Poland ,2025-05-15 FISA, RADWASTE, ENEN, SNTP

Javier Dies

-Commissioner Nuclear Safety Council (CSN)
-Chairman Spanish Nuclear Energy Technological Platform R&D CEIDEN
-Professor Chair in Nuclear Engineering*

***currently on special leave**

This presentation is based on my 40 years of professional experience:

- Commissioner at the Spanish Nuclear Safety Council (CSN) 2015-2028
- Chairman Spanish Nuclear Energy Technological Platform CEIDEN 2019-
- Professor Chair in Nuclear Engineering at UPC-Barcelona Tech Spain, for 30 years.
- Vice President of European Nuclear Education Network ENEN, 2013-2016.
- Has published more than 240 papers on nuclear Engineering.
- Has managed 15 PhD in Nuclear Engineering.
- Author of Multimedia on Nuclear Reactor Physics with about 800 pages, translated to 6 languages and distributed through IAEA to more than 134 countries.
- Has participated in 13 missions (Argentina, Austria, China, Ghana, Malaysia, Saudi Arabia, South Africa, Tailandia, USA, Vietnam) of the International Atomic Energy Agency (IAEA).
- Commissioner that participate in the WENRA meetings since 2015,
- Commissioner that participate in the Comity of safety standards CSS of IAEA since 2015.

3 Background

- The safe and sustainable deployment and use of nuclear technology will always depend on a highly educated and specialized workforce. With solid knowledge in nuclear engineering, radiation protection, nuclear safety.

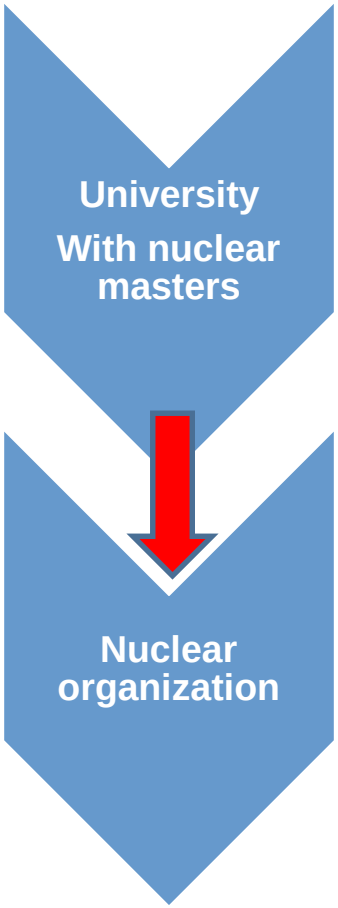
- Prepare and develop specialists requires considerable time and effort.

- Ageing of nuclear workforce is a reality in most of the countries. Hence, long-term sustainability will be only achieved by attracting new talent.

- In the world there is the tendency to operate the existing nuclear power plant 80 years
- 33 countries have announced that they will build 495 new nuclear power plants

- So in the world is need more nuclear skills.

4 Overview on Nuclear Skills



- Attract students to nuclear programs and nuclear sector
- Nuclear education

Nuclear Employment Portal

- Recruitment
- Training Programs
- Promotion schemes
- KM Plans & Retirement

From a nuclear safety point of view, nuclear Skills is of paramount importance

• Nuclear Employment Portal :

- the Spanish nuclear Society SNE has set up the Employment portal.

- All the students of the masters in nuclear engineering are animated from his professors to register in the Employment Portal .
- All the companies, in the nuclear sector are animated to send all his new jobs positions to the Employment Portal.

Once a new nuclear-related job position appears in the country, each graduate registered in the Employment portal receive an e-mail with the job position description, and contact details of the company or institution.

6 Academical education of the staff in the nuclear regulatory body

•**Certification Name:** European Master of Science in Nuclear Engineering EMSNE
•**Certification Authority:** European Nuclear Education Network Association
•In IAEA has developed the ceremony for delivery this certification several years.

•In the nuclear regulatory body should be convenient that at least 50 % of the technical staff will have an academicals education in the recruitment moment similar at that. Of course later will develop training activities inside the regulatory body.

•In some countries this is very difficult , but is better to have some technical people working rather that don't have enough technical people in the regulatory body ,

•But in order to improve the efficiency of the regulatory body it will be very convenient to achieve a goal like, that, steep by step. Every year to recruit 5 or 10 nuclear engineers.

•If the regulatory body have about 220 technical people , about 110 should be staff with the academicals education of nuclear engineers.

•+ with this can increase the efficiency of the nuclear regulatory body, reduce the time required for licensee,

•I heared that there are a country where this number is also bigger achieving 90%. (China) But that is very difficult to achieve in Europe, but is an excellent achievement .

