Empresarios Agrupados

Presentation of EA References and Capabilities

EMPRESARIOS AGRUPADOS

Engineers and Consultants

Company Profile & Services Provided

Company Profile

- Architect Engineering & Construction Management Company
- Established in 1971
- Headquarters in Madrid (Spain)
- Main focus: Nuclear and Conventional Power Plant Projects
- Leading engineering company in Spain
- Projects in more than 30 other countries
- Multidisciplinary staff of over 1,100 persons
- Full range of engineering services provided
- Quality System: 10CFR50 App. B, 10CFR21, ASME NQA-1,ISO 9001-2008 & ISO 1400 Certification

Services Provided

- Consulting
- Pre-construction activities

  (e.g. Feasibility studies, project development studies, site selection & preparation, Bid Invitation Specifications (BIS), Bid evaluation, etc.)
- Licensing and Permitting
- Project Management
- Engineering and Design (all project disciplines)
- Procurement Services
- Construction Management
- Testing & Commissioning Management
- Quality Management
- Engineering Support to Plants in Operation

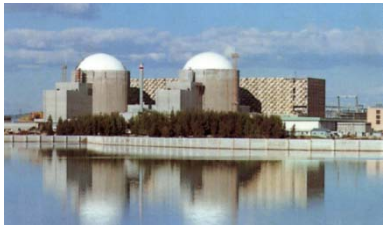
EMPRESARIOS AGRUPADOS

Fields of Activity

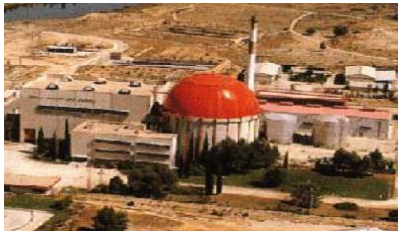
Nuclear Projects

New-build nuclear power plants

Engineering support services to plants in operation



Decomissio-ning and Radioactive Waste Management



Research Reactors and Generation IV Reactors

ITER Fusión Reactor-Cadarache (France)

