



On-going Research & Outlook in the Spanish Context

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- 1. What is CEIDEN?
- 2. How does it work?
- 3. Technical Program
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WHAT IS CEIDEN?



What is it?

CEIDEN is a Spanish organization established for the **coordination** of the efforts and needs of Nuclear Fission Energy R&D

What does it do?

Definition and development of joint projects, and presentation of a common position for national and international commitments and proposals in the Nuclear Fission R&D field

Who is in?

CEIDEN gathers all actors/entities involved in the R&D of Nuclear Fission in Spain

WHO IS IN?



Miembros del CEIDEN

Empresas Electricas

- Endesa
- Iberdrola Generación SAU

· Gas Natural Fenosa

Empresas de Ingeniería y Construcción

- Acciona Ingieneria
- Analisis-dsc
- Arraela, S.L.
- · Coapsa Control St.
- Empresarios Agrupados
- Iberdrola Ingenieria y construcción
- Ingeciber S.A.
- Intecsa.Inarsa
- · Sener Ingenieria y Sistemas S.A.
- Técnicas y Servicios de Ingenieria S.L.
- · Westinghouse Electric Spain

Empresas de Servicios

- Advanced Material Simulation S.L.
- CIC Consulting Informático
- Construcciones Técnicas de Radioterapia
- Enwesa
- Indizen Technologies S.L.
- Medidas Ambientales S.
- · Nortuen
- · Proton Laser Applications, S.L.
- Suministros y Planificación Industriales
- Thunder España Simulación S.L.U.
- Instituciones de I+D

 Centro de Estudios e Investigaciones Tecnicas de Guipuzkoa (CEIT)

Investigación Metalúrgica del Noroestel · Fundació CTM Centre Tecnològic

Instituto Catalán de Investigación Quimica

- Centro para el Desarrollo Tecnologico Industrial.
 Centro Tecnológico AIMEN (Asociación de (CDTI)
- Ciernat.

Aimplas

- Fundación Centro Tecnologico de Componentes Imdea
- Innobe AIE Centro Tecnologico
- Instituto de ciencias de la construcción Eduardo ... Inte Torroja
- Titania Servicios Tecnológicos S.L.

- AMPHOS21
- Aguageo
- ASTECO Ingenieria y Arquitectura
- CT3 Ingenieria
- Gas Natural Fenosa Engineering
- Inesco Ingenieros S.L.

· Chemtrol Provectos y Sistemas

Desarrollo y Aplicación de Sistemas (DAS)

Geotecnia y cimientos S.A. (geocisa)

Cometec

· Nucleonova

Tecnalia

SOLINTEL M&P.S. E

TECNATOMSA

- Ingenieria IDOM internacional S.A.

Empresas de bienes de equipo

- Equipos Nucleares S.A (ENSA)
- Leading Enterprises Group
- Obeki Electric Machines
- · Vector & Wellheads Engineering SL

Ciclo del combustible

- · Enresa Soluciones Ambientales

Universidades

- · E.T.S.I. de Caminos, Canales y Puertos de la
- Universidad Politécnica de Madrid
- SEA Ingenies in Aprilisis de Blindajes SL.
 SynerPlus More than 10 Orange Black Madrid bers

 - Classifie Coviedo les Mento de la Liniversidad de Murcia Dise Cetto les
 - · Universidad Politecnica de Madrid
- Universitat Politécnica de Valência:

Ingenieria y Diseño Europeo, S.A. (Idesa)

Tecnologías Asociadas Tecnasa S.L.

Enusa Industrias Avanzadas S.A.

Universidad Autonoma de Madrid

Universidad Autónoma de Madrid / CIEMAT

(Lainsa)

Logistica y acondicionamiento industriales S.A.

- · Westinghouse Electric Company

Instituciones de I+D

CEIDEN

than 20 collaborators outside Spain

GE Hitachi

LANENT

NUCLEAR Y SALVAGUARDIAS, MÉXICO

- FAEPAC
- Otras Entidades

RADIOPROTECCIÓN URUGUAY

Wonuc España

Otras Entidades

- Asociación Española de la industria Eléctrica: (UNESA)
- Consejo de Seguridad Nuclear
- SOCIEDAD ESPAÑOLA DE PROTECCIÓN RADIOLÓGICA
- Cluster de la Energia de Extremadura
- Cluster de la Energia del País Vasco Foro de la Industria Nuclear Española
- Sociedad Nuclear Española (SNE)











HOW DOES IT WORK?

