Canada

AFRICA AND MIDDLE EAST
2% of revenue
5% of workforce
MANUFACTURING OPERATIONS
Namibia, Niger

ASIA-PACIFIC
18% of revenue
1% of workforce
MANUFACTURING OPERATIONS
China, India, Japan
AREVA, safety is the cornerstone of our strategy.

Safety of our Customers
Supporting utilities in demonstrating and upgrading the safety of their fleet
30+ solutions in Safety Analysis, Safety Upgrades and Safety Procedures

Safety of our Operations
Maintaining the highest level of safety throughout the lifecycle of our nuclear facilities
Reduced accident frequency rate (number of accidents per million hours worked) from 6.6 in 2004 to 1.7 in 2011

Safety of our Products
A wide new-generation reactor portfolio that offers the highest safety features
A comprehensive Reactor Portfolio to better serve Utilities’ needs

<table>
<thead>
<tr>
<th>Main Technical Data</th>
<th>PWR</th>
<th>PWR</th>
<th>BWR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermal power</td>
<td>4,590 MWth</td>
<td>3,150 MWth</td>
<td>3,370 MWth</td>
</tr>
<tr>
<td>Net power</td>
<td>1,650 Mwe</td>
<td>1,150 Mwe</td>
<td>1,250 Mwe</td>
</tr>
<tr>
<td>Thermal efficiency</td>
<td>37%</td>
<td>37%</td>
<td>37%</td>
</tr>
<tr>
<td>Target design availability</td>
<td>92%</td>
<td>92%</td>
<td>92%</td>
</tr>
<tr>
<td># loops</td>
<td>4</td>
<td>3</td>
<td>N/A</td>
</tr>
<tr>
<td>(secondary) Steam pressure</td>
<td>77 bar</td>
<td>72 bar</td>
<td>75 bar</td>
</tr>
<tr>
<td>Operation cycle length</td>
<td>up to 24 months</td>
<td>up to 24 months</td>
<td>up to 24 months</td>
</tr>
<tr>
<td>Collective dose</td>
<td>&lt;0.5 manSievert/yrs</td>
<td>&lt;0.5 manSievert/yrs</td>
<td>&lt;0.5 manSievert/yrs</td>
</tr>
<tr>
<td>Design service life</td>
<td>60 yrs</td>
<td>60 yrs</td>
<td>60 yrs</td>
</tr>
<tr>
<td>I&amp;C</td>
<td>Full digital</td>
<td>Full digital</td>
<td>Full digital</td>
</tr>
</tbody>
</table>

AREVA’s portfolio is based on proven and evolutionary models constantly optimized to meet utilities’ needs worldwide.
Exclusive discussions ongoing for the construction of up to 12 nuclear reactors
- Participation in tenders for 4 nuclear reactors
- Upcoming opportunities for the construction of at least 19 nuclear reactors

*AREVA’s appeal pending
◆ AREVA presentation

▶ AREVA EPR projects

◆ ATMEA1 projects
Bringing AREVA Gen III project experience for building NPP in Brazil

Olkiluoto 3

83%
01/04/2013

Taishan 1&2

Dome
July 2013

Flamanville 3

The World’s First Advanced Fleet to be deployed.
OL3- Reactor Building
Inner dome installation - September 2009

- Inner Dome lifted and installed on September 6th, 2009
- Shipment delivery of the Reactor Dome from Poland to OL3 Site on May 4, 2009
- Welding of the Dome completed in September 2009
OL3- Main Primary Components
Reactor Pressure Vessel installation – June 18, 2010
OL3 construction site
The value of AREVA experience

Construction duration from first concrete to dome lifting
(# of months)

AREVA experience will be leveraged in new build project in Brazil
AREVA presentation

AREVA EPR projects

ATMEA1 projects
A Joint Venture between two world nuclear leaders

ATMEA

1 NUCLEAR ISLAND DESIGNED

ATMEA1

2 WORLD LEADING NUCLEAR SUPPLIERS
1 JOINT VENTURE
**Brief Overview of The Company**

**ATMEA’s Expertise and Capabilities**

- **Company name:** ATMEA S.A.S.
- **Office Location:** Paris La Defense
- **President & CEO:** Andreas Goebel
- **Deputy CEO:** Satoshi Utsumi
- **Establishment:** November 2007
- **Capital:** 126 Million Euros

- **Scope of activities:** Development, Marketing & Sales, Construction & Commissioning activities for the 1100 MWe class Generation III+ ATMEA1 Nuclear Island

- The ATMEA company is the **exclusive vendor** of the ATMEA1 Nuclear Island

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**ATMEA1 Reactor: A mid-sized Generation III+ PWR**
## ATMEA1 Reactor main features