Architect-Engineering and Construction Management

Thermal Power Plants

Combined-cycle thermal power plants

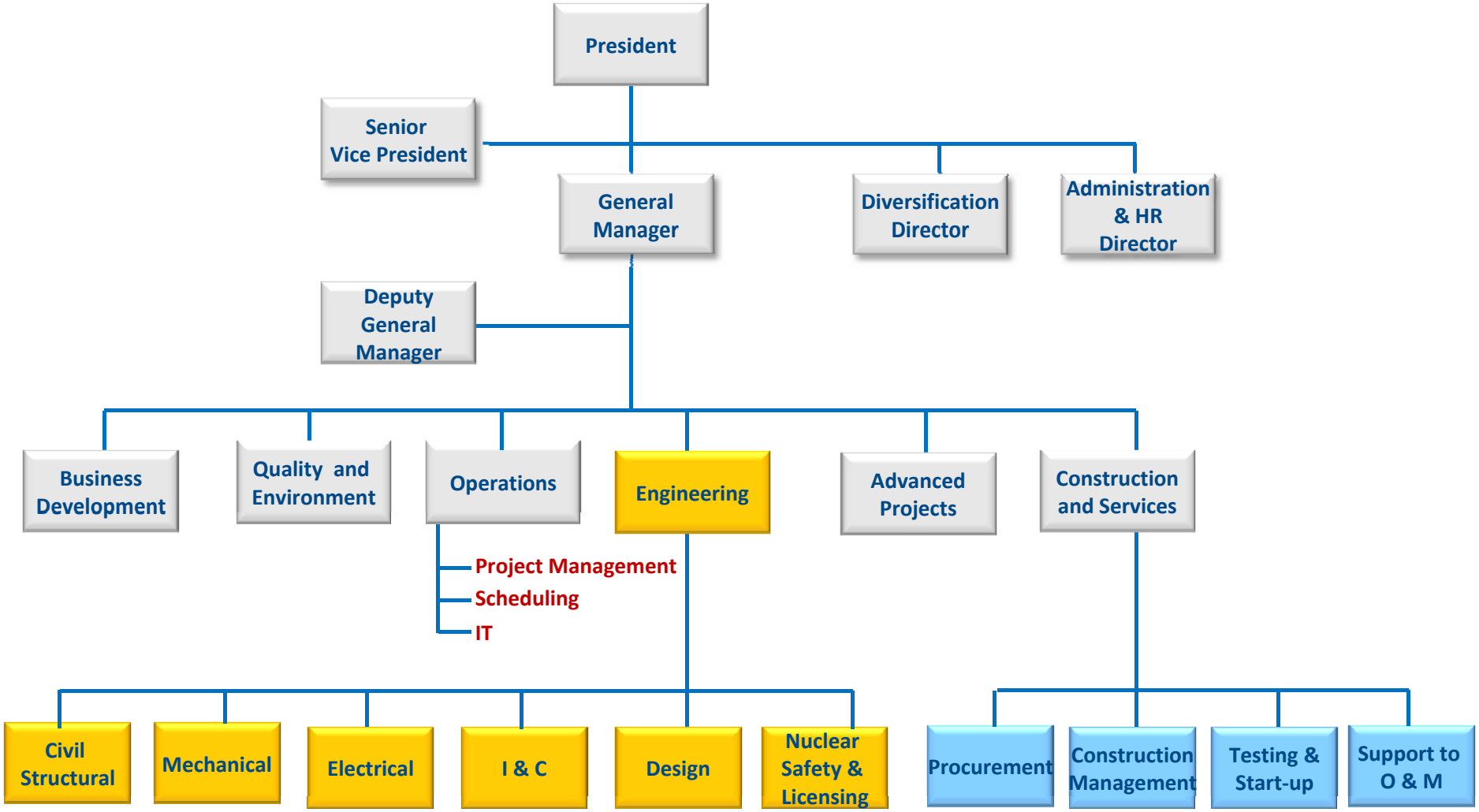
Coal and FO-fired thermal power plants

Renewable energies

Solar and Biomass Thermal Power Plants

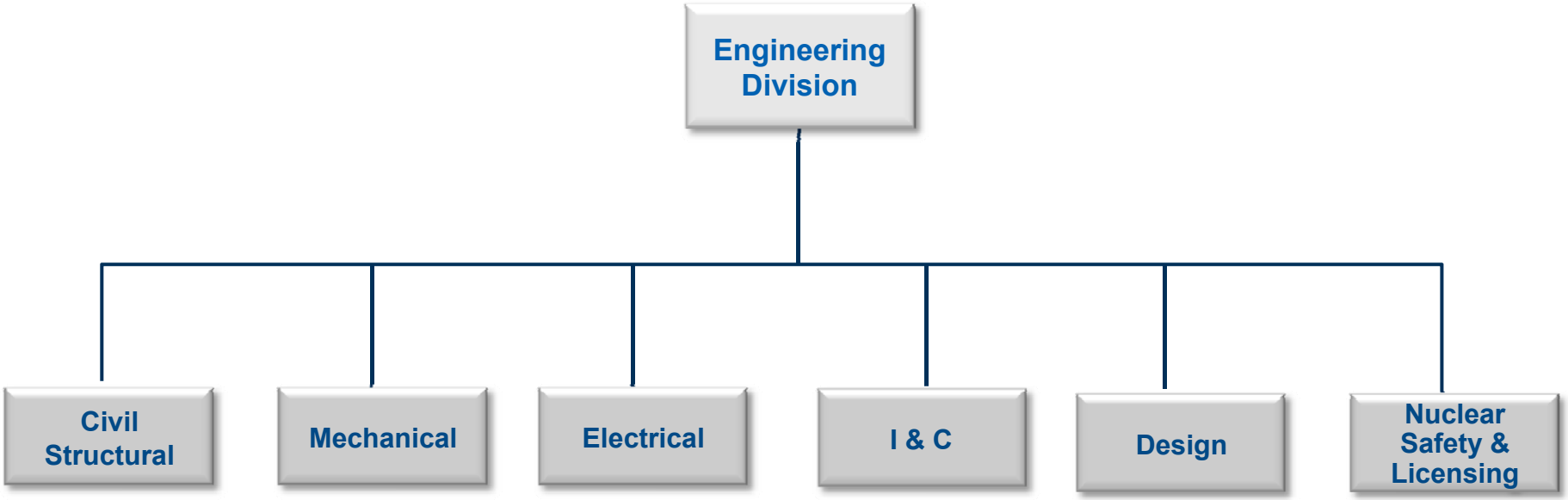
EMPRESARIOS AGRUPADOS

EA´s Organization Chart

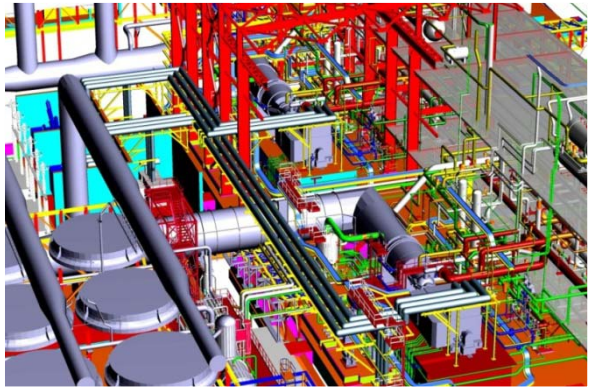


EMPRESARIOS AGRUPADOS

EA Engineering and Design Services



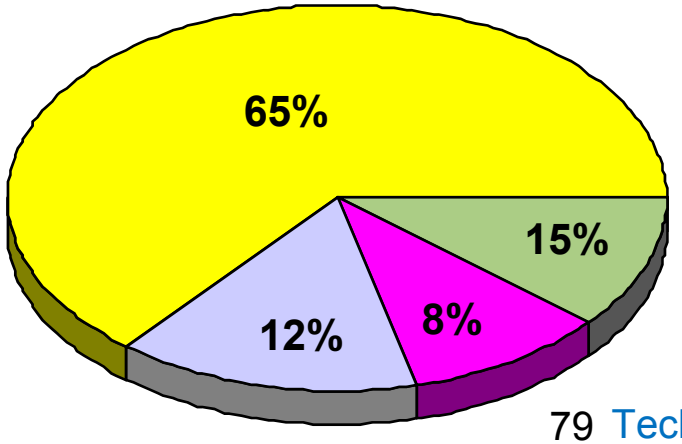
EA performs the complete basic and detail design for all project disciplines



