ATMEA and the ATMEA1 reactor
Who is ATMEA?

2 world leading nuclear suppliers

Joint venture: ATMEA

- Company name: ATMEA S.A.S.
- Office Location: Paris La Defense
- President & CEO: Philippe Namy
- Deputy CEO: Makoto Kanda
- 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
- Organization: Subcontract engineering work to both mother companies for the ATMEA1 development activities

The ATMEA1 Reactor: A mid-sized Generation III+ PWR
**What is ATMEA’s expertise?**

**AREVA+MHI: Unrivaled experience and resources**

- Engineering, Procurement, Manufacturing, Construction
  - Extensive and outstanding experience from almost 130 Nuclear Power Plants built all over the world including 4 EPR™ reactors under construction (Generation III+ technology)

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*Ohi NPP in Japan*

*Civaux NPP in France*
**What is ATMEA’s expertise?**

**AREVA+MHI: Unrivaled experience and resources**

- **Engineering and nuclear experts:**
  - More than 50,000 experienced nuclear professionals world-wide

- **Manufacturing capabilities:**
  - In-house state-of-the-art manufacturing workshops and technology which assures delivery schedule and high-quality
What is ATMEA’s expertise?

AREVA+MHI: Unrivaled experience and resources

- Well established & proven supply chain with:
  - Large Forgings suppliers: Japan Steel Works, Japan Casting & Forging Corp. (*), Creusot forge (Sfarsteel **)
    * Group company of Mitsubishi  ** Subsidiary of AREVA
  - Long-lead material suppliers: Sumitomo Metal Inc., Valinox, Sandvick, for Steam Generator tubings

The Sfarsteel forging facility
### ATMEA1 Main Features

<table>
<thead>
<tr>
<th>Reactor Type</th>
<th>3-Loop PWR</th>
<th>Safety System</th>
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<tr>
<td>Electrical output</td>
<td>1100 – 1150 MWe (Net)</td>
<td>3-Train reliable systems with passive features</td>
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<tr>
<td>Core</td>
<td>157 Fuel Assemblies</td>
<td>Severe Accident Management</td>
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<tr>
<td>Steam Pressure</td>
<td>More than 7 MPa</td>
<td>Resists airplane crash</td>
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**Safety System**
- Core catcher
- Hydrogen re-combiners
- Pre-stressed Concrete Containment Vessel
- Digital

**Reactor Building**
- Reactor Building
- Fuel Building
- Safeguard Building
- Emergency Power Building
- Nuclear Auxiliary Building
- Turbine Building
**General design approach**

ATMEA1 is a GEN III+ reactor

- Similar safety characteristics than the latest AREVA and MHI reactors
- Evolutionary design using proven technology and as much as possible “off the shelf” MHI and AREVA equipment

**Generation 3 safety objectives**

- Reduction of the probability of severe accidents with core melt
- Reduce the impact of severe accident on the population at the vicinity of the site
- Improve resistance to internal and external hazards
ATMEA1 robust design with its redundant and diversified safety features ensures best-in-class safety

Internal events - External hazards - Internal hazards

PROTECT
Robust design, reliable equipment and clearly separated safety trains

COOL DOWN
Ensure the residual heat cooling function by redundant and diversified safety features

CONFINE
No/very limited environmental impact even under extreme conditions
Safety systems and components are protected
  - Either by bunkerization (ex. building reinforcement) or geographical separation (ex. Emergency Power Sources: EPS) to secure the safety functions
  - Against external flooding in watertight buildings
  - Safety trains are separated

Reinforced pre-stressed concrete containment Vessel, 1.8m thick

Safeguard building and Fuel building with 1.8m thick walls of reinforced concrete
The seismic level for standard design is defined as 0.3 g SSE with conservative design margins (0.3g SSE = covering US-West coast-type earthquakes).