Chairman: Javier Dies (CSN)/General Secretary: Pablo T. León (ENDESA)

	(======================================	
Executive Committee		
Subsector	Members	
Utilities	3	
Fuel cycle companies	2	
Engineering and construction companies	1	
Equipment manufacturers	1	
Service companies	1	
Small and medium-sized companies	1	
R&D institutions	2	
Universities	3	
Regulatory Body (CSN)	2	
Competent Ministry on R&D	1	
Competent Ministry on Energy	1	
General Assembly		
All members and interested parties		





NON-LEGAL ENTITY / NO BUDGET / IN-KIND CONTRIBUTIONS

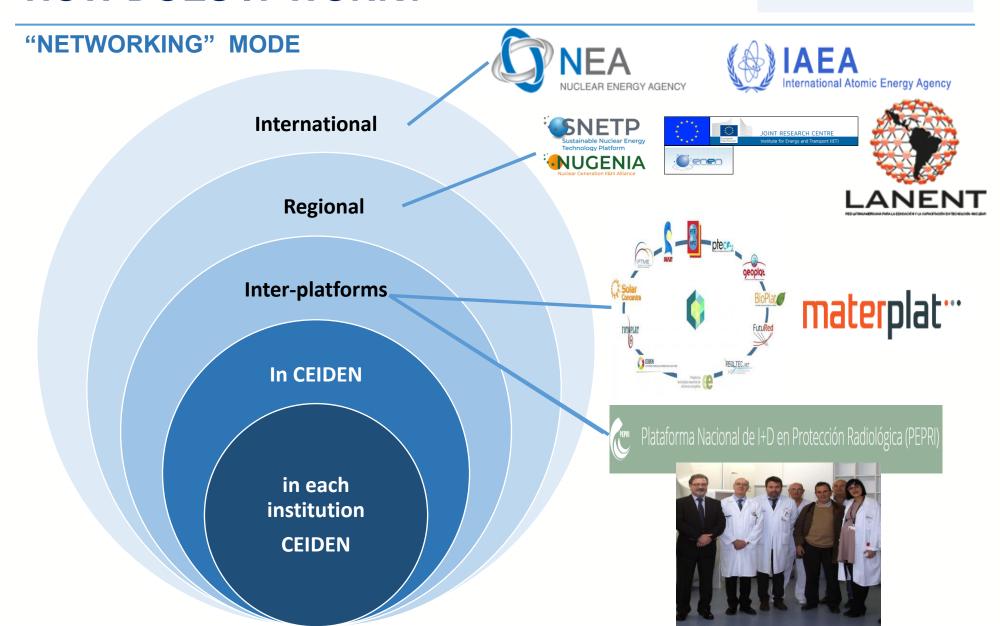
- CEIDEN working groups
- CEIDEN projects
- CEIDEN supported projects





HOW DOES IT WORK?





STRATEGIC AGENDA



Based on:

Technical challenges

Articulated through:

PTI: Priority Technology Initiatives

PTI: Accident Tolerant Fuel (ATF)





TC3: New
Technologies and
New Projects

TC1: Safe Long Term
Operation





PTI: Safe Long Term
Operation (big data,
flexible operation)

Technological Challenges (TCs)

PTI



PTI: Centralized
Storage Facility
(ATC)

TC2: Spent Fuel and Waste Management



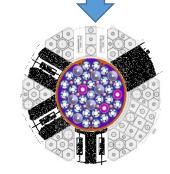


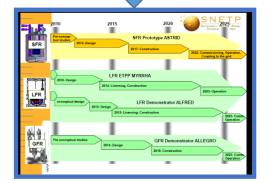
TECHNICAL PROGRAM

Tech Challeng	PROGRAM / PROJECT	
TC1	Material studies from Zorita NPP: 1) Reactors Internals 2) Irradiated Concrete	
	Gap analysis on mechanisms of material degradation	
	New Materials Working Group	
TC2	Storage and transport of spent fuel program	
	Accident Tolerant Fuel (ATF)	
TC3		
	Spanish group participating in Jules Horowitz Reactor Pro, (JHR) Project	
	Coor nation of participation of Spain in the European ESNII in. tive (Gen IV)	