EMPRESARIOS AGRUPADOS

Human Resources

University Graduates 668



163 Designers and Draftsmen

79 Technicians

Administrative 122

Total EA
1032

Home Office	Field
783	249

EMPRESARIOS AGRUPADOS

Main EA References in Power Plant Projects

Summary of EA's experience as a full scope Architect-Engineer			
Nuclear Power Plants [3 PWRs + 3 BWRs]:	6 Units		6,316 MWe
Combined - Cycle Power Plants:	37 Units		22,845 MWe
Coal and/or Oil – Fired Power Plants:	24 Units		7,780 MWe
Solar Power Plants:	3 Units		80 MWe
Hydroelectric Power Plants:	2 Units		250 MWe
TOTAL	72 Units		37,271 MWe

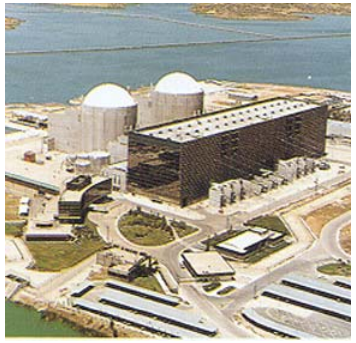
EA's scope of services in these projects

- Project Management *(all)*
- Engineering and Design (*all*)
- Procurement Management *(some)*
- Construction Management *(some)*
- Commissioning Management *(some)*

EMPRESARIOS AGRUPADOS

EA Construction Management Services

- Construction Supervision
- Construction Planning and Scheduling
- Quality Control
- Field Purchasing
- Materials & Warehouse Control
- Construction Costs Monitoring and Control
- Construction Contracts Administration
- Labour Relations
- Safety & Health and Environmental Protection
- Site Physical Security
- Field Detail Design Office
- Construction Turnover to Plant Testing Team
- Site Services
  (Site IT System, Medical Assistance, etc.)
- Communications



Almaraz NPP Units 1&2, Spain
Iberdrola/UF/Endesa
PWR Westinghouse, 2x980 MWe
(Complete Services)

Trillo NPP, Spain
Iberdrola/UF/HC
PWR Siemens, 1066 MWe
(Complete Services)

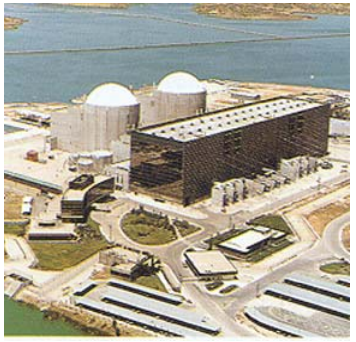
Cofrentes NPP, Spain
Iberdrola
BWR 6, Mark III, 1000 MWe
(Support to the Utility)

Valdecaballeros 1 & 2 NPP, Spain
GE
BWR 6, Mark III, 2 x 975 MWe

EMPRESARIOS AGRUPADOS

EA Plant Testing & Commissioning Management Services

- Plant Testing and Commissioning Programme
- Testing and Commissioning Organization
- Testing and Commissioning Planning and Scheduling
- Preparation and Approval of Testing/Commissioning Procedures
- Conduct the Testing/Commissioning Program for Structures, Systems and Equipment
- Review and Evaluation of Test Results
- Preparation of Test Reports



Almaraz NPP Units 1&2, Spain
Iberdrola/UF/Endesa
PWR Westinghouse, 2x980 MWe
(Complete Services)

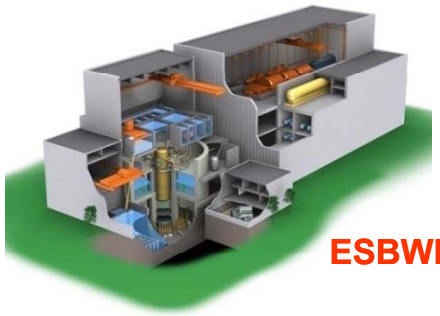
Trillo NPP, Spain
Iberdrola/UF/HC
PWR Siemens, 1066 MWe
(Complete Services)

Cofrentes NPP, Spain
Iberdrola
BWR 6, Mark III, 1000 MWe
(Support to the Utility)

Testing and Startup of Numerous Coal-Fired, F-O Fired and Combined Cycle Power Plants
(Complete Services)

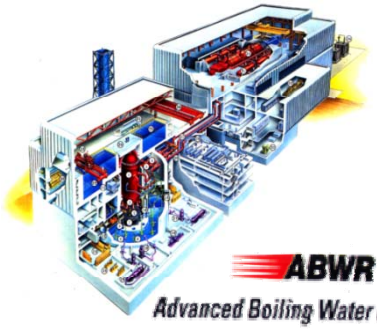
EMPRESARIOS AGRUPADOS

EA relevant experience - BWR Projects



ESBWR

- ESBWR design development
- NRC Design Certification: DCD preparation



- ABWR design development
- First-of-a-Kind-Engineering (FOAKE) program

Lungmen 1 and 2 NPP - Taiwan
2x1360 MWe, ABWR

- Engineering & Design services to GE for all Project disciplines

Cofrentes NPP - Spain
1100 MWe, BWR 6 / Mark III

- Architect-Engineer for the project
- Complete Engineering & Design
- Procurement
- Construction Management support
- Commissioning services

