CEIDEN
Spanish Nuclear Fission Technology Platform

SPANISH NUCLEAR FISSION TECHNOLOGY PLATFORM

CEIDEN

CONTENTS

CEIDEN
Spanish Nuclear Fission Technology Platform

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?

CEIDEN
Spanish Nuclear Fission Technology Platform

Miembros del CEIDEN

Empresas Electricas

- Endesa
- Iberdrola Generación SAU
- Gas Natural Fenosa

Empresas de Ingeniería y Construcción

- Acciona Ingeniería
- Analisis-dsc
- Arraela, S.L.
- Coapsa Control SL
- Empresarios Agrupados
- Iberdrola Ingeniería y construcción
- Ingeciber S.A.
- Intecsa Inarsa
- Sener Ingeniería y Sistemas S.A.
- Técnicas y Servicios de Ingeniería S.L.
- Westinghouse Electric Spain
- AMPHOS21
- Aquageo
- ASTECO Ingeniería y Arquitectura
- CT3 Ingeniería
- Gas Natural Fenosa Engineering
- Inesco Ingenieros S.L.
- Ingeniería IDOM internacional S.A.
- SEA Ingeniería y Análisis de Blindajes S.L.
- SynerPlus
- Tecnicas Re...

Empresas de Servicios

- Advanced Material Simulation S.L.
- CIC Consulting Informático
- Construcciones Técnicas de Radioterapia
- Enwesa
- Indizen Technologies S.L.
- Innoban Red de Inversores Angel para la Innovación
- Medidas A...
- Nortuen
- Proton Laser Applications, S.L.
- Suministros y Planificación Industriales
- Thunder España Simulación S.L.U.
- Chemtrol P...
- Cometec
- Desarrollo y Aplicación de Sistemas (DAS)
- Geotecnia y cimientos S.A (geocisa)
- Indra
- Instalaciones Inabensa S.A.
- IPM-Project
- ...
- SOLINTEL M&P S.L.
- TECNATOM S.A.

Instituciones de I+D

- Aimplas
- Centro para el Desarrollo Tecnologico Industrial (CDTI)
- Ciemat
- Fundación Centro Tecnologico de Componentes
- Innobe AIE Centro Tecnologico
- Instituto de ciencias de la construcción Eduardo Torroja
- Titania Servicios Tecnológicos S.L.
- Centro de Estudios e Investigaciones Tecnicas de Guipuzkoa (CEIT)
- Centro Tecnológico AIMEN (Asociación de Investigación Metalúrgica del Noroeste)
- Fundació CTM Centre Tecnològic
- Imdea
- Instituto Catalán de Investigación Química
- Inte
- Tecnalia

Empresas de bienes de equipo

- Equipos Nucleares S.A (ENSA)
- Leading Enterprises Group
- Obeki Electric Machines
- Vector & Wellheads Engineering SL
- Ingeniería y Diseño Europeo, S.A. (Ideasa)
- Logística y acondicionarniento industriales S.A (Lainsa)
- Tecnologías Asociadas Tecnasa S.L.

Ciclo del combustible

- Enresa Soluciones Ambientales
- Enusa Industrias Avanzadas S.A.

Universidades

- E.T.S.I. de Caminos, Canales y Puertos de la Universidad Politécnica de Madrid
- Universidad Carlos III
- Universidad de Oviedo. Departamento de Física Aplicada
- ...Universidad Politecnica de Madrid
- Universidad Autonoma de Madrid
- Universidad Autónoma de Madrid / CIEMAT
- Universidad Complutense de Madrid. Departamento de Estudios Avanzados
- Universidad de Zaragoza
- Universidad del País Vas...
- Universitat Politècnica de València

Organismos Institucionales

- Ministerio de Economía y Competitividad
- Ministerio de Industria, Energía y Turismo

Otras Entidades

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

More than 100 members classified in 11 subsectors

+

More than 20 collaborators outside Spain

Empresas de bienes de equipo

- GE Hitachi

Instituciones de I+D

- IBEMECIN

Organismos Institucionales

- ...RADIOPROTECCION URUGUAY
- FAEPAC
- ...NUCLEAR Y SALVAGUARDIAS, MÉXICO
- LAHENT

Otras Entidades

- Wonuc España

HOW DOES IT WORK?

