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NPP Long Term Operation in Spain. - First Application for License Renewal

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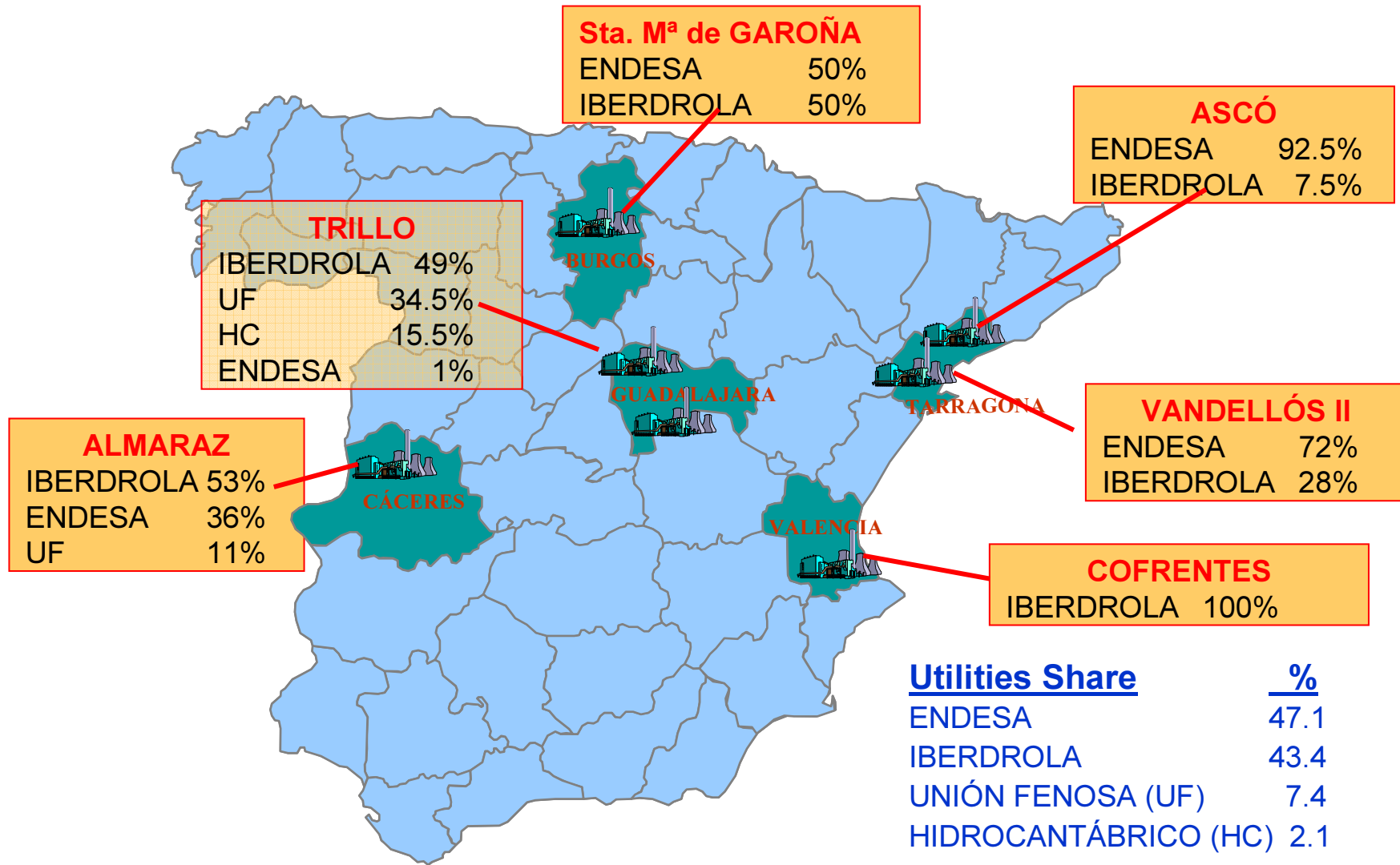
UNESA – Spanish Utilities Association

Nuclear Stations in Spain



Name	Rating	Type	Origin of Technology	Initial Connection
4 Single-unit site				
Garoña	466	BWR	USA	1971
Cofrentes	1092	BWR	USA	1984
Vandellós II	1087.1	PWR	USA	1987
Trillo	1066	PWR	Germany	1988
1 two-units site (common buildings)				
Almaraz 1	977	PWR	USA	1981
Almaraz 2	980	PWR	USA	1983
1 two-units site (separate buildings)				
Ascó 1	1032.5	PWR	USA	1983
Ascó 2	1027.2	PWR	USA	1985

Operating NPP Ownership Distribution



STRATEGY:

- **Operate the NPPs as long as they are considered safe and reliable.**
- **Maintain / improve NPP safety and availability.**

ACTIONS:

- Continuous Safety Assessment.**
- Periodic Safety Reviews (PRS).**
- Life Management Programmes (PLiM).**
 - Continuous control of SSC condition (UNESA PLiM Methodology)**
 - Permanent technological updating (modernisation)**
- Long Term Operation (LTO).**
- Technology and tool development to facilitate assessment, inspection, mitigation, repair and replacement for main important SSC.**

- **No legal lifetime limit for the Spanish NPPs.**
- **For each plant, an Operating License is required and includes the due date for its renewal.**
- **A PSR is required by the Spanish Nuclear Regulatory Authority (CSN) to be performed every 10 years and submitted when applying for a new renewal of the plant Operating License.**
- **Licensing requirements have been stated for the safe operation of the NPPs beyond 40 years design life (long term operation).**

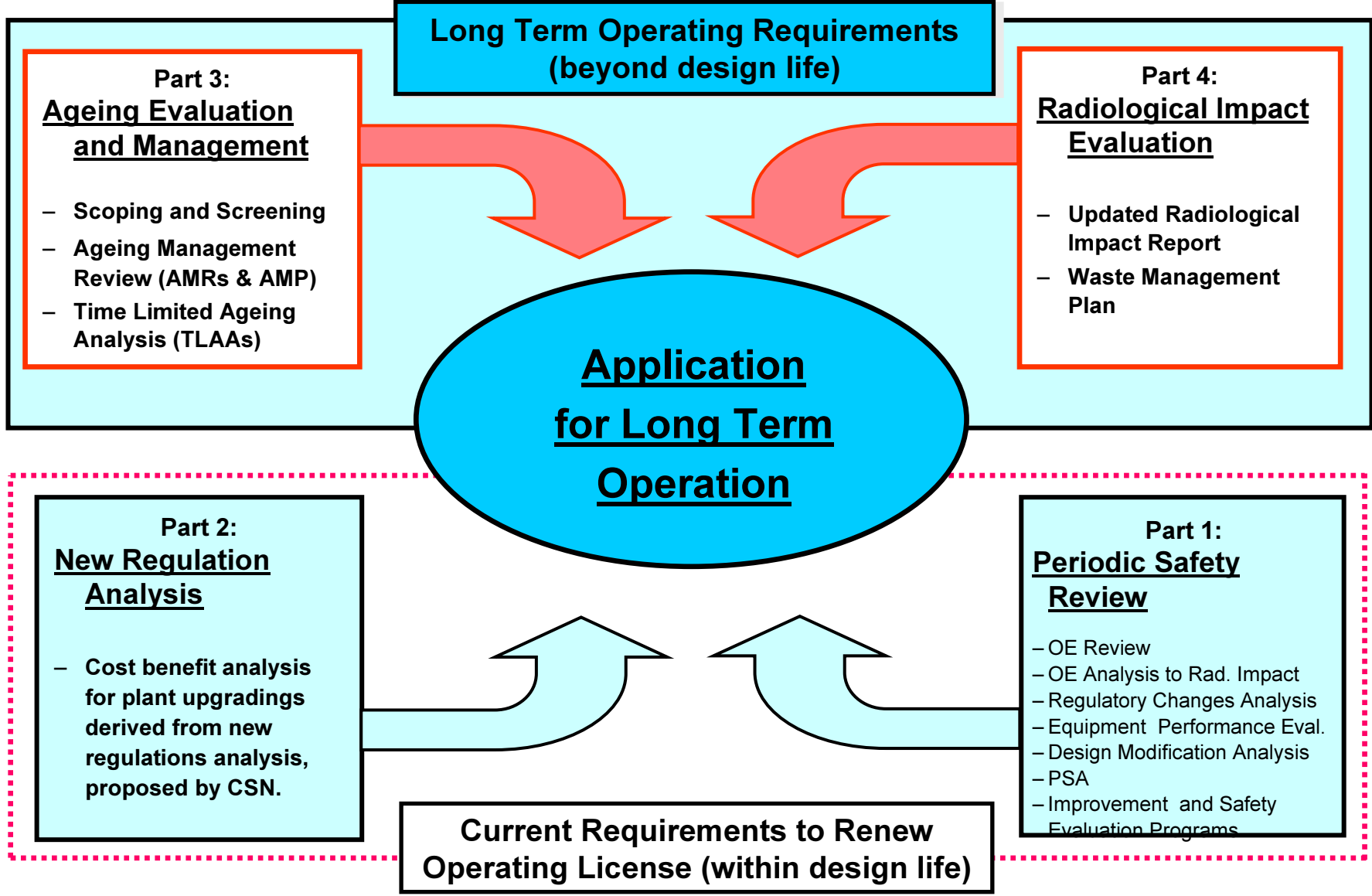
Status of Spanish NPP PSRs and Operating Licenses

NPP	PSR Situation (10 years Operating License from approval)
Garoña	Approved, Jul-99
Almaraz	Approved, Jun-00
Cofrentes	Approved, Mar-01
Ascó	Approved, Oct-01
Vandellós II	Approved, Jul-00
Trillo	Approved, Nov-03