Valdecaballeros NPP - Spain
2x975 MWe, BWR 6 / Mark III

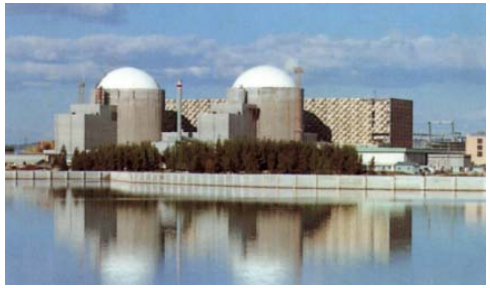
- Architect-Engineer for the project
- Complete Engineering & Design
- Procurement
- Construction Management
- Commissioning services

Sta. Mª Garoña NPP - Spain
460 MWe, BWR 3 / Mark I

- Engineering support to plant operation
- Operation licence extension program
- Extensive backfitting projects

EMPRESARIOS AGRUPADOS

EA relevant experience - PWR Projects



Almaraz 1 & 2 NPP - Spain
2x1000 MWe, PWR

- Architect-Engineer for the project
- Complete Engineering & Design
- Procurement services
- Construction Management
- Commissioning services

Trillo NPP - Spain
1066 MWe, PWR

- Architect-Engineer for the project
- Complete Engineering & Design
- Procurement services
- Construction Management
- Commissioning services

AP600
Advanced PWR, passive type, 600 MWe, Westinghouse

- AP600 design development
- Engineering support for NRC Design Certification

AP1000
Advanced PWR, passive type,
11500 MWe, Westinghouse

- AP1000 design development

EMPRESARIOS AGRUPADOS

Engineering Services for Operating NPPs in Russia and Eastern European Countries

- EU Phare and Tacis Programmes and EBRD projects
- Safety improvements in VVER-440/230, VVER-440/213, VVER-1000 and RBMK plants in operation
- Typical projects carried out:
  - Containment Systems Design Review and Validation
  - Probabilistic Safety Analysis (PSA)
  - Equipment Environmental Qualification
  - "Leak-Before-Break" (LBB) Analysis
  - Improvement of QA Programmes in plants in operation
  - Engineering Support to VVER-1000 Modernization Programmes
  - Radioactive Waste Management and Decommissioning
- More than 130 contracts carried out (Phare + Tacis + EBRD + IAEA)
- EA established a company in Ukraine (ENERTEK) to provide engineering
- Services to support NPPs in operation in this country

NPPs where services were provided:

- Russian Federation
  - Kalinin
  - Novovoronesh
  - Kola
  - Balakovo
- Ukraine
  - Zaporoshye
  - Rovno
  - Khemelnisky
  - South Ukraine
- Bulgaria
  - Kozloduy Units 1 to 6
- Czech Republic
  - Temelín Units 1 and 2
  - Dukovany Units 1 to 4
- Slovakia
  - Bohunice
- Armenia
  - Medsamor

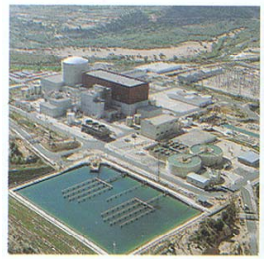
EMPRESARIOS AGRUPADOS

Engineering Support Services to Nuclear Plants in operation

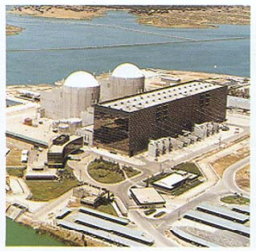
EA provides engineering support services to all 8 Nuclear Units in operation in Spain

EA has been delivering these services on a continuous basis for the last 35 years

Garoña NPP, Spain
BWR 3, Mark I, 450 MWe
GEH

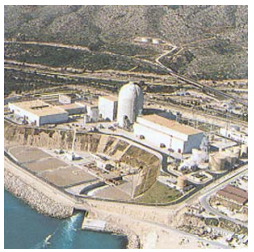


Cofrentes NPP, Spain
BWR 6, Mark III, 1100 MWe
GEH



Almaraz NPP, Spain
PWR, 2 x 1000 MWe
Westinghouse

Trillo NPP, Spain
PWR, 1066 MWe
Areva (Siemens-KWU)



Vandellós 2
PWR, 980 MWe
Westinghouse

Ascó
PWR, 2 x 980 MWe
Westinghouse

Services include:

- Plant design modifications
- Plant updates due to new requirements by the regulatory authorities
- Modernisation projects
- Power uprating
- Plant life extension
- Post-Fukushima backfitting programs
- Refueling outages support

Services comprise:

- Project management
- Engineering and design
- Construction/erection supervision
- Commissioning support

EMPRESARIOS AGRUPADOS

Examples of on going EA-Projects to implement post-Fukushima requirements

CN KRŠKO NPP. (NEK, Slovenia)
Plant/Reactor: PWR, W, 730 MWe
Project: Upgrading the current BB1
Electrical Power Supply System