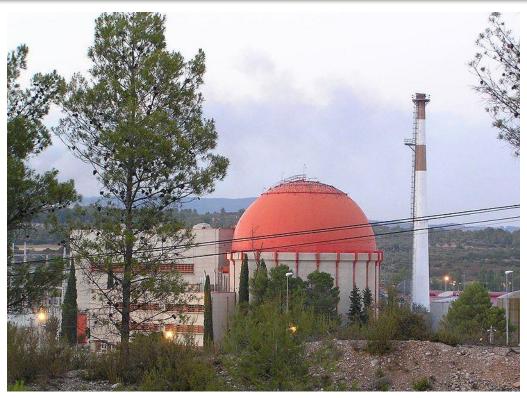






TC1: ZIRP Project (Zorita Internals Research Project)

Objective: Characterize the effects of neutron irradiation on the mechanical and microscopic properties of stainless steel materials irradiated under service conditions to increase the understanding of fluence effects at end of service life (40, 60 years and beyond)



Jose Cabrera NPP "Zorita" Westinghouse design 1968 – 2006 (~26 EFPY)

Participants

- EPRI
- U.S. NRC
- CSN (Spanish regulator)
- SSM (Swedish regulator)
- Tractebel
- AXPO
- Additional in-kind contribution from Japanese utilities/MHI



TC1: ZIRP Project (Zorita Internals Research Project)

- All testing of Zorita baffle plate material completed.
- The results contributed to the development of aging management strategies.

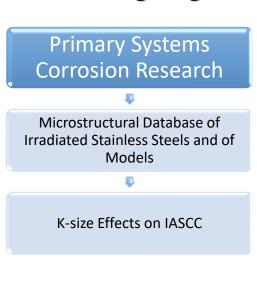
Property	Dose (dpa)	Summary
Tensile Testing	10, 30, 50	50 dpa specimen at RT showed very low elongation; other specimens behaved as expected
IASCC Crack Initiation	40 to 49	Failures were observed above 60% of the irradiated yield stress
IASCC Crack Growth Rate	10, 30, 50	Very low CGRs with 50 dpa showing lower CGR than 30 dpa specimen
Fracture Toughness	10, 30, 50	Overall, the specimens showed low fracture toughness properties.
Microstructural Testing	32 to 47	Very low levels of void swelling; measured as 0.03 to 0.05%



TC1: ZIRP Project (Zorita Internals Research Project)

EPRI Testing Programs using Zorita Materials

Materials Reliability Program **Zorita Internals Research Program** (ZIRP) Zorita Weld Testing Program Crack Growth Rate Tests in Halden under PWR Conditions Thermal Aging Analysis of Stainless Steel Welds Qualification of KOH for pH Control







- Spanish entities involved in the ZIRP project:
 - Gas Natural Fenosa/Socoin
 - TECNATOM
 - ENUSA
 - ENRESA
 - ETSA



TC2: Irradiated Concrete

- Administrative difficulties have delayed the project launch for years now.
- Several national organizations involved: CSN, ENRESA, ENDESA, GNF, IBERDROLA, IET
- Major technical areas to be addressed:
 - Effects of fluence and temperature on the biological shielding.
 - Transfer channel characterization (boric acid attack).
 - In-containment concrete characterization.
 - Containment liner corrosion.

• Progress made:

- Samples taken at different locations (containment; BSh).
- Preliminary analysis of non-irradiated concrete done (ICP; XRF; DRX).
- Further work programme outlined, but not conducted yet.







TECHNICAL PROGRAMME: CROSS-CUTTING TOPICS











- Sociotechnical studies group
- > Spanish nuclear sector capabilities studies
- > Spanish nuclear R&D investment analysis: 50-55 M€/y
- Research laboratories and R&D infrastructures group
- > Small and Medium Sized Companies Group
- Follow-up and coordination of Spanish participation in main

 International programs and networks: H2020 / SNE-TP / NUGENIA
- CAMP-España Code Application and Maintenance Program







- > Robust networking with other national entities deeply rooted in nuclear fission
- > Strengthen links to other related national technological platforms