CEIDEN
Spanish Nuclear Fission Technology Platform

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	

HOW DOES IT WORK?

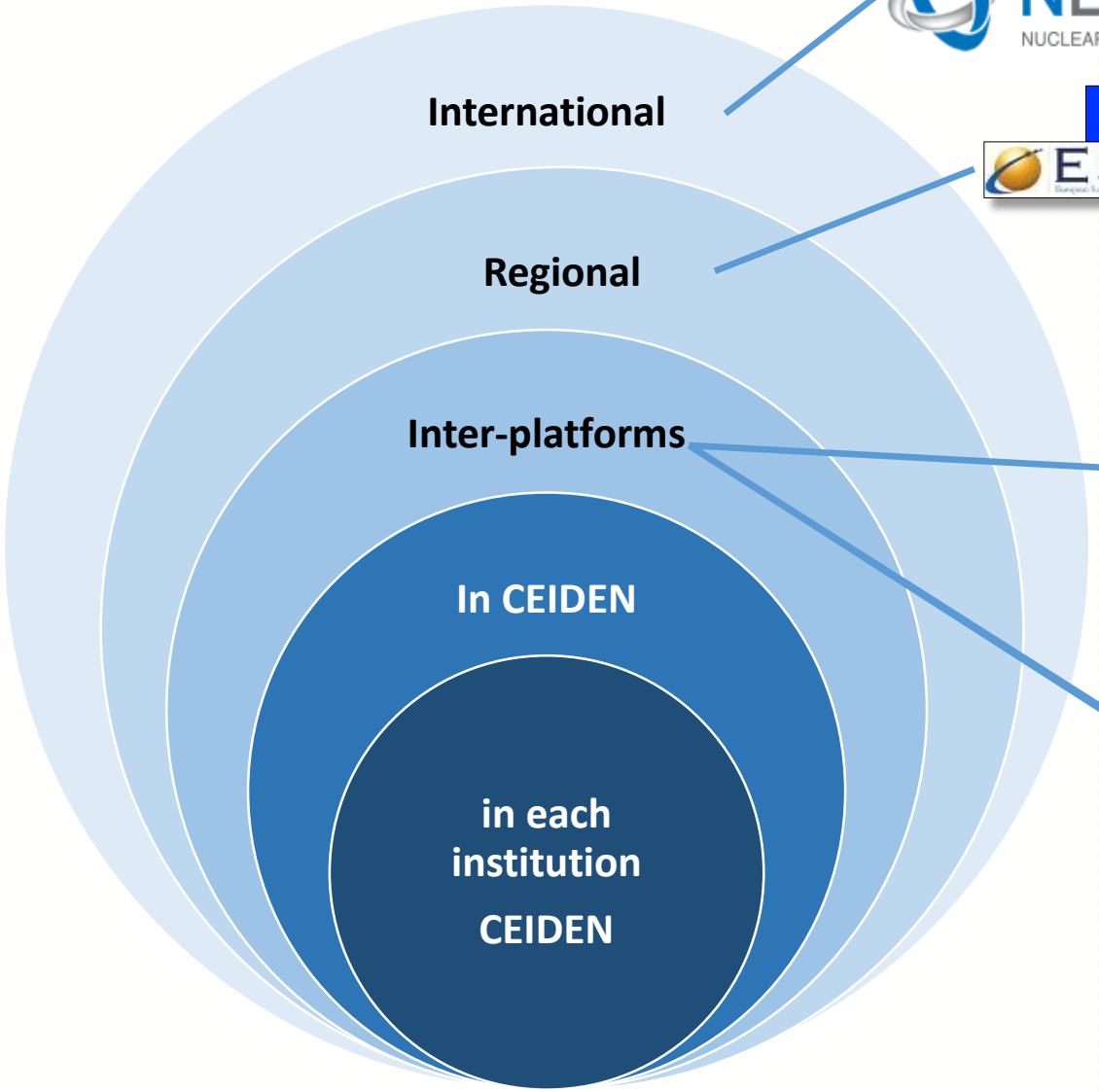
CEIDEN
Spanish Nuclear Fission Technology Platform