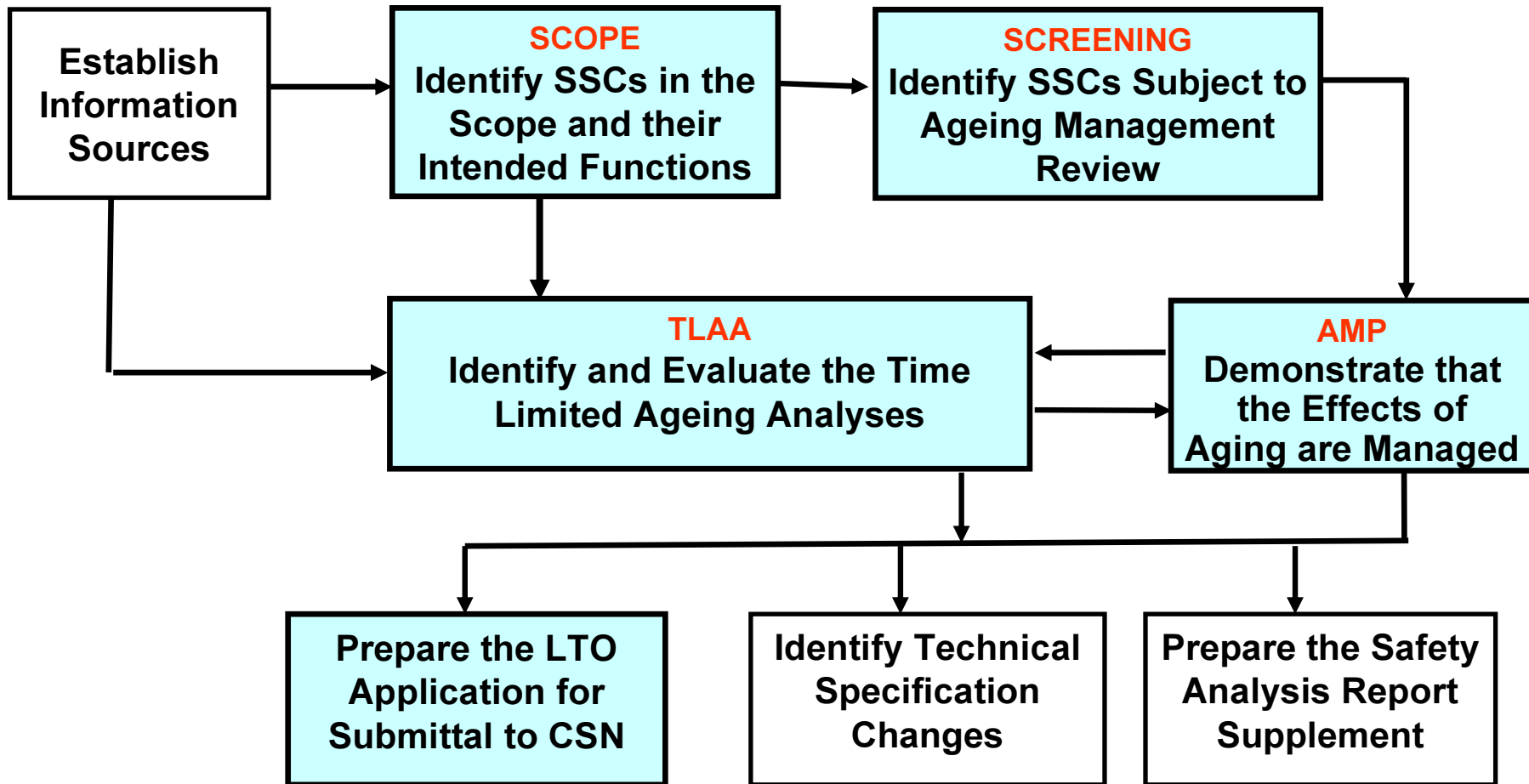
Spanish NPP Long Term Operation (LTO)

- **PSR is considered the basic tool for application of a request for NPP LTO (renewal of the Operation License for a new 10 year period beyond 40 years).**
- **In addition to the analyses required in the PSR, specific requirements related to LTO include:**
 - Ageing Management & Evaluation Programme (10CFR54 / LR Rule, NEI 95-10 scope)
 - Updated Radiation Impact Study
 - Review and assessment of regulation/standard applicability.