CEIDEN is now the reference for Nuclear R&D in Spain

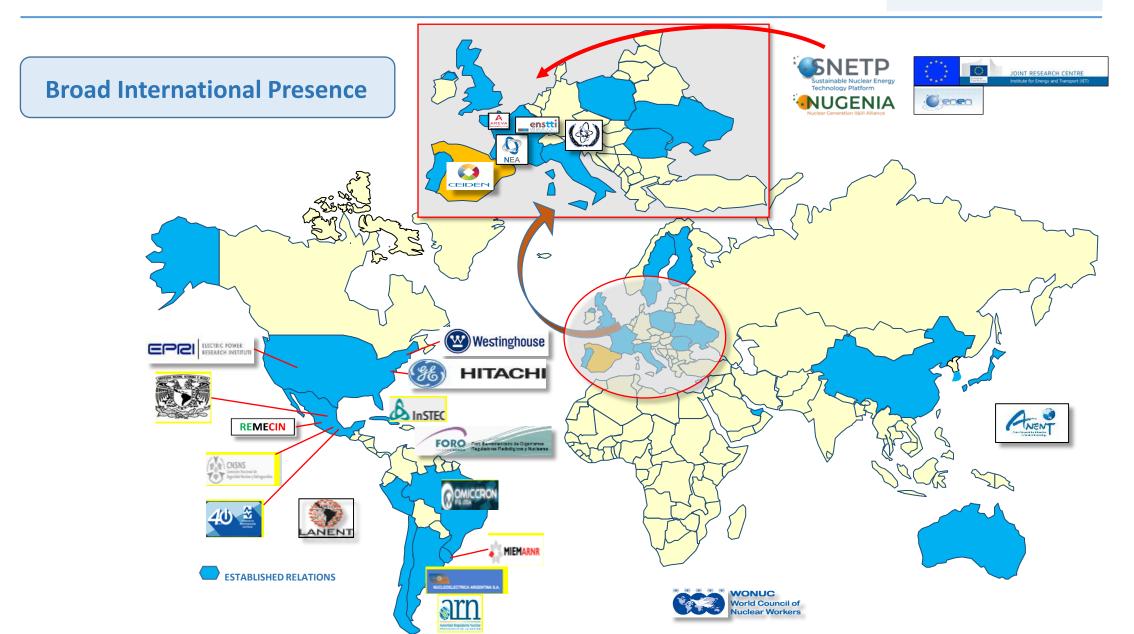












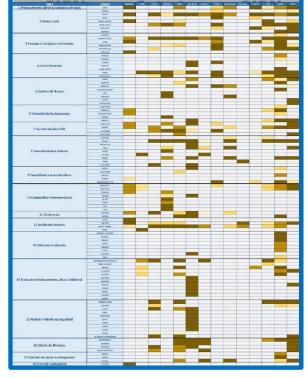
Spanish Nuclear Fission Technology Platforn

- > Technical publications
- > Enhanced presence in media
- Workshops & dissemination of CEIDEN activities









Results of the Spanish Nuclear Sector in the "Analysis of the Potential Development of Energy Technologies in Spain"

R. Velasco & P.T. León

On June 30, 2011, driven by the Minister of Science and Technology Cristina Garmendia, the ALINNE Alliance (Alliance for Energy Research and In-novation) was established. ALINNE is a non-profit initiative created to unite and coordinate efforts amone all actors in the value chain of R & D in energy, allowing to respond to the main policy challenges that the R&D have in the field of the energy sector, con-tributing to the definition of a work patterns nationwide and European positioning. The founder members of ALINNE are composed of eleven representatives of the private sector who are the presidents of the nine Spanish companies with active participation in the field of R&D and leading the IBEX 35 at the time, two SMEs, and nine representatives of the public sec-tor. The CIEMAT currently holds the secretariat of the Alliance.

In the field of ALINNE it was ysis of the Potential Development of Energy Technologies in Spain". This is a comparative analysis to assess abilities, potential, development, positiondifferent energy technologies. In the study were involved 13 technology platforms in the field of energy:

- Platform for Energy Efficiency.
 Spanish CO, Technology Platform.
- Platform for Hydrogen and Fuel
- Cells.
 BIOPLAT Platform (Biomass).
- GEOPLAT Platform (Geothermal).
 Natural Gas Platform for Mobility Nuclear Fission Energy technologi-
- cal platform, CEIDEN.

 REOLTEC Platform (Wind).
- Marine Platform FUTURED Platform (Intelligent Networks)
- Fotoplat Platform (Photovoltaic). - ASIT Platform (Solar Thermal Low Temperature).