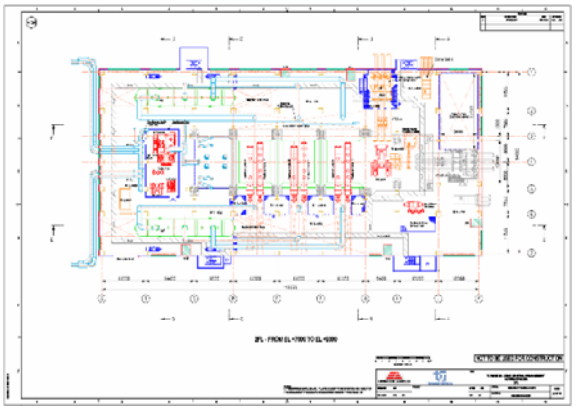
Scope of services:

- Preparation of the design and installation criteria
- System Design
- Electrical Calculations
- Layout
- Equipment procurement specifications
- Technical support for erection & commissioning (SAT)
- Modification of existing licensing documentation & operating procedures
- Elaboration of the as-built documentation

EMPRESARIOS AGRUPADOS

EA New Build NPP Projects in Europe: Preconstruction activities and Owner Engineer

Olkiluoto 3 NPP (TVO, Finland)



Mitsubishi Turbine Island

- Hinkley Point 1&2, (NNB/EDF, UK)
- Penly, (EDF, France)
- Olkiluoto 4 (TVO, Finland)

RESUN (Switzerland)

Akkuyu NPP (Turkey)

4x1200 MWe VVER Units
(Site Preparation Projects)

Temelín, 3&4 NPP (ČEZ-Czech Republic)

Hanhikivi NPP (FENNOVOIMA, Finland)

Dukovany 5 NPP (ČEZ-Czech Republic)

Bohunice V-3 NPP (JESS-Slovakia)

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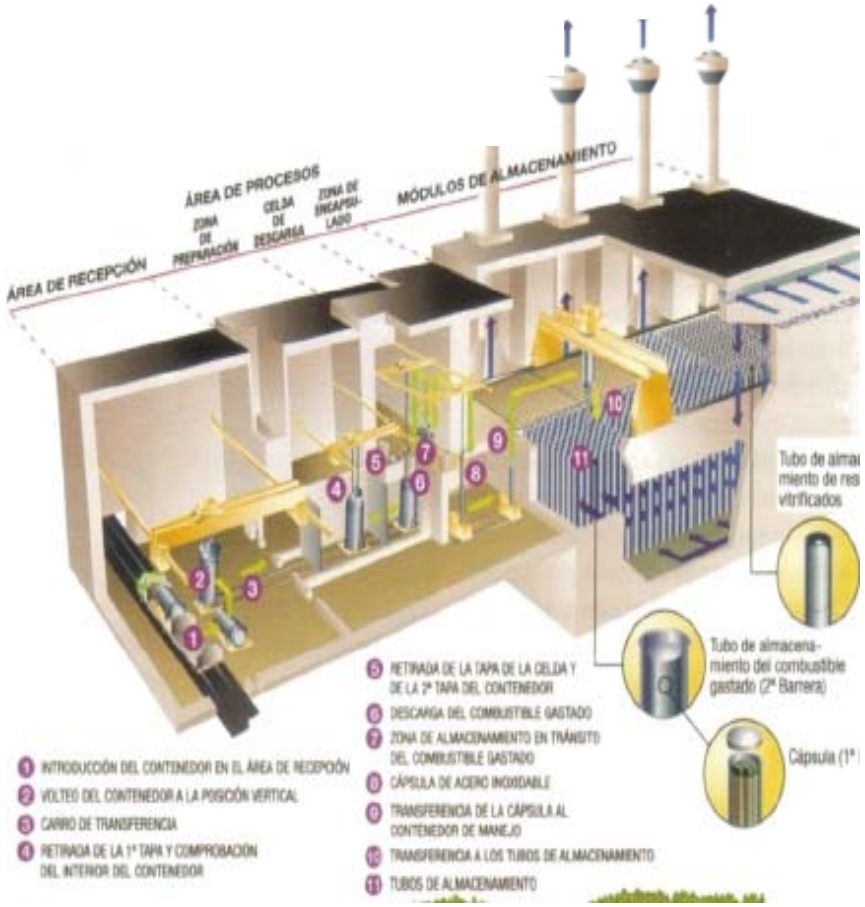
EA relevant experience - Other Nuclear Projects



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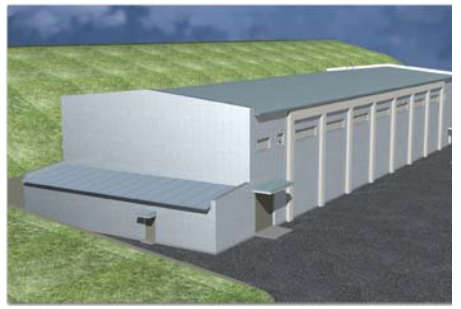
Spent Fuel Centralized Interim Storage Facility (ATC) Project (Client: ENRESA, Spain)

Complete Engineering & Design

EMPRESARIOS AGRUPADOS

Radioactive Waste Management

- **Bulgaria**
  - Project Management Unit (PMU) for Licensing, Design and Construction of the National Radwaste Repository (SERAW-EBRD) (In Consortium with Nuvia)
  - Design of Novi-Han repository for Institutional Radwaste (Phare)
- **México**
  - Development of a policy and strategy for management of spent nuclear fuel and radioactive waste in México (European Commission/ENRESA)