Spanish NPP Long Term Operation (LTO)



LTO – Ageing Evaluation and Management



Santa Maria de Garoña NPP

LTO Operating License Renewal

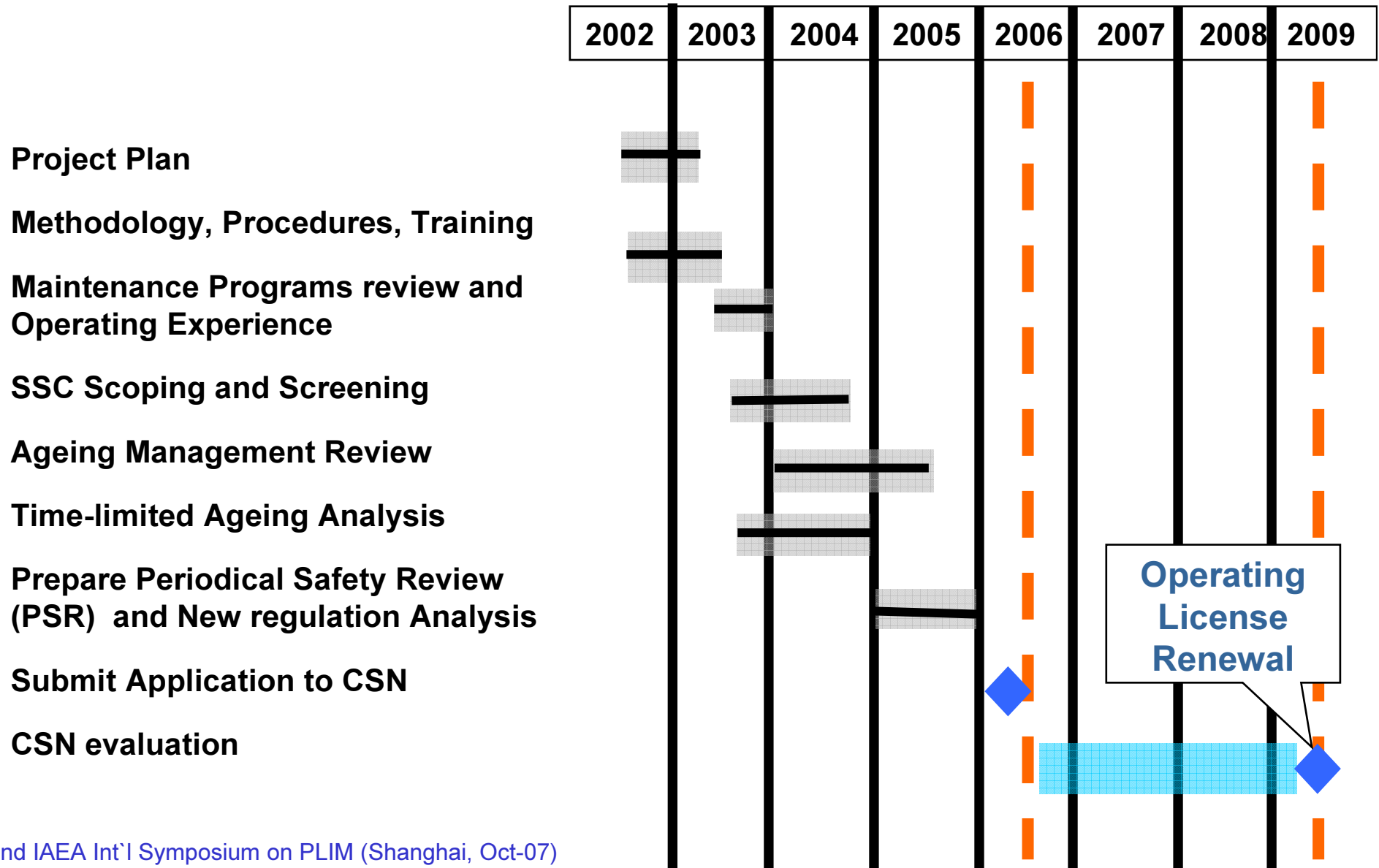


BWR GE-3 Mark-I Containment

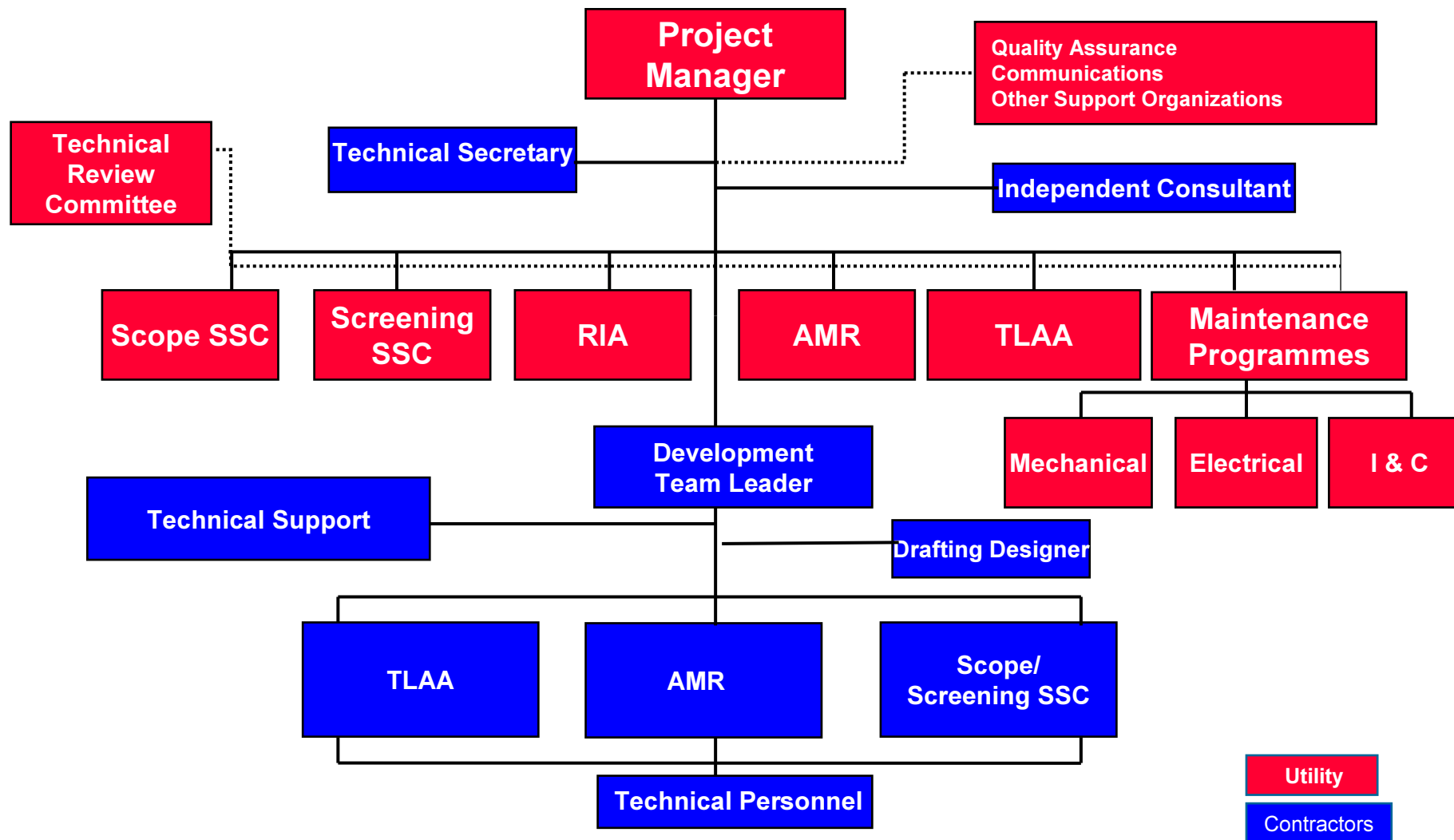
- Electric output: 466 MWe
- Operation Starting: March 1971
- Plants of similar design and vintage:
 - ✓ Muhleberg (Switzerland)
 - ✓ Monticello (USA)
 - ✓ Dresden 2 & 3 (USA)
 - ✓ Quad Cities 1 & 2 (USA)
 - ✓ Fukushima (Japan)



Santa Maria de Garoña NPP LTO Operating License Renewal



Santa Maria de Garoña NPP LTO Operating License Renewal



Red colour: Nuclenor staff

37 Mechanical Systems within the AMR scope

AFE	Essential Cooling Water
CRD	Control Rod Drive
CS	Core Spray
CST	Condensated Storage Tank
CUD	Clean Up Desmineralized
CW	Circulating Water
DRW	Building Drain Radwaste
DWS	Demineralized Water System
FDW	Feedwater
FPC	Fuel Pool Cooling
HDV	Heaters drains and vents
HPCI	High Pressure Coolant Injection
HS	Help Steam
HSC	Control Room Ventilation
HVAC-DW	Primary Containment Ventilation
HVAC-RX	Reactor Building Ventilation
HVAC-TB	Turbine Building Ventilation
IA	Instrument Air

37 Mechanical Systems within the AMR scope
 (Cont'd)

IC	Isolation Condenser
LPCI	Low Pressure Coolant Injection
MS	Main Steam
MU	Make Up
OG	Off Gas
PASS	Post Accident Sample System
PCI	Fire Protection
RBCCW	Reactor Building Closed Cooling Water
RECIR	Recirculating System
RHCS	Reactor Heat Cooling System
RW	Radwaste
RX	Reactor
SA	Service Air
SBGT	Standby Gas Treatment
SBLC	Standby Liquid Control
SHC	Shutdown Cooling
SS	Sample System
SW	Service Water
TURB	Turbine

**6 Electrical Systems with mechanical parts
within the AMR scope**

AC/DG	Emergency Diesel
AC/E1	Turbine Generator
ACS	Atmospheric Control System
ADS/MDS	Automatic / Manual Despressurization System
NMS	Neutron Monitoring System
RPVI	Reactor Pressure Vessel Instrumentation