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

- CEIDEN working groups
- CEIDEN projects
- CEIDEN supported projects

HOW DOES IT WORK?

"NETWORKING" MODE



NEA NUCLEAR ENERGY AGENCY

IAEA International Atomic Energy Agency

JOINT RESEARCH CENTRE Institute for Energy and Transport (IET)

ESNII SNETP NUGENIA enen

LANENT

materplat

Plataforma Nacional de I+D en Protección Radiológica (PEPRI)

STRATEGIC AGENDA

CEIDEN
Spanish Nuclear Fission Technology Platform

ITP: Priority Technology Initiatives

Strategic Plan defined and approved, with clear objectives

RT1: Safe Long Term Operation

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

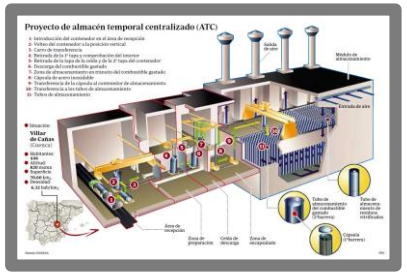
ITP: Accident Tolerant Fuel

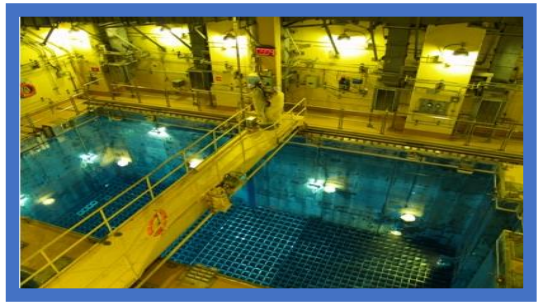
RT3: New Technologies and New Projects

Technological Challenges (RT)

ITP

ITP: Centralized Storage Facility (ATC)

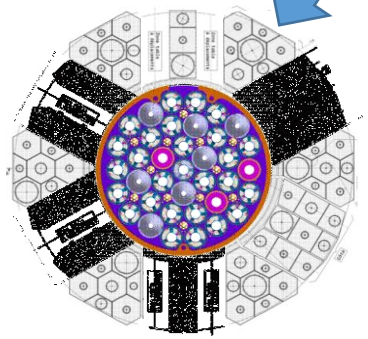


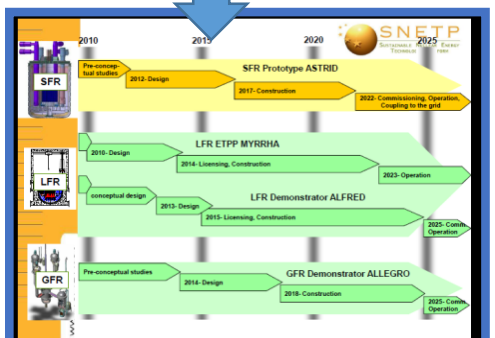


RT2: Spent Fuel and Waste Management

TECHNICAL PROGRAM

Tech Challeng	PROGRAM / PROJECT
RT1	Material studies from Zorita NPP: 1) Reactors Internals 2) Irradiated Concrete
	Gap analysis on mechanisms of material degradation
	New Materials Working Group
RT2	Storage and transport of spent fuel program
	Accident Tolerant Fuel (ATF)
RT3	Spanish group participating in Jules Horowitz Reactor Project (JHR) Project
	Coordination of participation of Spain in the European ESNII initiative (Gen IV)