<table>
<thead>
<tr>
<th>Reactor Type</th>
<th>3-Loop PWR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrical output</td>
<td>1100 – 1150 MWe (Net)</td>
</tr>
<tr>
<td>Core</td>
<td>157 Fuel Assemblies</td>
</tr>
<tr>
<td>Steam Pressure</td>
<td>More than 7 MPa</td>
</tr>
<tr>
<td>Safety System</td>
<td>3 train reliable active system with passive features + 1 diversified safety train</td>
</tr>
<tr>
<td>Severe Accident Management</td>
<td>Core catcher Hydrogen re-combiners</td>
</tr>
<tr>
<td>Resists airplane crash</td>
<td>Pre-stressed Concrete Containment Vessel</td>
</tr>
<tr>
<td>I&amp;C</td>
<td>Full Digital</td>
</tr>
</tbody>
</table>

1. Reactor Building
2. Fuel Building
3. Safeguard Building
4. Emergency Power Building
5. Nuclear Auxiliary Building
6. Turbine Building
ATMEAL Reactor Main Features
Main Nuclear Island Buildings

- Pre-stressed Concrete Containment Vessel
- Safeguard building and Fuel building with thickened concrete wall
- Protection against large commercial airplane crash (APC) in compliance with US-NRC regulation and European practice
- Safety systems and components are protected:
  - Either by segregation or bunkerization to secure the required safety functions
  - Against Tsunami/Flooding in leak tight buildings
Typical 3-loop configuration

- Design based on ASME Boiler and Pressure Vessel Code
- Experienced materials reflecting the latest experiences of AREVA and MHI
- Design applying the latest technologies of AREVA and MHI

Technology is coming from the latest Generation III+ design, EPR™ and APWR

Experience feedback from about 130 nuclear power plant constructions and operation
Assessment results confirmed robustness of the current ATMEA1 design and its adequate grace time as similar Generation III+ evolutionary reactors

- Resistance against external hazards
- Design margin and absence of “cliff-edge” effect
- Long-term containment integrity under severe accident conditions

For now no need for design modifications in terms of safety options

First lessons learned from Fukushima have validated ATMEA1’s safety approach

ATMEA will make a close follow-up of national and worldwide consensus regarding additional safety dispositions that could be raised in the wake of Fukushima accident
ATMEAs achievements and current activities


Conceptual Design
- Definition of main features
- Project engineering manual
- Conceptual safety features

Basic Design
- Functional requirements
- Safety requirements
- General arrangement
- Core system & component design
- Standard Preliminary Safety Analysis Report

We are here today

ATMEAs selection

Jordan Project

Standard Detailed Design

ASN* Review

Conclusion of ASN Safety Options Review

CNSC* (Canada) Review

Report

Final decision pending

Japan/ Turkey IGA for the 2nd Turkey NPP with 4 ATMEA1

IAEA Report

ATMEA1s achievements and current activities

*ASN: French Safety Authority  *CNSC: Canadian Nuclear Safety Commission

UFRJ- August 2013
Ready for Bidding and Licensing

IAEA Assessment report

Standard PSAR following US-NRC structure, PSA Level 1 and Level 2

French Safety Authority (ASN) Assessment

Canadian Safety Authority (CNSC) Assessment
ATMEA Worldwide Activities

- ATMEA1 Reactor selected in many countries as a potential technology for New Power Plant

Opportunities / Negotiations going on
Japan driven business

- Canada
- Slovenia
- Hungary
- Turkey
- Jordan
- Malaysia
- Brazil
- Argentina
ATMEA opportunities (1/2)

▶ Jordan bid: *Selection still pending*
  - Main Jordanian issues: financing and operator (the “strategic partner”)
  - ATMEA1 still in the final phase

▶ Vietnam Ninh Thuan 2
  - Japan has agreed to build and finance 2000 MW
  - Selection by Japan and Vietnam governments in 2014: ATMEA1 well positioned

▶ Brazil
  - Confirmation of nuclear development policy expected soon
  - No tender process expected for the 2 pre-identified sites
  - Public/Private Partnership (PPP)
  - Site pre-feasibility study underway by ATMEA for ETN
ATMEA opportunities (2/2)

Turkey SINOP

- IGA agreement signed on May 3rd between Japan and Turkey for exclusive negotiations about 4 ATMEA1 units
- The IGA allows exclusive negotiation on detailed terms until signature of the Host Government Agreement (HGA) between Turkey and the Industrial team: MHI, ITOCHU, GDF SUEZ and local Turkish Utility EUAS. It also authorizes the start of the « Feasibility Study ».
- Technology proposed by MHI is ATMEA1 (Gen III+ AREVA-MHI design) possibly adapted to the site. Commercial operation of 1st unit is targeted in 2023.
- Site location: SINOP Peninsula, on the Black Sea allocated by Turkey, without ownership, to the Project Company, free of charge until the end of decommissioning.
- GDF SUEZ will partner with the project and offer its expertise as a developer, operator of nuclear power plants
- Anticipated Project Structure: 49% Equity by Turkish Government (EÜAŞ, local Turkish Utility and Turkish industrials) and 51% for the Japan Consortium (MHI, ITC and GDF SUEZ).
6 ATMEA1 units in Brazil in the future
Why not?
Obrigado!