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TECNATOM SUPPORT SERVICES FOR NEW NPP PROJECTS

- This presentation is aimed to provide a high-level overview on Tecnatom Services in support of new Nuclear Power Plant Projects.
- Most of Tecnatom Support Services for New NPP Projects are also applicable to:
 - Upgrading / Upgrading Projects for Operating NPPs.
 - Reactivation of NPP Construction Projects.



Background (I)

- Tecnatom is an engineering services company, established in 1957, currently owned by the three largest Spanish Nuclear Utilities (Endesa, Iberdrola and Union Fenosa).
- 600 full-time employees. 350 MSc/BSc. Averaged “nuclear experience” > 20 years.
- Specialized in providing equipment and services for the Nuclear Industry:
 - ✓ Safe & Reliable Operation: Personnel Training, Simulation, Engineering support.
 - ✓ Structural Integrity: NDE Inspection and Testing
- References in Spain + 20 Countries abroad.
- Customers: Utilities, Regulators, Vendors, NPP Owners/Operators, Fuel Suppliers.



Background (II)

- Tecnatom is independent of the main OEMs.
- Customers can benefit of the Tecnatom experience, know-how and technology accrued during more than 50 years serving the international nuclear industry.
- Through subsidiaries, partner companies and commercial representatives, Tecnatom have direct presence in:
 - ✓ Mexico
 - ✓ Brazil
 - ✓ Argentina
 - ✓ France
 - ✓ China
 - ✓ South Korea, Taiwan and Ukraine



Challenges to the reactivation (I)

- Challenges to the reactivation of nuclear power plants construction are common worldwide, including:
 - Regulatory processes
 - Workforce availability
 - Construction project management

Challenges to the reactivation (II)

- The regulatory processes are changing significantly for the better. The approval of the Permits and Licenses are being pursued in parallel rather than in series. One step process process (COL)
- Having a trained workforce with technical expertise is going to be an important challenge, perhaps the most important one in this resurgence of nuclear power.



Challenges to the reactivation (III)

- Establish a strong integrated management team will be one of the keys to success.



Lessons learned

“Those who cannot remember the past are
condemned to repeat it”

Jorge Santayana

➤ Some reasons for project failure

- Weak project management teams
- Lack of trained resources
- Regulatory changes
- Design changes during construction
- Equipment supply
- Economic and financing aspects
- Etc



Some keys to success

- Apply qualified resources
- Apply enough resources for early planning
- Project leadership, organization and integration
- Establish a strong integrated management team
- Appropriate selection of the technology
- Financial basis
- Etc



Tecnatom support

- 1. Pre-project Tecnatom Support Activities. “Going nuclear” (again).**
- 2. Tecnatom Support Activities for New NPP Projects.**
 - ✓ Plant Design / Construction Stage
 - ✓ Start – up
 - ✓ Commercial Operation



1. Pre-project Tecnatom Support Activities. Going “nuclear” (again).

- **Based on > 30 year experience as Training Centre for the Nuclear Industry and as “Reservoir” of nuclear know how, Tecnatom is well positioned to provide independent advice / consultancy at Country / Utility / Regulatory Body / A-E company levels on:**
 - Nuclear infrastructure development / revamping.
 - Development of tailored Training Programmes and Training Materials.
 - Design and Operation of Training Centres
 - Selection, recruitment and training of personnel.
 - “Training the Trainers”.

- **Through its active involvement in development activities for Generation III and III+ Reactors, Tecnatom is well positioned to provide independent advice / consultancy on:**
 - Technical and economic assessment of new reactor designs.
 - International Regulations, codes and standards.
 - Project planning and management.
 - Pre-Licensing activities.



2. *Tecnatom Support Activities for New NPP Projects.*

- **Once a project for building / refurbishing / reactivating a new NPP is launched, Tecnatom can support the Utility / Plant Owner/Vendor/A-E company – Operator in the following “Work Packages”:**
- Main Control Room Design & Human Factors Engineering Implementation (plant and MMI)
 - Plant Operations Manual (normal, abnormal and emergency operation)
 - Simulation (building of simulators, development of models)
 - Training of Plant Staff (Operation, maintenance, management, etc)
 - Pre- and In-service Inspection & Testing Engineering (development of PSI/ISI programmes based on risk-informed methods)
 - Supply of advanced, non intrusive, dedicated Inspection Equipment
 - Qualification / Dedication and Supply of Components.
 - Inspection & Testing Services: Shop Manufacturing / PSI / ISI