CROSS-CUTTING TOPICS

- **KEEP+ group: Education, Training & Knowledge Management**
- **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**

RESULTS 2014-2018

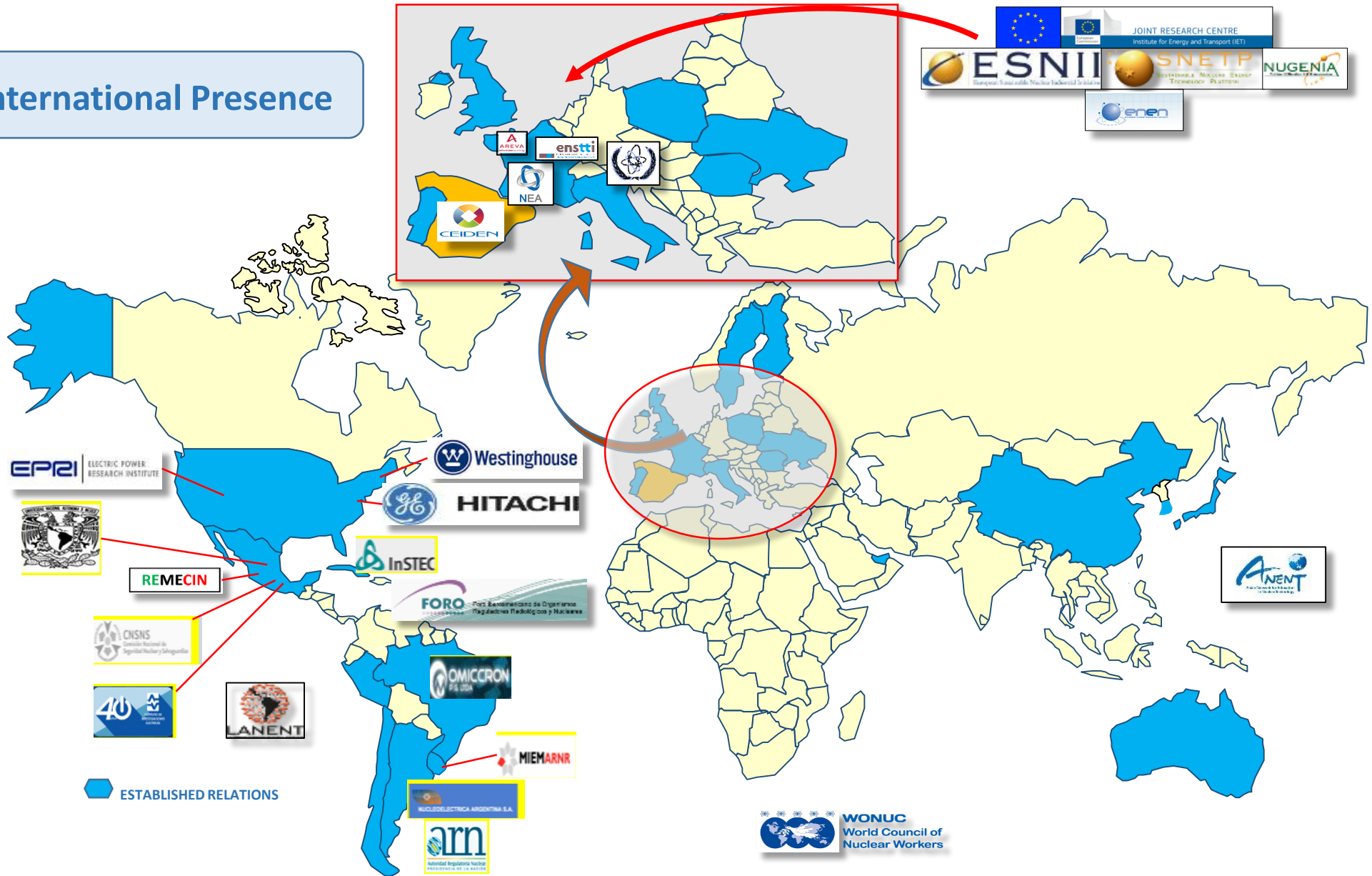
- More institutional relations and cooperation
- More visibility