**10 Electrical Systems
within the AMR scope**

AC/120	Altern Current 120
AC/400	Altern Current 400
AC/4160	Altern Current 4160
AC/ES	Altern Current Switchyard
ALUM/TF	Lighting
ARI/RPT	Alternative Rod Insertion / Recirculation Pump Trip
COMUNIC	Communications
DC	Direct Current
PPR	Alternate Shutdown System
RPS	Reactor Protection System

Garoña NPP – LTO Operating License Renewal SSC Scope to AMR



**20 Structures
within the
AMR scope**

CP	Primary Containment
ED-RX	Reactor Building
ED-TB	Turbine Building
ED-RW	Radwaste Building
ED-SV	Service Building
ED-CHIME	Stack
EDIF-TOMA	Intake Structure
EDIF-CT	Intake Channel
EDIF-P138	138 kv switchyard
EDIF-P220	220 kv switchyard
EDIF-P400	400 kv switchyard
EDIF-AUTO	Autotransformer Area
ED-TDR	Liquid Waste Tanks
EDIF-TGF	Diesel Tank Containment
EDIF-TC	Condensated Tank Containment
ED-CEN	Buried Conduit
ED-TEN	Buried Piping
EDIF-TR	Standby Transformer Basement
EDIF-TAA	Startup Transformer Basement
SOP-DCW-25/27	Emergency Diesel Cooler Support Structure

Garoña NPP – LTO Operating License Renewal Ageing Management Programmes (AMP<>PGE)



VESSEL	MECHANICAL	ISI
PGE-01: Management program of the fatigue in the pressure boundary	PGE-11: Programme for Erosion-Corrosion	PGE-03: In-service Inspection of components class. 1, 2 and 3
PGE-05: Welded connetions (attachments) to vessel inside	PGE-13: Refrigeration Systems in open loop (SW LPCI)	PGE-06: Nozzles of vessel feed-water
PGE-09: Vessel penetrations	PGE-18/1: Fire Protection (Dry)	PGE-07: Nozzle of the CRD's return line
PGE-10: Vessel internals	PGE-18/2: Fire Protection (Water)	PGE-08: Stress corrosion in BWR
PGE-21: Monitoring of reactor vessel	PGE-31: Periodic Inspections of conduits of ventilation systems	PGE-17: Inspection of Reactor water purification (CUD)
PGE-36: Control of the CRD's penetrations into the vessel.	PGE-32: Inspection of the nozzles of the dry well and suppression chamber spray.	PGE-24: In-service Inspection, Chap. 10, metally Boundary
	PGE-33: Inspection of nozzles of the dry well and suppression chamber spray.	PGE-25: In-service Inspection, Chap. 5, Supports
	PGE-34: Monitoring of Emergency Diesel Groups	PGE-26 Containment leakage test
		PGE-42: Closing studs of vessel head

Garoña NPP – LTO Operating License Renewal Ageing Management Programmes (AMP<>PGE)



STRUCTURAL	ELECTRICAL	GENERIC	CORROSION
PGE-12: Bolts integrity	PGE-02: Environmental qualification of electrical components	PGE-04: Chemistry control of water	PGE-37: Programme to follow up the systems
PGE-15: Cranes and reactor service platform	PGE-29/1: Surveillance of electrical cables, not qualified, in severe environmental locations.	PGE-20: Chemistry control of diesel oil	PGE-38: Selective leaching
PGE-19: Tanks on ground of carbon steel	PGE-29/2: Surveillance of electrical cables of instrumentation circuits, not qualified, in severe environmental locations	PGE-22: Unique inspections	PGE-43: Programme for periodic inspections
PGE-23: Pipes buried	PGE-39: Programme for aging management of the conduits for buses of phases.		
PGE-27: Structures program	PGE-40: Programme for ageing management of frames for fuse-racks		
PGE-28: Painting program	PGE-41: Surveillance of connections of electrical cables, not qualified, in severe environmental locations		

Garoña NPP – LTO Operating License Renewal

New or improved AMPs



AMP No.	AMP (PGE) Name
05	Internal vessel attachments
09	Vessel penetrations
10	Reactor vessel internals
19	Carbon steel above ground tanks
22	One time inspection
23	Buried piping
28	Paintings
29/1	Not qualified electrical cables in severe environment
32	Dry well and torus spargers
38	Selective leaching
39	Phase bars ducts
40	Fuses supports
41	Not qualified electrical cable connections in severe environment surveill.
43	Periodic inspections

Potential TLAAs



Application of TLAA definition criteria



Final TLAAs



Evaluation:

- a) Analysis remain valid for the period of extended operation**
- b) Analysis projected to the end of the period of extended operation**
- c) Ageing effects will be managed for the period of extended operation**

