ALMARAZ FSS TRANSFER.
MORE THAN 30 YEARS OF SERVICES.
Index

1. TECNATOM OVERVIEW
2. SIMULATION SERVICES
3. ALMARAZ FSS RETROSPECTIVE
4. BUILDING & TRANSFER PROJECT
5. CONCLUSIONS
OUR MISSION

To ensure that power production and industrial facilities are operated efficiently, safely and to a high level of excellence.

OUR VISION

To achieve a safe and sustainable world through our know-how and technology.
HOW WE SUPPORT YOU

We develop integral solutions designed to help companies to become safer and more efficient
WE ACCOMPANY YOU
In all key aspects of operation

Because we manage

- **PEOPLE**
  We develop solutions that strengthen the capabilities of our clients

- **ASSETS**
  We manage your critical assets, achieving more safety and competitiveness

- **PROCESSES**
  We develop cutting-edge technologies to boost transformation

Energy – Industry – Transport Sectors
GROUP BUSINESS FIGURES

- **Investment**: 7.5% of Turnover
- **Annual Projects**: 250
- **Projects in**: 42 countries
- **Subsidiaries in**: 10 countries
- **People**: 800
OUR CLIENTS

Energy sector

Industry & Transport sector
Index

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SIMULATION SERVICES

- Simulator Development
- Simulation Assisted Engineering
- Consulting Services
- Simulators Operation
- Simulator Based Training
- Maintenance & Upgrading
• Tecnatom owns and maintains the Spanish fleet of FSS (5) in accordance with international standards.
• The fleet is used mainly for training but engineering purposes also, contributing to digitization of industrial processes and increased reliability via Digital Twins.
• Spanish Utilities are represented by Tecnatom in the ANSI/ANS-3.5 (2018) and ANSI/ANS-3.5.1 (in development) Working Groups and in the Utility Simulators Users Group (USUG).

Main Activities:
Operation and Management of Simulators
Analysis and implementation of plant modifications
Simulator testing and validation
Routine corrective HW and SW maintenance
Assure full availability anytime anywhere
Daily Operational Readiness Tests
Technology upgrades
Simulators Configuration Management
• **Workforce**
  - More than 60 simulation Engineers (50% with more than 15 years of experience)
  - Different Roles (Modelling, SW, HW, HFE, Operation, I&C)
  - More than 150 experts in NPP Operation and Design

• **Methodology**
  - Focused on:
    - Simulator Development (including V&V)
    - Simulator Maintenance and Operation
    - Simulator Modernization Projects
    - Simulation Assisted Engineering
    - Configuration Management
  - Meeting International Standards (ANSI 3.5, ...) and Regulatory Guides.
  - ISO 9001 Certification
Simulation Nuclear References

Almaraz Westinghouse PWR-3L
Cofrentes General Electric BWR
Ascó Westinghouse PWR-3L
Trillo KWU-Siemens PWR-3L
Vandellos Westinghouse PWR-3L
Laguna Verde General Electric BWR
Atucha II Siemens PHWR
Jose Cabrera Westinghouse PWR-1L
Angra I Westinghouse PWR-2L
Horizon Hitachi ABWR

Jules Horowitz Smolensk Rosatom RBMK
Lungmen General Electric ABWR
Garona General Electric BWR
Grafenrheinfeld KWU-Siemens PWR-4L
Atucha I Siemens PHWR
1300 Fleet EDF P4-P4’
iPWR SMR IAEA SMR
IFE Multi-unit Simulator SMR
ITER IO Fusion Reactor
Index

1. TECNATOM OVERVIEW
2. SIMULATION SERVICES
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5. CONCLUSIONS
Almaraz NPP FSS was in operation at Tecnatom facilities (Madrid) since 1998.

The origin of the simulator dates back to 1979 with the original configuration of the Lemóniz NPP FSS, a paralyzed Spanish nuclear project.

An average of 2,000 hours a year of courses are taught in the simulator, to which must be added many hours of testing and maintenance.

More than 20 SAEs have been carried out in this simulator.

Operators from others NPP like Ascó, Vandellós or Angra-1 were trained in this FSS.
SAE References in Almaraz FSS (most relevant)

- Steam Generators replacement (TH GV y FW, FW control).
- Turbine change impact.
- Turbine DEH Manual closure behavior when 200%/m and 133%/m.
- New SCDR implementation (24 control loops).
- New DCS for MSRs drains.
- New SSGG control level stability analysis.
- Plant power uprate to 108%.
- New AFW control system implementation.
- Fire scenario analysis.
Index

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2. SIMULATION SERVICES
3. ALMARAZ FSS RETROSPECTIVE
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In 2020, Almaraz NPP decided to transfer the FSS from Tecnatom Headquarters in Madrid to the site in Extremadura, 155 miles far away.

They are two (2) projects that come together in time and place:
1. BUILDING CONSTRUCTION
2. SIMULATOR TRANSFER

Activities mostly carried out at the NPP site.

Complex project due to the intervention of different subcontractors in both projects.

Simulator with the same features in its new location.

Further promote the use of the FSS both for training and for engineering or plant tests (with a view to a potential extension of life).
PROJECTS

1. **Construction of a suitable building for the needs of the simulator**

2. **Transfer and commissioning of the simulator**, including the necessary tests so that the simulator works in the same conditions as in its original location.
Planning

Building Construccion

Simulator Transfer
Timeline

Building Construction

Mar 14 2020, COVID-19 Lockdown
Mar 20, Building Contract Award
Jun 3, start land movement
Jul 20, start building construction
Nov 4, Building ready to host the simulator
Dec 18, Simulator Ready for Tests
Mar 15, Classrooms and building services finished

Simulator Transfer

Sept. 1, Transfer Contract Signature
Oct 21, Last training course at Old Location
Oct 28, Starts Disassembly
Nov 13, Ends Disassembly
Nov 28, Starts Disassembly
Dec 19, Simulator Ready for Tests
Mar 15, Ready for Training
Mar 29, First training course at New Location
BUILDING PHASES

- Permits management
- Studies and land movements
- Electromagnetic analysis (high voltage grid)
- Construction of the building
- Provision of infrastructures for the operation of the simulator
- Rest of building services: offices, classrooms, toilets, etc..
- Certifications

TARGETS

- Building structure before starting the transfer
- Installation of the simulator without incidents
- Compliance with building regulations and quality standards
- Habitability of the building
- Environmental conditions for the simulator
TRANSFER PHASES

- Strategy definition and Planning
- Adaptation of the simulator for disconnection and subsequent transfer
- Preparation of the building for the reception of the panels
- Transportation
- Panel positioning and wiring reconnection
- Installation of computers and communication systems
- Power supply
- Acceptance test
- Ready for Training

TARGETS

- Traceability in the disassembly stage to ensure correct assembly
- Ensure the integrity of panels, equipment and instruments
- Maintain physical and functional fidelity
- Finish the project on the agreed date
Conclusions

- Deadlines met despite difficulties
- Satisfactory result, without deviations or failures

CHALLENGES ACHIEVED

- Works in the context of construction, field unknown until now
- Activities within the facilities of a nuclear power plant
- 2 stages that converge in time and space, dependent on each other
- Several companies participating in the project
- Risk of damage of critical equipment
- Confluence with the COVID-19 pandemic throughout the development of the project
Keys to succeed

- Strong planning and Risk Management
- Weekly follow-up
- Teamwork with utility and subcontractors
- Professional Team
- Careful selection of subcontractors
- Previous works and equipment protection

Thank you!