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

RESULTS 2014-2018

CEIDEN
Spanish Nuclear Fission Technology Platform

Strong International Presence



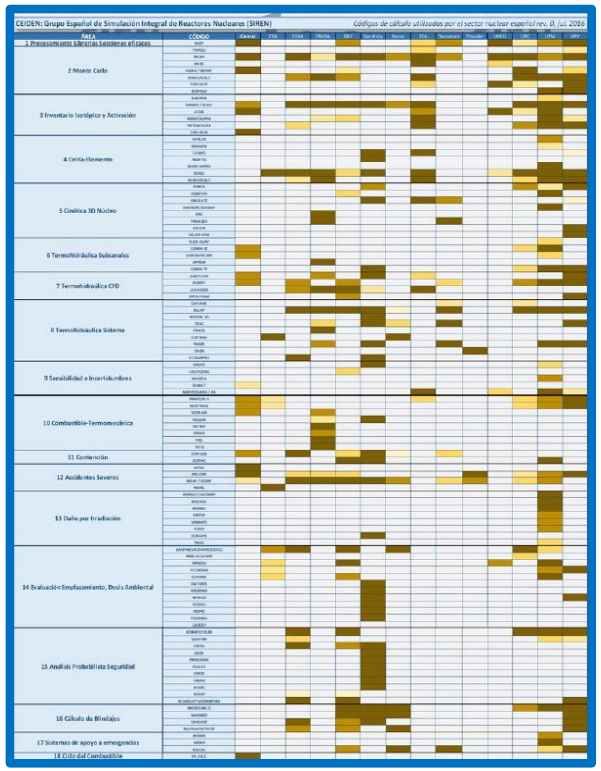
RESULTS 2014-2018

CEIDEN
Spanish Nuclear Fission Technology Platform

Strong South America Presence

RESULTS 2014-2018

- More publications
- More presence in media
- More workshops & dissemination of information




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

R. Velasco & P.T. León

INTRODUCTION

On June 30, 2011, driven by the Minister of Science and Technology Cristina Garmendia, the ALINNE Alliance (Alliance for Energy Research and Innovation) was established. ALINNE is a non-profit initiative created to unite and coordinate efforts among 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, contributing 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 sector. The CIEMAT currently holds the secretariat of the Alliance.

In the field of ALINNE it was launched on March 2014 the "Analysis of the Potential Development of Energy Technologies in Spain". This is a comparative analysis to assess abilities, potential, development, positioning and technological coherence of the different energy technologies. In the study were involved 13 technology platforms in the field of energy:

- Platform for Energy Efficiency.
- Spanish CO_2 Technology Platform.
- Platform for Hydrogen and Fuel Cells.
- BIOPLAT Platform (Biomass).
- GEOPLAT Platform (Geothermal).
- Natural Gas Platform for Mobility
- Nuclear Fission Energy technological platform, CEIDEN.
- REOLTEC Platform (Wind).
- Marine Platform.
- FUTURED Platform (Intelligent Networks).
- Fotoplat Platform (Photovoltaic).
- ASIT Platform (Solar Thermal Low Temperature).
- Concentra Solar Platform (Solar concentration).

With the main objective of employment, industry and to built a knowledge society, this exercise aims to identify the energy technologies that are strong themselves for its clear expectations of market and their alignment with the European energy policy, technologies in which Spain is strong or it can be and technologies that can have a better impact in reducing emissions, improve the balance of payments and the external dependance, and that have a greater tractor effect for the industrial technological 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 nuclear sector.