Overview on Nuclear Skills in the nuclear regulatory body

University
With nuclear masters

- Attract students to nuclear programs and nuclear sector
- Nuclear education

Develop efforts to achieve 50 % of technical staff

Nuclear organization
Regulatory boody

- Recruitment
- Training Programs
- Promotion schemes
- KM Plans & Retirement

From a nuclear safety point of view, nuclear Skills is of paramount importance

8 Nuclear Masters currently in operation in Spain:

➢ **This universities have more than 40 years of experience, in nuclear education**

1. Master en Seguridad Nuclear Y protección radiológica
Universidad politécnica de Valencia. Valencia.
https://www.upv.es/titulaciones/MUSNPR/

2. Master en ciencia y tecnología nuclear
Universidad Politécnica de Madrid, Madrid
https://www.industriales.upm.es/docencia/master-en-ciencia-y-tecnologia-nuclear/

4. Master in Nuclear Engineering MNE
Universidad Politécnica de Cataluña, Barcelona
https://nuclearengineering.masters.upc.edu/es

5. European Master in Nuclear Energy, EMINE
Universidad Politécnica de Cataluña, Barcelona
https://etseib.upc.edu/ca/estudis/masters/master-MSc-EMINE

This 3 masters we would like to have 100 estudents each master.

9 Key Points: University - National level

- **Enhance support to Universities** with well established master's degrees in nuclear engineering:
- National level
  - CSN Nuclear Safety council, sponsored with 70.000 €/year since 2010. 3 chairs in nuclear safety and radiation protection . 3 master in nuclear engineering

  - European Comision

Suggestion for European Commission should support master in nuclear engineering in each country of Europe. But at maximum 3 masters in nuclear engineering for each country. Likes the 3 ones in the previous slide.

Can give a support for instance about 70.000 €/year during 5 years. for each master in nuclear engineering.
-for scholarships for master thesis.
- scholarships to pay the fees of the masters.
-award to bets student of the master every year.
-award to best master thesis .every year
-support to improve the education laboratories in radiation protection , or nuclear simulator for education,
-support to technical visits of the studens of the master in nuclear engineering to nuclear power plant, congress like Spanish nuclear society,

Sharing educational material in nuclear

1. DIES, J.; PUIG, F.; PEREIRA, C.;
2. **Multimedia on Nuclear Reactor Physics.**

800 pages ,

digital book

languages :
Spanish, Arabic, Chinese ,
French, English ,
Free of charge.
http://elearning.iaea.org/multimedia-nuclear-reactor-physics

MULTIMEDIA ON NUCLEAR REACTOR PHYSICS (MNRP)

DISTRIBUTED TO 134 COUNTRIES

Albania, Armenia, Austria, Azerbaijan, Belarus, Belgium, Bulgaria, Croatia, Cyprus, Czech, Denmark, Finland, France, Germany, Georgia, Greece, Hungary, Latvia, Lithuania, Luxemburg, Ireland, Italy, Macedonia, Moldova, Montenegro, Netherlands, Norway, Nord Macedonia, Poland, Portugal, Romania, Russia, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, UK, Ukraine.

Argentine, Brazil, Bolivia, Canada, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, Guatemala, Jamaica, Mexico, Nicaragua, Panama, Peru, Salvador, Trinidad y Tobago, Uruguay, USA, Venezuela, Virgin Islands.

Algeria, Angola, Botswana, Burkina Faso, Cameroon, Central African Republic, Congo, Egypt, Ethiopia, Ghana, Ivory Coast, Kenya, Lesptho, Liberia, Libya, Madagascar, Malawi, Morocco, Namibia, Niger, Nigeria, Rwanda, Senegal, Somalia, South Africa, Sudan, Tanzania, Togo, Tunisia, Uganda, Zambia, Zimbabwe.

Afghanistan, Bangladesh, Bhutan, Cambodia, China, Hong Kong, India, Indonesia, Iran, Iraq, Israel, Japan, Jordan, Kazakhstan, Korea, Kuwait, Laos, Lebanon, Malaysia, Mongolia, Myanmar, Nepal, Oman, Pakistan, Palestine, Philippines, Qatar, Saudi Arabia, Singapore, Sri Lanka, Syria, Uzbekistan, Taiwan, Thailand, Turkey, UAE, Vietnam, Yemen.