With the main objective of employedge society, this exercise aims to identify the energy technologies that are strong themselves for its clear ex-pectations of market and their alignment with the European energy policy, technologies in which Spain is strong or it can be and technologie that can have a better impact in reance of payments and the external dependence, and that have a greater tractor effect for the industrial tech-

nological development The representation in this exercise of the Spanish nuclear sector has been carried out through the Fission Nuclear Energy technological platform, CEIDEN, which has actively participated in all the phases of the process involving all the actors in the Spanish

The aim of this article is to present the results in the exercise of the Spanish nuclear sector.

AND OBJECTIVES

ergy Club, made before the effective launch of the exercise, the general criteria for carrying out the analysi velopment of energy technologies in Spain were defined. These criteria are based on the use of quantitative and qualitative indicators

In the ALINNE workshop of March 5, 2014, held in CIEMAT, the EXCEL tool to use for technology platforms was introduced for those interested in participating in this study, and it defines the criteria grouped into !

and Innovation.

Economy and Employment. Capabilities in Science, Technology

Technological Status Concentra Solar Platform (Solar 4. Infrastructure Capabilities of R&D for homologation and certification.





NUCLEAR ESRAÑA September 2015



> Strengthening Education & Training, and Knowledge Management (KEEP Group)

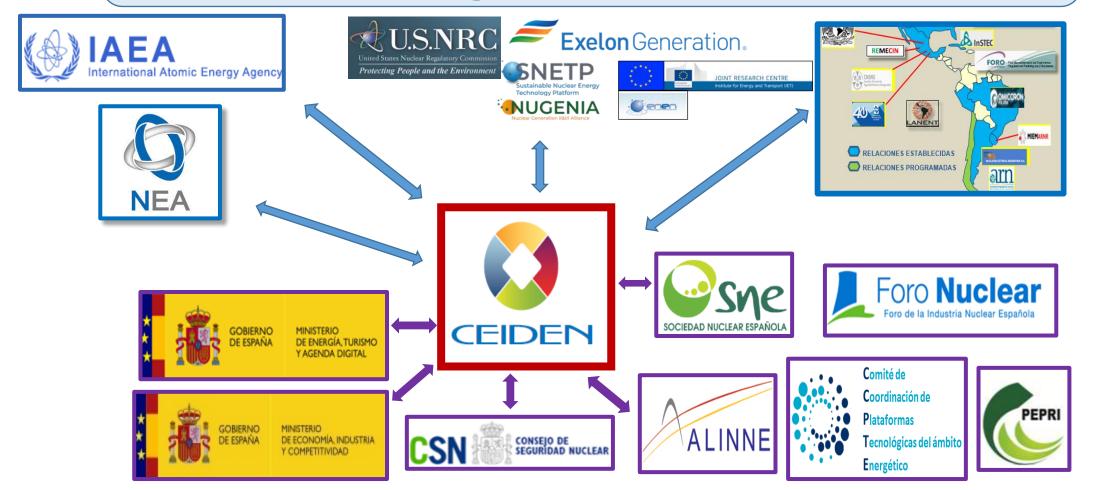






CEIDEN Platform

A national model for R&D in the nuclear field with strong international links





SUMMARY & FINAL REMARKS

- ➤ The CEIDEN technology platform is an entity coordinating the needs and efforts of R&D in the field of nuclear fission technology, nationwide.
- ➤ More tan **100** public and private entities participate in CEIDEN, which represents the majority of the players in this field in Spain. In addition, there are more than **20** international collaborators
- CEIDEN has established cooperation bonds with South American entities, specially in the E&T and KM fields.
- > CEIDEN develops a variety of lines of specific work. The majority of CEIDEN programs have relationships with equivalent international programs, being highly valued in this environment.
- ➤ CEIDEN contributes to the **national** and **international education and training**, and **knowledge management** development through KEEP+ permanent group



SUMMARY & FINAL REMARKS

- ➤ The main strengths of CEIDEN are its 'networking' operation model and non-profit contribution by all its members.
- ➤ The total amount devoted to nuclear R&D in Spain in the last years is stable (around 50-55 M€). The main contribution comes from own resources of the entities of the sector.
- ➤ CEIDEN objective is to transmit to the Administration and to the Spanish companies the idea that the promotion of R&D supports nuclear Spanish industrial exports, and the safe operation of short, medium and long term of our nuclear power plants

Thank you very much



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