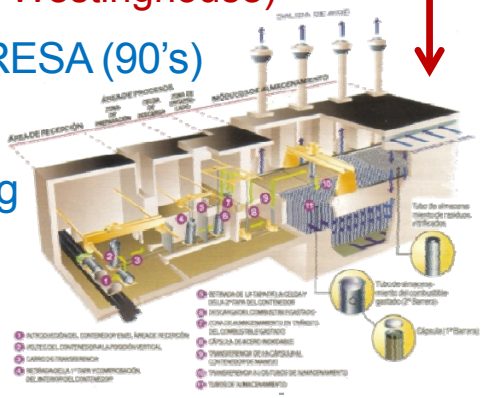
- **José Cabrera, Almaraz and Trillo NPP's (Spain)**
  - Plant Radwaste Treatment Systems
  - Low Activity Radwaste Interim Storage Facility (on-site)
- **SBWR Project (GEH)**
  - Plant Radwaste Treatment System Design

- **Valdecaballeros NPP (Spain)**
  - Plant Solid and Liquid Radwaste Treatment System Design
- **Nuclear Power Plant Decontamination**
  - Preparation of Procedures and Operation Supervision
- **El Cabril Low and Intermediate Level Final Storage Facility (Spain)**
  - Engineering and Design Independent Review for ENRESA

EMPRESARIOS AGRUPADOS

Spent Fuel Storage

- Centralised Interim Storage (ATC) facility for all Spent Fuel from all NPP's in Spain (ENRESA)
  Engineering and Design of the ATC facility (Vault type) (in Consortium with Westinghouse)
- Generic Centralised Interim Spent Fuel Storage (dry and wet storage)-ENRESA (90's)
  Project Engineering and Design
- Generic Design of Centralised Interim Spent Fuel Storage in closed building
  Owner's Engineering for ENRESA and Licensing Support
- Interim Intermediate Storage at Trillo NPP (Metal Containers)-ENRESA
  Detail Engineering and Design
- Interim Intermediate Storage at José Cabrera NPP (concrete containers)
  Owner's Engineering and Licensing Support for ENRESA
- Dual Purpose Metal Spent Fuel Storage Casks at Dukovany NPP (VVER)
  Bid Invitation Specifications and Bid Evaluation for CEZ (Czech Republic)
- Dual Purpose Metal Containers for Spent Fuel in Almaraz and Trillo NPP's (ENRESA)
  Owner's Engineer, Licensing, Manufacturing and Site Testing Supervision
- Final Spent Fuel and High Activity Radwaste Deep Storage Facility in Spain (ENRESA)
  Site Selection, General Layout, Conceptual Design and Safety Analysis
- Interim Intermediate Storage Facility at Ascó NPP (PWR, 2 x 1000MWe Spain)
  Design and Licensing Support for the Owner (ANAV)



EMPRESARIOS AGRUPADOS

Decommissioning and Dismantling of NPPs & Radioactive Facilities

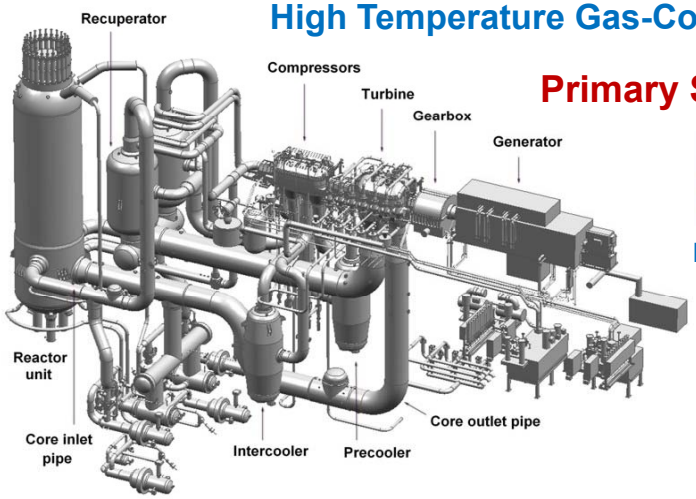
- Kozloduy NPP, (VVER 440) Bulgaria (SERAW, EBRD):
  - Project management Unit (PMU) for the dismantling of Kozloduy NPP Units 1, 2, 3 & 4 (In Consortium with Nuvia)
- Bohunice 1&2 NPP (VVER-400) Slovakia (JAVYS; EBRD):
  - PMU for the Dismantling of Bohunice Units 1&2
- José Cabrera NPP (PWR, Spain) (ENRESA):
  - Basic and Detail Engineering for the NPP Dismantling and Site Execution Management
- Bohunice A-1 NPP (Slovak Republic)
  - Pre-decommissioning Studies

- Vandellòs NPP Unit 1 (Graphite-Gas Reactor) (ENRESA):
  - Engineering for Dismantling and Dismantling Execution
- Institutional Radwaste Storage Facility at Roznan (Poland, Phare):
  - Preparation of Dismantling Plan
- CIEMAT Facilities, Research Center in Spain (ENRESA):
  - Engineering, Preparation of the Licensing Documentation, Management and Supervision of the Dismantling Operations
- Pilot Projects for Decommissioning and Dismantling of a Generic PWR 1000 MW NPP and of a Generic BWR 450 MWe NPP (ENRESA)