Australia, New Zealand

Estimate of new hiring of human resources in the SPANISH NUCLEAR SECTOR

CEIDEN

Prepared by the KEEP+ Group- CEIDEN

Last update 2023-03-14

KEEP+ Group-

Is the Training and Knowledge Management Group of the Technological Platform for Nuclear Energy in Spain - CEIDEN

Estimate of New Higher Education Graduates in the Nuclear Sector In the Next 5 years

Company/Institution	2023	2024	2025	2026	2027	TOTAL
1	80	63	33	20	20	216
2	27	45	63	33	36	204
3	30	34	39	45	52	200
4	20	25	30	25	25	125
5	42	29	24	1	1	97
6	16	16	16	16	16	80
7	10	15	12	9	14	60
8	12	10	9	8	8	47
9	12	8	8	8	8	44
10	3	3	2	1	10	19
11	3	2	2	4	6	17
12	3	3	3	2	2	13
13	4	4	-	-	-	8
14	1	2	0	1	1	5
15	1	1	1	1	1	5
16	2	3	-	-	-	5
17	1	1	1	1	1	5
18	1	2	0	0	0	3
19	1	1	1	1	1	5
20	2	4	5	7	8	26
21	12	24	30	50	60	176
22	23	4	5	6	5	43
23	10	7	7	6	0	30
TOTAL	316	306	291	245	275	1433

Estimate of New Hires of Vocational Training Technicians in the nuclear sector – 5 years

Company/ Institution	2023	2024	2025	2026	2027	TOTAL
1	76	60	31	19	19	205
2	16	16	16	16	16	80
3	20	20	16	10	-	66
4	4	8	10	12	16	50
5	7	9	10	9	9	44
6	10	10	10	5	5	40
7	12	6	5	5	0	28
8	4	5	5	4	5	23
9	2	4	6	3	3	18
10	5	3	3	0	0	11
11	5	5	-	-	-	10
12	5	5	-	-	-	10
13	1	1	2	2	3	9
14	1	1	1	1	1	5
15	2	1	1	1	0	5
16	0	1	1	1	1	4
17	0	1	0	1	0	2
18	0	0	0	0	0	0
19	0	0	0	0	0	0
20	1	2	2	3	4	12
21	0	0	0	0	0	0
22	8	14	11	13	14	60
23	18	8	7	9	0	42
TOTAL	197	180	137	114	96	742

Conclusion

With the information provided by 23 companies and institutions in the nuclear sector based in Spain, it is concluded that a total of 2,157 new personnel will be needed for the next 5 years (2023-2027). Distributed as follows:

- Incorporate about 1,433 higher educated new graduates.
- Incorporate some 724 new graduates in professional training

15 References

1. DIES, J.; PUIG, F.; PEREIRA, C.; "Nuclear Reactor Physics Multimedia"(languages: Arabic, Chinese, English, French, Spanish, and Russian) ", v.8 , 800 slides, E-book, Spain, 2016.
   Digital version is Free of charge.
   http://elearning.iaea.org/multimedia-nuclear-reactor-physics

2. DIES, J.; TAPIA, C.; PUIG, F.; VILLAR, D.; "Experiences program in nuclear engineering area. SIREP 1300 nuclear power plant conceptual simulator (DFEN-ETSEIB-UPC), (language: English), E-prints UPC, http://hdl.handle.net/2117/17190 , pág. 206, 2012.

Sugestion of topics for Research for european comision .

-fuel, advanced tecnological fuel. ATF.

-Use of AMR, that use irradiated fuel, and reduce the radiactive waste

-research projects about good practices to operate a nuclear power plant 80 years.

Thank you!

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Prof. PhD. Ing. Javier Dies

Chairman

CEIDEN
SPANISH NUCLEAR ENERGY TECHNOLOGY PLATFORM, for research and development

https://ceiden.com/

More than 100 members classified in 11 subsectors

CEIDEN

SPANISH NUCLEAR ENERGY TECHNOLOGY PLATFORM

How does it work?

CEIDEN
Spanish Nuclear Fission Technology Platform

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

subsector	*members*
Utilities	3
Fuel cycle companies	2
Engineering and construction companies	1
Equipment manufacturers	1
Service companies	1
Small and medium-sized enterprises	1
R&D institutions	2
Universities	3
Nuclear Regulatory Bodies (CSN)	2
Ministry competent in R&D&i	1
Ministry competent in Energy	1

General Assembly

All members and interested parties

Working groups at CEIDEN
SPANISH NUCLEAR ENERGY TECHNOLOGY PLATFORM

- Group fuel ATF. Advanced technological fuels.
- Group SMR (Small Modular Reactors)
- Group of Materials
- Group of Fuel
- Group of Simulation SIREN
- Group CAMP
- Group KEEP+ education in nuclear engineering (Spanis ENEN)
- Group PYME,
- Group of sociotechnical research , communication, in nuclear energy.
- Group of neutronic laboratories

- SMR represent one opportunity for the nuclear industry in general and for Research and Development in nuclear energy.
- Several Spanish companies are currently developing several international projects about SMR.
  - -IDOM is partner of the Project to design and building de SMR Moltex with Canada.
  - Empresarios Agrupados collaborate with one Project with ThorCon, and with the Project MIRRA of Belgium.
  - Tecnatom is working in design of simulators for SMR.
  - ENSA , participate in several international projects about SMR

CEIDEM have a working group about SMR., and in this group there are 33 Spanish institutions, companies, universities, public companies.