Matrix of TE Work Packages Support

WORK PACKAGE / PROJECT STAGE	Design / Constr.		Start - up		Operation	
	Utility / AE	Vendor	Utility / AE	Vendor	Utility / AE	Vendor
HUMAN FACTORS ENGINEERING /MCR	X	X			X	X
OPERATION PROCEDURES	X	X	X	X	X	X
SIMULATION	X	X	X	X	X	X
TRAINING	X		X		X	
INSPECTION & TESTING ENGINEERING	X	X	X	X	X	X
DEV. & SUPPLY OF INSPEC. EQUIPMENT	X	X			X	
QUALIFICATION / DEDICATION	X	X			X	X
INSPECTION & TESTING SERVICES	X	X	X		X	X



3. *TE References. New NPP Projects*

CUSTOMER	COUNTRY	REACTOR	TE WORK PACKAGE
Westinghouse Electric Co.	USA	AP 600 (FOAKE)	Generation & Validation of Function Based Task Analysis Plan
			Design of Functional Displays
			Specification of Electronic Procedures System
General Electric Co.	USA (Taiwan)	ABWR (Lungmen)	Analysis of Functional System Requirements
			Allocation of Functions to MCR Personnel
			Tasks' Analysis
			HSI Design
			HFE Verification & Validation
			Alarm System Engineering
			Development and Supply of NSSS Model
			Development of Training Materials
General Electric Co.	USA	SBWR / ABWR	Develop. of Procedures (operation, surveillance, annunciator response, start up)
			Training of License and non-license Plant Staff
			Implementation Plans for ABWR HSI Design
			Analysis of Operations for RHR and RSD Systems
General Electric Co.	USA	ESBWR	Design and Evaluation of RSD System
			Participation in Displays' Design
			Technical Specifications for Alarms and Electronic Procedures Systems
			Safety Analysis
IAEA	Austria	INPRO Project	Secondment of a TE Expert
			REP 2000
			EPP
Westinghouse Electric Co.	USA	AP 1000	Development of Operation and Maintenance Procedure
			Design of Main Control Room
			Instrumentation & Control
Westinghouse Electric Co.	USA	AP 1000	Operational Sequence Analysis
			Development of Operating Procedures
			Alarm System Engineering
Pebble Bed Modular Reactor	RSA	PBMR	PSI / ISI Engineering Consultancy
			Training Consultancy



4. *TE References. International Plant Upgrading Projects*

CUSTOMER	COUNTRY	NSSS	TE WORK PACKAGE
Laguna Verde NPP	MEX	GE BWR 6	Training of License and non-license Operating Staff TS for development and testing of the MCR Full-Scope Simulator
NOK - Beznau NPP	SWITZ	WEC PWR 2-L	Licensing of COMPRO and AWARE systems, on behalf of NOK, in front of Swiss Regulator (HSK)
Atucha NPP	ARG	KWU PHWR	Development of Training Plans Design, Development and Evaluation of Interactive Graphic Simulator Training of License and non-license Operating Staff
PAKS NPP	HUNGARY	VVER 440-213	Development of Training Plans
Grafenrheinfeld D3 NPP	GER	KWU	MCR Simulator Upgrades
IAEA	AUSTRIA	VVER 440-213	Development of Normal, Abnormal and Emergency Operating Procedures
Angra NPP	BRAZ	WEC PWR 2-L	Development of Normal, Abnormal and Emergency Operating Procedures Training of License and non-license Operating Staff
South Ukraine NPP	UKR	VVER 1000	Supply of Plant Process Computer Review of Control Room Design
Westinghouse		VVER 440-213	Development of Emergency Procedures for PAKS NPP (Hungary)



4. *TE References. Domestic Plant Upgrading Projects*

CUSTOMER	NSSS	TE WORK PACKAGES
Cofrentes NPP	GE BWR 6	Modernisation of MCR. Replacement of Conventional I&C by Digital I&C
Santa Maria Garoña NPP	GE BWR 3	MCR Full-scope Simulator. Design, Development and Evaluation of Interactive Graphic Simulator.
Almaraz 1&2 NPP	W PWR 3-L	Replacement of Plant Process Computer.
Asco 1&2 NPP	W PWR 3-L	Design, Development, Supply and Evaluation of a Computerized Alarm System & SPDS
Vandellos 2 NPP	W PWR 3-L	Development of Normal, Abnormal and Emergency Operating Procedures
Jose Cabrera NPP	W PWR 1-L	HFE Evaluation of Operating Procedures
Trillo 1 NPP	KWU 3-L	Development and Implementation of Computer-based Operation Support Systems
		Development of Training Plans. Training of License and non-license Plant Staff.
		HFE Evaluation of Operating Procedures
		Root Cause Analysis of Operating Events
		Task Analysis for License and non-license Operating Staff
		Design and Development of SAT (Systematic Approach to Training)
		Development of Plant Star up Guidelines and Procedures
		Technical Support for Digital Control Implementation