For much higher values, seismic relief devices are also available:

- Already implemented on existing AREVA NPPs, Nuclear research reactors, and Nuclear fuel facilities in operation
- Widely implemented in Japan for conventional buildings
Airplane Crash protection objectives

Using realistic analyses, incorporate into the design necessary features to ensure that:

- The reactor core remains cooled, or the containment remains intact
- Spent fuel cooling or spent fuel pool integrity is maintained

Airplane Crash protection features

ATMEA1 buildings are protected:

- By shielding (APC wall) : RB, FB, SAB
- By segregation : EPS buildings
COOL DOWN and Support Systems

Ensure the residual heat cooling function by redundant and diversified safety features

- UHS1 with 30 days autonomy
- Diversified Ultimate Heat Sink (UHS2)
- EPS x 4 trains to avoid Station Black Out (SBO)
- Sufficient “Grace Period” even under unlikely SBO
- Additional AC power generators for SBO
CONFINE

No/very limited environmental impact even under extreme conditions

- **Accidents without core meltdown**
  - No countermeasures outside of the site.

- **Accidents with core meltdown**
  - Countermeasures outside of the site, limited in space and time:
    - Protection of the population limited
    - No emergency evacuation of populations other than people in the immediate vicinity of the facility

- No permanent re-housing
- No long-term restriction for the consumption of food
CONFINE
Robust Containment Building and Core catcher

Annulus
Sub-atmospheric and filtered to reduce radioisotope releases

Pre-stressed containment vessel with Steel Liner

In-Containment Refueling Water Storage Pit

Core-catcher
For long-term Severe Accident Mitigation
ATMECA Company
ATMECA Expertise
The ATMECA1 Project
Robustness of the Design
French ASN safety review
Conclusion
Why this review?

Get an assessment from a well-known Safety Authority to demonstrate ATMEA1’s licensing certainty towards very stringent safety requirements.
French Safety Authority (ASN) review of ATMEA1 safety options within the French regulatory framework

- Assessment of the capability to mitigate radiological risks
- Occupational exposure
- Impact of normal operation on the environment as far as wastes and effluents are concerned. This is limited to the source term to the environment (non site-specific)
- Design principles for pressure-retaining equipment

Complete and comprehensive review: All non-site specific typical PSAR topics

The main objectives of WENRA are to develop a common approach to nuclear safety, to provide an independent capability to examine nuclear safety in applicant countries and to be a network of chief nuclear safety regulators in Europe exchanging experience and discussing significant safety issues.

7 WENRA STATEMENTS ON SAFETY OBJECTIVES FOR NEW NUCLEAR POWER PLANTS
POSITIVE RESULT OF THE ASSESSMENT

AIRPLANE CRASH PROTECTION

- Safety objectives and related safety options chosen for APC protection are satisfactory
- Global and local mechanical behaviors of the reactor building and auxiliary buildings sheltering safety systems are satisfactory

POST FUKUSHIMA ANALYSIS

- Meaningful and pro-active approach by ATMEA
- Safety options of ATMEA1 ensure an adequate robustness to extreme events

DESIGN OF THE MAIN EQUIPMENT

- Design choices for the main equipment are satisfactory and compliant with the French Technical Guidelines
  - The Nuclear Pressure Retaining Equipment (Steam Generator, Reactor Pressure Vessel, Pressurizer, primary loops,..)
  - Feedback experience on equipment and systems contributes to the robustness of the ATMEA1 reactor
Conclusion

THE POSITIVE CONCLUSION OF THE REVIEW OF ATMEA1 SAFETY OPTIONS BY AN INTERNATIONALLY RECOGNIZED SAFETY AUTHORITY

CLEARLY DEMONSTRATES

THE ATMEA1 REACTOR IS A GENERATION III+ REACTOR WITH OUTSTANDING SAFETY FEATURES BASED ON PROVEN TECHNOLOGY

ITS ROBUSTNESS TO COPE WITH EXTREME SITUATIONS

PREDICTABILITY AND CONFIDENCE FOR LICENSING