10 members of CEIDEN are members of European alliance on SMR

members of SMR group in CEIDEN.

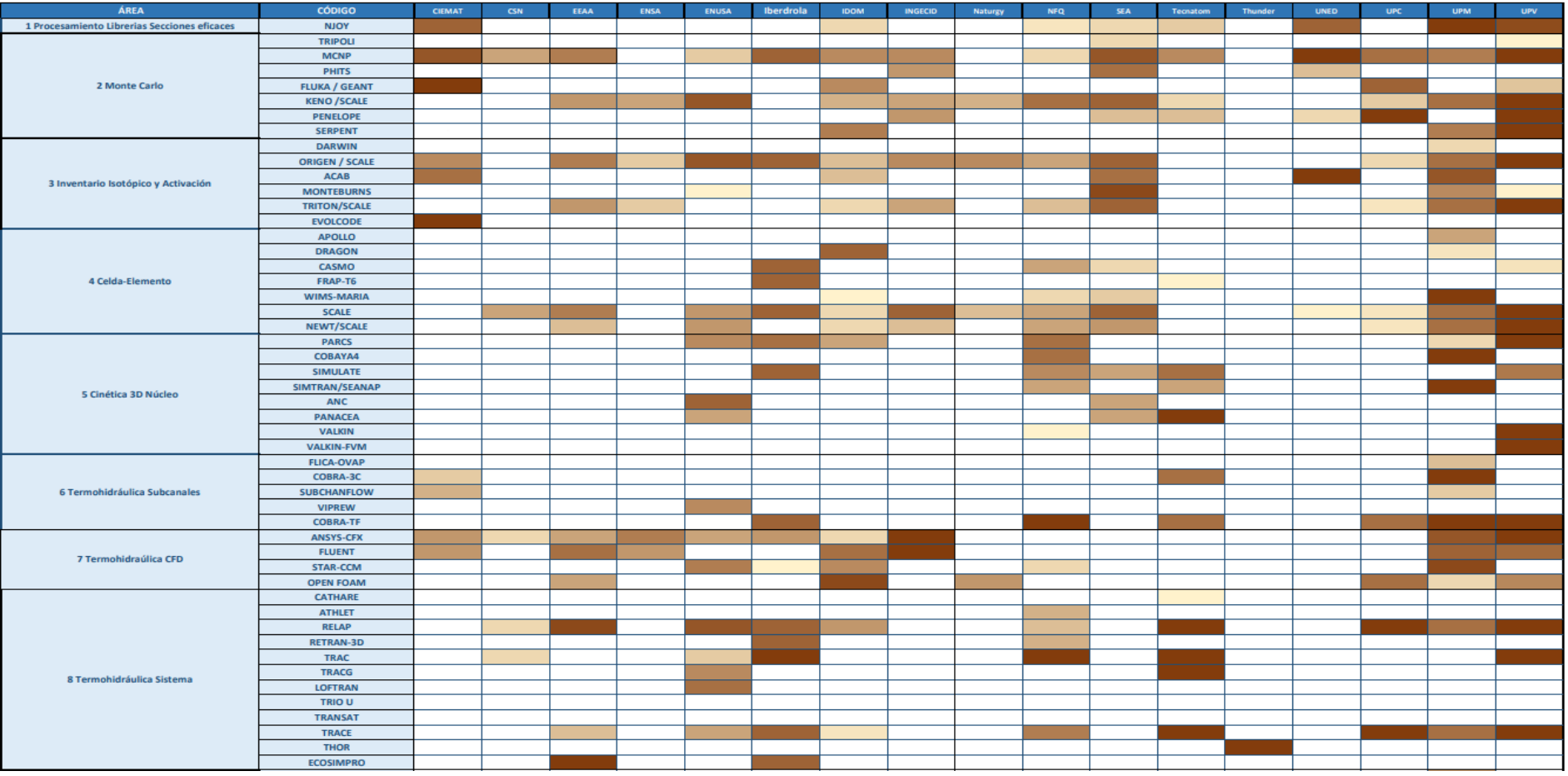
Paper published in nuclear engineering about activities of RDI in developemt in Spain about SMR.

Video about conference in the association of industrials engineers of madrid about SMR..

Computer codes used in Spanish nuclear sector.
-horizontal: computer code.
-vertical: institution, Company,

CEIDEN: Grupo Español de Simulación Integral de Reactores Nucleares (SIREN)

Códigos de cálculo utilizados en el sector nuclear español rev.2.1, jul. 2021



CEIDEN
Spanish Nuclear Fission Technology Platform

- The total amount devoted to nuclear **R&D in Spain in the last years is stable (around 45 Million euros/year)**. The main contribution comes from own resources of the entities of the sector