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

METHODOLOGICAL ASPECTS, CRITERIA AND OBJECTIVES

In the ALINNE workshop of September 25, 2013, in the Spanish Energy Club, made before the effective launch of the exercise, the general criteria for carrying out the analysis of the potential of technological development 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 5 categories:

1. Economy and Employment.
2. Capabilities in Science, Technology and Innovation.
3. Technological Status.
4. Infrastructure Capabilities of R&D for homologation and certification.

ROSARIO VELASCO
Presidenta del CEIDEN.
Vicepresidenta del CSN.

PABLO T. LEÓN
Secretario del CEIDEN.
Director de Tecnología y Desarrollo Nuclear de Endesa.

RESULTS 2014-2018

CEIDEN
Spanish Nuclear Fission Technology Platform

➢ Storg effort in Education & Training, and Knowledge Management (KEEP Group)

TECHNOLOGICAL PLATFORM OF NUCLEAR FISSION ENERGY

CEIDEN

The technology platform CEIDEN is a Spanish institution established to coordinate the needs and efforts of R&D and innovation in the field of nuclear fission technology.

One of the CEIDEN programs is the CEIDEN F+ work group. The objectives of this group are to promote the coordination of Education and Training (E&T) programs at the national and support the Spanish participation in international programs and networks (EU EUROSAFE, IAEA, Foratom, Latin America, among others).
Main activities of the CIEDEN are:

- Promote the coordination of national nuclear energy E&T programs, both to discern strengths and weaknesses assessing if they meets the current and future needs and to facilitate exports abroad.
- Assist the launch of advanced R&D and Innovation projects in E&T to enhance the nuclear capabilities nationwide available in nuclear sector.
- Support and Coordinate the Spanish participation in international E&T programs (UE, EUROSAFE, Foratom, Latin America) by creating and participating in national and international networks and organizations.
- Boost the accreditation of on-the-job training.
- Update the Nuclear Masters Catalog and the Nuclear Training Capability Catalog derived from the activities of the CEIDEN F+.

MASTERS INVENTORY

- Master's Degree in Nuclear Science and Technology. UPM
- Master's Degree in Energy Technologies for Sustainable Development. UPV
- Master's Degree in Sustainable Energy Engineering. UP País Vasco
- Master's Degree in Nuclear Technology and Instrumentation. U Huelva
- Master's Degree in Industrial and Environmental Safety. UP Valencia
- Master's Degree in Energy Engineering, Nuclear energy. UPC
- Master's Degree in Energy Engineering, Nuclear energy. UPM
- European Master of Science in Nuclear Fusion And Engineering Physics. U. Gent, Carlos III, UPC y UPM
- Master's Degree in Radiological Protection in Radioactive and Nuclear Facilities. UPV
- Master Course in Nuclear Engineering and Applications. UAM y CIEMAT
- Master Course on Electricity Generating Technologies. ETSIIM y Tecnatom

TRAINING CAPABILITIES

NPP OPERATION

- Licensed Operator Training
- Non-Licensed Operator Training
- Training In Maintenance
- Engineering
- Chemistry
- Radiological Protection
- Nuclear Safety and Licensing
- Nuclear Materials

NUCLEAR FUEL CYCLE

- Mining and Extraction of Uranium Concentrates
- Management and Supply of Enriched Uranium
- Nuclear Cycle Management
- Fuel Manufacturing
- Refueling Engineering
- Fuel Engineering
- Isotopic Inventory Calculation, Neutronic, Montecarlo
- Fuel Operation Support
- Radiological Protection
- Radiochemistry
- Handling of Fresh and Spent Nuclear Fuel
- On-Site Fuel Inspection
- Onsite Fuel Repair

RADIOACTIVE WASTE MANAGEMENT

- Decommissioning
- Engineering
- Radiological Protection
- Operation and Maintenance of waste storage facilities
- Decommissioning of Uranium mines and Uranium Production facilities
- Spent Fuel Isotopic Characterization
- Radioactive Waste Management
- Radioactive Waste Characterization