Garoña NPP – LTO Operating License Renewal TLAA List



No.	DESCRIPTION	Resolution	Type
	Neutron embrittlement of RPV and internals		
1	USE reduction of RPV material	Extension	Generic
2	RT _{NDT} shift of RPV material	Extension	Generic
3	RPV thermal shock caused by low temperature coolant injection	Extension	Generic
4	Shroud (and tie rods) thermal shock caused by low temperature coolant injection	Validation	Generic
5	P-T curves	Extension	Generic
	Metals fatigue		
	Reactor pressure vessel		
6	RPV fatigue analysis	Extension	Generic
7	Recirculation outlet nozzles fatigue analysis	Extension	Generic
8	Recirculation inlet nozzles fatigue analysis	Extension	Generic
9	Feedwater nozzles fatigue analysis	Extension	Generic
10	Core spray nozzles fatigue analysis	Val., & Ext.	Generic
11	Jet pumps instrumentation nozzles fatigue analysis	Extension	Generic
12	Shroud support low cycle thermal fatigue analysis	Val. & Ext.	Generic
	Internals		
13	Shroud tie rods low cycle thermal fatigue analysis	Validation	Generic
14	Jet pump diffuser to shroud support plate weld fatigue analysis	Extension	Generic
15	Nuclear instrumentation (LPRM) housings fatigue analysis	Extension	Specific
	Piping systems		
16	Recirculation piping fatigue analysis	Extension	Generic
17	B31.1, ASME III class 2& 3 or ASME VIII class B & C piping and components fatigue analysis	Validation	Generic

Garoña NPP – LTO Operating License Renewal TLAA List



No.	DESCRIPTION	Resolution	Type
	Other primary circuit analyses		
18	Isolation condenser fatigue analysis	Extension	Generic
19	Recirculation pumps fatigue analysis	Extensión	Specific
20	Environmental assisted fatigue (GSI 190)	Ext.& Aging Mgm't	Generic
	Primary containment fatigue		
21	Fatigue analysis of the suppression chamber, vents, downcomers and ECCS filters	Extension	Gen/Sp.
22	Fatigue analysis of SRV discharge piping inside the suppression chamber, external suppression chamber attached piping and associated penetrations	Extension	Generic
23	Drywell-to-suppression chamber vent line bellows fatigue analyses	Validation	Generic
24	Primary containment process penetrations bellows fatigue analysis	Validation	Generic
	Other fatigue analyses		
25	Reactor building crane load cycles	Extension	Generic
	Environmental effects		
31	Environmental qualification of electrical / I&C equipment	Extension	Generic
32	Dedication processes	Val. & Ext.	Specific
33	Radiation degradation of drywell shell expansion gap polyurethane foam	Validation	Generic

- **CSN has issued a Technical Instruction (TI) on Applicability Analysis of New Regulations and Standards (associated to the Operating License Renewal) in Nov. 2006.**
- **Apply to regulations/standards published by international organisations or by the technology origin country whose accomplishment must be analysed by the plant/utility.**

- **Previous work done on analysis of fulfilment of the following regulations:**
 - **10CFR50 Requirements derived from TMI. In-service Inspection. General Design Criteria (GDC).**
 - **NRC Bulletins, Generic Letters and Regulatory Guides.**
 - **IAEA Guides and Standards.**
- **After being issued the TI, the regulations to be analysed by Garoña NPP in its LTO Operating License Renewal:**

Garofa NPP – LTO Operating License Renewal New Regulation/Standards Analysis



10CFR50.44: Standards for the control of gases in LWR.

GDC 4: Environmental design and protection against missiles. Revision of the safety related ventilation system design and equipment according to ASME AG-1.

IEEE-279: Design criteria for NPP (protection systems and technological safeguards).

GDCs 41, 42 and 43: Design, inspection and testing of the containment atmosphere purification systems. Application of RG 1.52 to SBGT.

GDCs 53, 54, 55, 56, and 57: Testing and inspection of containment, piping and pressure boundary components that enter containment, containment isolation and valves. ANSI-56-2 and ANSI-56-8 with the requirements of 10CFR50 Appendix J Option B.

RG 1.32: Criteria for Power Systems in NPP.

RG 1.75: Physical independence of electrical systems. Minimum separation distance requisites and electrical cables ducts and redundant divisions equipment isolation.

RG 1.118: Periodic testing of protection and electrical power systems.

RG 1.153: Criteria for safety systems. Review of the Control Room Habitability, Standby Gas Treatment and Secondary Containment Isolation systems.

RG 1.189: Fire protection systems in operating NPP.

- **Revision of the Radiological Analytical Study (EAR)**
 - Licensing document updating due to socio-economic evolution of the region, decreasing evolution of the emissions and changes in calculation methodologies.
- **Revision of the Waste Management Plan**
 - According to the “Guide for the Elaboration of the Radioactive Waste Management Plan” (Guide generated through an UNESA-CSN project).
- **Spent Fuel Pool Reracking**
 - Guide tubes, filters and spacer holders to be removed to install new racks with storage capacity until 2019.
 - Verification of the refrigeration capacity, criticality studies and radiation consequences.