EMPRESARIOS AGRUPADOS

Research Reactor Projects: Examples

High Temperature Gas-Cooled Reactor, 165 MWe

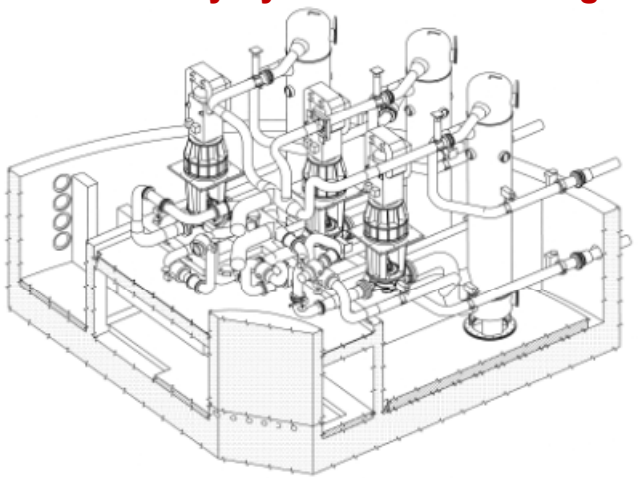


Primary System Design

PBMR (Pty) Ltd-SudAfrica

Julius Horowitz Reactor (JHR)
CEA (France)

Primary System Heat Exchangers Supply



MYRRHA

Experimental Accelerator Driven Reactor System (Mol-Belgium)
(Consortium AREVA-ANSALDO-EA)

SCK•CEN
STUDIECENTRUM VOOR KERNENERGIE
CENTRE D'ETUDE DE L'ENERGIE NUCLEAIRE

Front End Engineering and Design (Feed) Project

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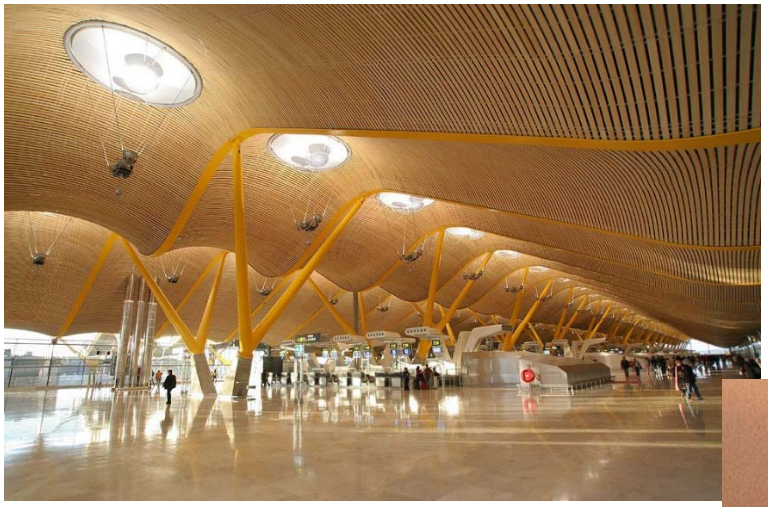
Other relevant experiences in Construction Management



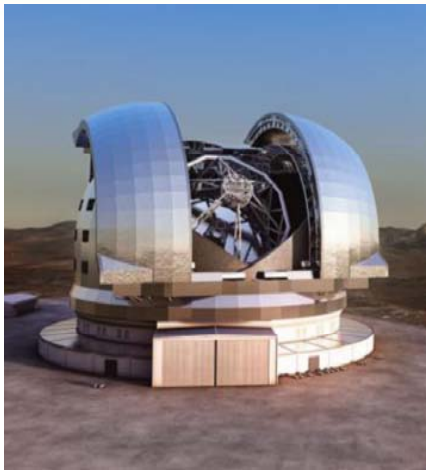
Madrid Barajas Airport-T4

- Construction supervision
- Commissioning management

Canary Island Large Telescope (GranTeCan Telescope)

EPC Contract:

- Design
- Procurement
- Construction management
- Commissioning management



European Extremely Large Telescope E-ELT (Chile)

- EPC Contract
- Preselected bidder, in the large stages of bidding process

EMPRESARIOS AGRUPADOS

ITER Fusion Reactor Project (Cadarache-France)

ITER Facilities at Cadarache (France)

View of ITER construction site

Architect Engineering and Construction Management Services

Client: Fusion for Energy

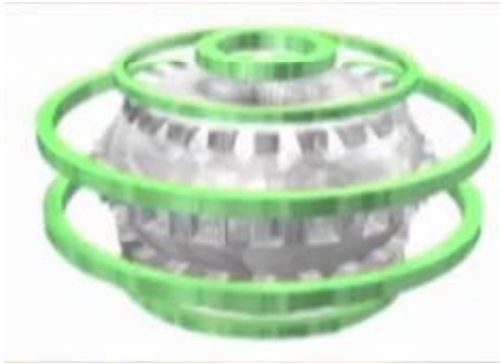
engage *Consortium*

ASSYSTEM ATKINS EMPRESARIOS AGRUPADOS IOSIS

EMPRESARIOS AGRUPADOS

ITER PF Coil Building

- Design and Build Specifications
- Bid Evaluation Support to F4E
- Support to F4E to resolve Contractor questions during the design and construction process