DESIGN, ENGINEERING, CONSTRUCTION, ASSEMBLING, LICENSING AND START-UP OF NUCLEAR FACILITIES

- New Reactors
- Nuclear Safety and Licensing
- Probabilistic Safety Analysis
- Engineering
- New Nuclear Power Plant Projects
- Analysis of Severe Accidents

PROMOTION OF NUCLEAR ENERGY AND SAFETY

- Dissemination of the Nuclear Energy and Technologies.
- Radiological Protection
- Nuclear safety

COMMON AREAS

NUCLEAR SAFETY MANAGEMENT

- Nuclear Safety and Licensing
- Risk Prevention
- Safety Culture
- Human Factors Engineering
- Leadership Development
- Total Quality Management
- Operating Experience Analysis Methodologies
- Failure Analysis
- Innovation strategies

RADIOLOGICAL PROTECTION AND DOSIMETRY

- Radiological Protection
- Dosimetry
- Hot Cells
- Radiation Shielding

FUEL

- Logistic and Transport of Nuclear Materials.
- Criticality
- Thermomechanics of the Fuel Assembly
- Neutronic
- Monte Carlo Simulation Methods
- Photon and Neutron detection systems

TRAINING

- Knowledge Management
- Instructors Certification
- Training Methodology
- On-the-Job Training

MATERIALS & INSPECTION AND TESTING METHODS

- Inspection and Testing Methods
- Materials, Analysis, and Applications
- Corrosion
- Calibration
- Welding Process
- Inspection of Welded constructions

OTHER KNOWLEDGE AREAS

- Environmental Impact Assessment
- Waste Water Treatment
- Energy efficiency management

TOOLS AND METHODS

Simulation, facilities for specific practices and human performance simulators are key technologies in training and engineering to facilitate the essential role of developing understanding and safe operation of the plant. In conjunction with these, nuclear training uses e-learning stations and computer codes to ensure the necessary competences in the different plant positions.

Tools and methods focused on training of the Spanish nuclear industry are the following:

Full Scope Control Room Simulator

- Full scope simulators available for training purpose:
  - General Electric BWR design
  - Westinghouse PWR design
  - Siemens-KWU PWR design
- Main Control Room Simulator development or turn-key projects

Interactive Graphics Simulator (IGS)

- Training (Operation and Engineering)
- Technologies: BWR, PWR, Gen 3+

Human Factors Simulator (Field Simulator)

- Hydraulic loop and the corresponding control room with 11 training stations
- Single-pass gate to vital areas

Computer-based Training (CBT) and e-learning stations

Facilities for Specific Practices

- Fuel factories
- Transportation and storage of radioactive material

Use of Computer Codes

- FRAPCOPN, FRAPTRAN, MELCOROASTEC, RODOS
- MAPA, Microshield, MCNP
- Radiation shielding analysis
- Nuclear fuel performance and design
- Core design