- **To be performed according to the CSN “Safety Guide 1.10”.**
- **Contents:**
 - **Analysis of the Operation Experience**
 - **Analysis of the experience related to Radiological Impact**
 - **Analysis of changes in the Regulations and Standards**
 - **Analysis of equipment performance**
 - **Analysis of Design Modifications**
 - **Updating of the Probabilistic Safety Assessment (PSA)**
 - **Improvement programmes and Safety Evaluation**

Garoña NPP – LTO Operating License Renewal Next activities

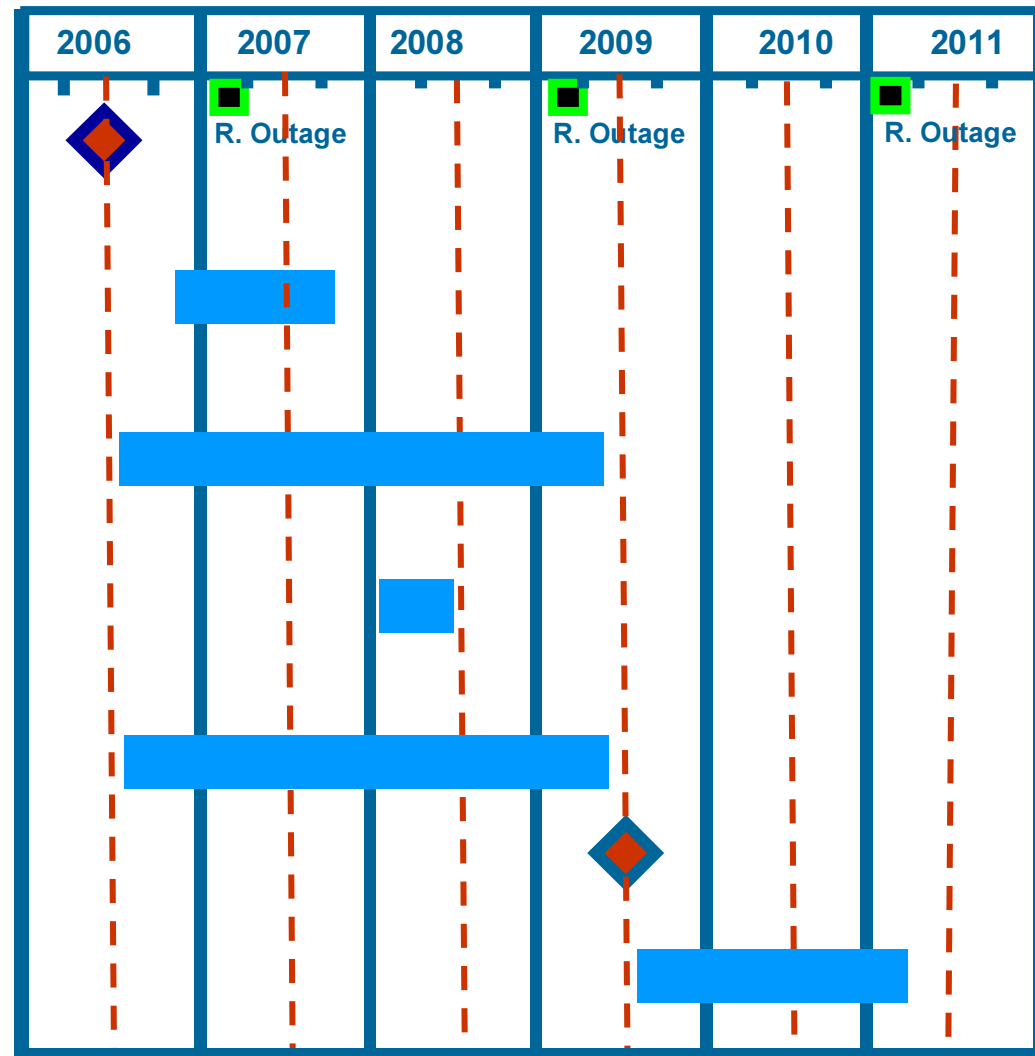


LTO Oper. Lic. Submittal

- Assessment of Regulation/Standards Applicability
- Implementation of Previous Commitments
- LTO Operating License Renewal Doc.'s Update
- CSN Inspection/Evaluation

LTO Oper. Lic. Approval

- Implementation of LRA Commitments



- ↑ Licensing requirements for Long Term Operation of NPPs in Spain has been stated and one BWR plant (Garoña NPP) will be the first plant facing to those requirements.**
- ↑ Those requirements put emphasis in ageing issues to assure that key plant equipment will perform its intended function during extended operating period, in such a manner that licensing bases are maintained.**
- ↑ A robust methodology is available to evaluate relevant ageing effects for key plant equipment.**
- ↑ Garoña operating excellence and results of ageing management evaluation show that there are no technical obstacles which would preclude operating the plant to 60 years and beyond.**