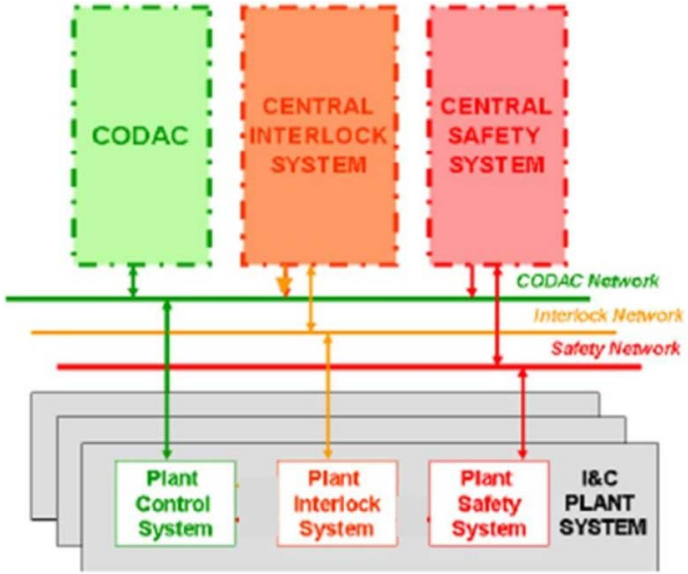


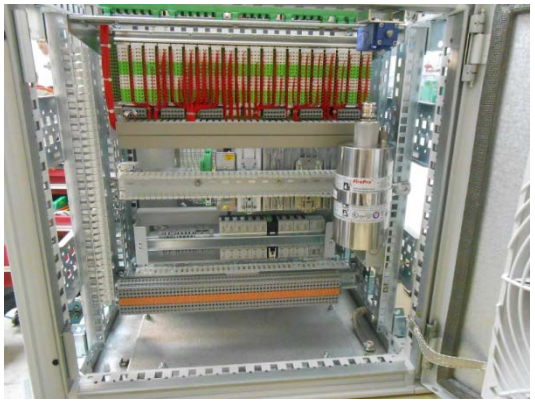
EMPRESARIOS AGRUPADOS

ITER Central Safety System-Nuclear (CSS-N) Contract

CSS-N Contract signature

Contract signature between the ITER Organization (IO) and the Spanish consortium comprising Empresarios Agrupados and Inabensa for the detailed design, qualification, supply, testing and commissioning of the Central Safety System-Nuclear (CSS-N)





EMPRESARIOS AGRUPADOS

ITER DWS Tanks Design, Fabrication & Installation Contract

Consortium ENSA – Empresarios Agrupados Internacional, S.A.

Ensa makes history delivering Europe's first-ever equipment to ITER

- August 2013: notification of contract award
- Scope of supply:
  - Design, fabrication and installation of:
    - Four 20m^3 tritiated water holding tanks, and
    - Two 100m^3 emergency tanks

EMPRESARIOS AGRUPADOS

ITER - Other Recent IO and F4E Contracts

- IO: Tokamak Building Anchorage Plates Load Definition
- IO: Engineering support to perform dynamic simulation of ITER cryogenic system
- IO: Support to IO for the Definition of Construction Documentation and Data
- IO: SmartPlant Project Technical Support to IO
- F4E: Tritium Migration Modelling and Conceptual Design of the Tritium Accountancy Systems for the European Test Blanket Systems
- F4E: Upgrade of the Tritium transport simulation tool based on EcosimPro and generation of new simulation new results

EMPRESARIOS AGRUPADOS

Conventional Power Plant Projects in Spain (some examples)

ELCOGAS IGCC 335 MWe

CASTELLON 800 MWe

CASTEJON 400 MWe

TARRAGONA 400 MWe

SANTURCE 400 MWe

GRANADILLA 220 MWe

ARCOS 2x400 MWe

BESÓS 800 MWe

ACECA 400 MWe

LA PLANA DEL VENT 2x400 MWe

AS PONTES 800 MWe

BARCELONA
2 X 420 MWe

EMPRESARIOS AGRUPADOS

Conventional Power Plants Projects outside Spain (Some Examples)

SHATURA 400 MWe (OGK4-RUSSIA)

MESAIEED 3X800 MWe (QATAR)

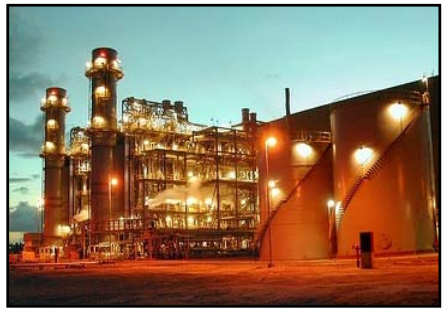
RIGA 2 400 MWe (RIGA, LATVIA)

KOUDIET 2x400 MWe (ALGERIA)

HADRJET EN NOUSS 3x400 MWe (ALGERIA)

DENIZLI 800 MWe (TURKEY)

LAVRION V 400 MWe (GREECE)



TERMOPERNAMBUCO 520 MWe (BRASIL)

MOERDIJK 433 MWe (NETHERLANDS)

LARES 2x420 MWe (PORTUGAL)

MONTOIR 400 MWe (FRANCE)

SAMSUN 2X433 MWe (TURKEY)

EMPRESARIOS AGRUPADOS

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Thank you for your attention