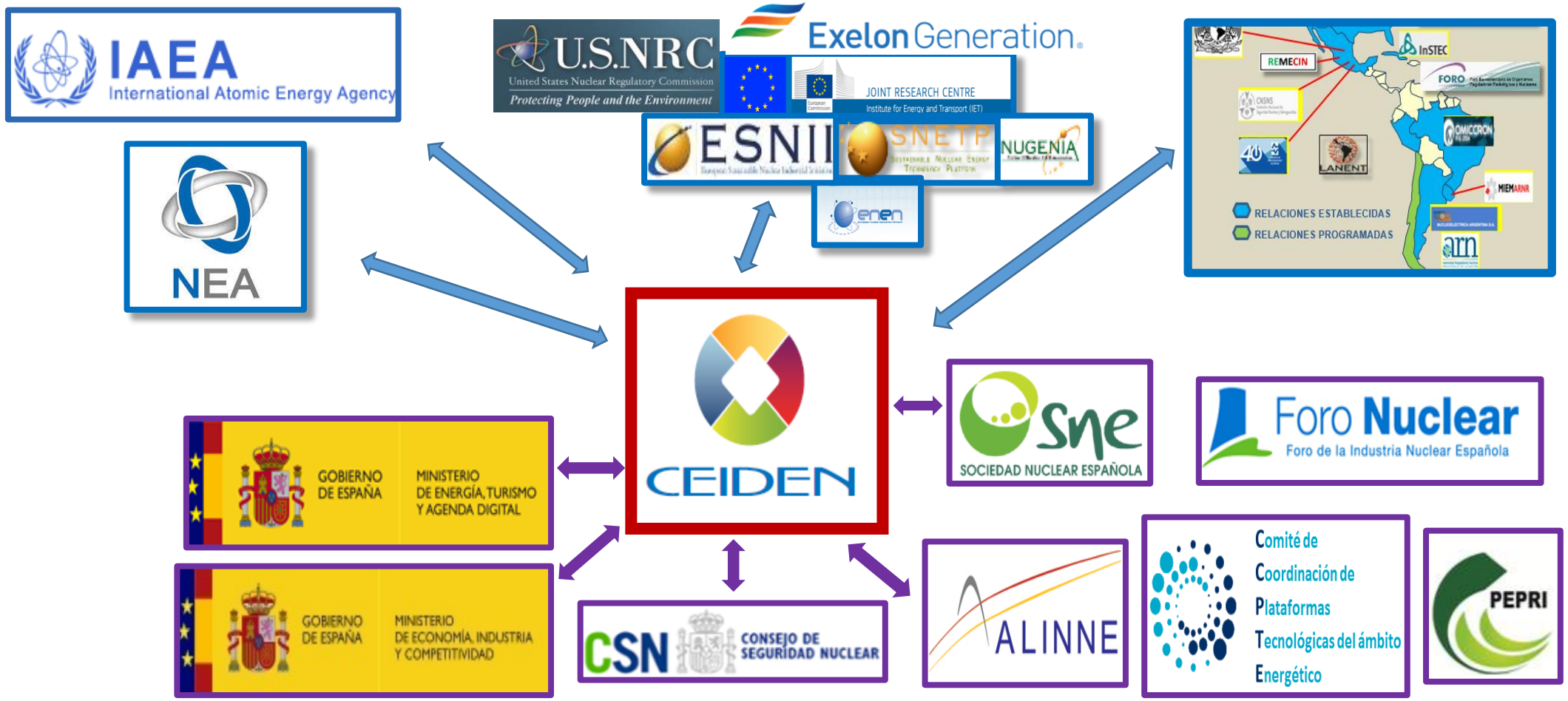
For more information please visit the CEIDEN website
http://www.ceiden.com/

CEIDEN

RESULTS 2014-2018

CEIDEN
Spanish Nuclear Fission Technology Platform

Conclusion: The CEIDEN Platform has become a model in R&D and technological development within the national and international nuclear field



CHALLENGES

- Become more known and useful for CEIDEN members
- Achieve more coordination and communication within every CEIDEN subsector
- Achieve more integration of small and medium sized companies in CEIDEN
- Increase CEIDEN leadership in EU Projects
- Achieve more spreading of CEIDEN activities outside the nuclear field
- Obtain financial resources for events organization and communication activities

CONCLUSIONS

- 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 ties 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
- The main strengths of CEIDEN are its **'networking' operation model** and **non-profit contribution** by all its members.

CONCLUSIONS

CEIDEN
Spanish Nuclear Fission Technology Platform

- 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

Chairman:
Javier Dies Javier.Dies@csn.es
+34.91.346.03.35
General Secretary:
Pablo T. León pabloteofilo.leon@enel.com
+34.91.213.40.26

Visit our website: www.ceiden.com

Follow us on Twitter

info@ceiden.com