

Curriculum vitae

Personal profile

Surname(s): Garcia Herranz
Name: Nuria
Contact address: Escuela Técnica Superior de Ingenieros Industriales
C/ José Gutiérrez Abascal, 2, 28006 Madrid
Universidad Politécnica de Madrid
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Current professional situation

Employing entity: Universidad Politécnica de Madrid (UPM)
Department: Energy Engineering, Escuela Técnica Superior de Ingenieros Industriales
Professional category: Associate Professor (since 07/06/2011)
Member of the UPM research group "Science and Technology of Advanced Nuclear Fission Systems"

Research short description: Reactor physics (neutronics and multi-physics) for Light Water Reactors & Gen-IV Fast Reactors
Nuclear Data : Sensitivity and Uncertainty Analysis in neutronics simulations
Criticality Safety and Activation, Depletion and Decay calculations

ORCID: 0000-0002-0760-2974
ResearcherID: H-9963-2015

University education

Energy Engineer, Universidad Politécnica de Madrid, 1995
PhD in Nuclear Engineering, Universidad Politécnica de Madrid, 2000
Thesis title: *Development of a three-dimensional diffusion code with heterogeneity effects in the few-group cross-sections and discontinuity factors for PWR analysis*. Director: J.M. Aragonés
Obtained qualification : Cum laude

Language skills

Language	Listening and Speaking	Reading and Writing
Spanish	Native	Native
French (DALF certificate)	C1	C1
English	B2	C1

Research fields

My main research areas include neutronics applied to reactor physics (both current generations and Generation IV fast reactors), inventory and criticality safety calculations, together with sensitivity and uncertainty analysis and quantification due to nuclear data. Each topic has a background color through the CV for greater clarity.

Reactor Physics (neutronics and multi-physics) for Light Water Reactors

- Development of computational tools for multi-scale and multi-physics analysis of LWR
 - Development of COBAYA core simulator, UPM in-house neutron diffusion core simulator for light water reactor analysis, integrated in the European platform for nuclear reactor simulations developed during the European FP6 NURESIM and FP7 NURISP and NURESAFE projects
 - Development of the multiphysics computational platform SALOME-based SCALE6.2/COBAYA/COBRA-TF (SCALE6.2 as engine for cross-section generation, COBAYA as core simulator, COBRA-TF as two-phase TH code with both channel and subchannel resolutions / flexible coupling)
 - Development of calculation schemes (with the corresponding V&V&UQ), including generation of few-group data for core simulators
- Application to advanced or pioneering studies in the domain of LWR (optimization of loading patterns, manoeuvres, transient analysis). Agreements with Spanish Nuclear Power Plants. Participation in 4 Euratom projects

Reactor Physics (neutronics and multi-physics) for Gen-IV fast reactors

- Development of calculation schemes for neutronics characterization and assessment of safety parameters for Gen-IV reactors: criticality, reactivity coefficients and fuel cycle and repository parameters (inventory, decay heat, radiotoxicity, neutron emission).
- Application to Sodium Fast Reactors (SPX, ASTRID, ESFR), Lead-cooled Fast Reactors (ALFRED, MYRRHA). Participation in 4 Euratom projects

Nuclear Data: Sensitivity and Uncertainty Analysis

- Development of techniques for Uncertainty Quantification due to nuclear data: Sensitivity Analysis, Uncertainty Analysis, Data Assimilation (techniques to improve predictions using integral experiments), Target Accuracy Assessment (to establish priorities for further improvement of uncertain parameters)
- Application to LWR, Sodium Fast Reactors, Lead-cooled Fast Reactors. Cooperation with the nuclear data community: recommendations for further improvements of nuclear data on the basis of the application results
- Active participation in the international OECD/NEA benchmark for Uncertainty Analysis in Modeling (UAM). Participation in 3 Euratom projects
- Member of the Expert Group on Uncertainty Analysis in Modelling (EGUAM) of the OECD/NEA

Criticality safety and inventory calculations

- Co-author of the inventory code ACAB available at NEA (see Technological results and knowledge transfer)
- Burnup credit analyses. Active participation in OECD NEA benchmarks: Burn-up Credit Criticality Safety Benchmark Phase III-C and Phayse VII. Agreement with the Spanish Nuclear Safety Council

Teaching experience

Teaching at bachelor level degrees

- Degree in Energy Engineering, Degree in Engineering in Industrial Technologies, UPM
- Main courses : *Nuclear Technology, Nuclear Power Plants*

Teaching at master's degrees

- Master in Nuclear Science and Technology, Master in Energy Engineering, UPM
- Main courses : *Neutronics, Nuclear Reactor Design*

Academic tuition and supervision of students

- 13 BSc thesis, 25 MSc thesis, internship supervisor of 4 European students

Direction of doctoral thesis

1. *Development of an analytic nodal diffusion code in multigroups for nuclear reactors in 3D Cartesian and Hexagonal geometries*, J.A. Lozano, 2010. Cum Laude. Codirector : J.M. Aragonés
Prize of the European Nuclear Education Network Association (ENEN) PhD Event, 2008
2. *Core physics and safety analysis of Gen-IV SFR using existing and newly developed computational tools*, R. Ochoa, 2014. Cum Laude. International Mention
3. *Generation of optimized libraries with uncertainty quantification for best-estimate plus uncertainties calculations (BEPU) of light water reactors*, S. Sánchez-Cervera, UPM, 2017. Cum Laude
4. *Methodologies for sensitivity/uncertainty analysis using reactor core simulators with application to PWR*, E. Castro, 2018 (<http://oa.upm.es/51754/>). Cum Laude. International Mention
Finalist of the ENEN PhD Prize 2018
5. *Nuclear data analyses for improving the safety of advanced lead-cooled reactors*, P. Romojaro, 2019 (<http://oa.upm.es/57150/>). Cum Laude, International Mention. Codirector : F. Alvarez Velarde (CIEMAT)
Prize of the Spanish Nuclear Society 2019 to the best PhD in Nuclear Science and Technology
Finalist of the ENEN PhD Prize 2019
Finalist of the European Nuclear Society Prize 2020

Educational R&D projects funded through competitive calls

9 educational publications and participation in the following EU projects for innovation in teaching :

Name of the project: GREaT-PIONEeR

Funding entity: EURATOM, Horizon2020 (NFRP-2019-2020)

Start-End date: 01/11/2020 - 31/10/2023

Duration: 3 years

Total amount UPM: 173,875.00 €

Role : Participant of the UPM research team, WP leader

Name of the project: GENTLE: Graduate and Executive Nuclear Training and Lifelong Education

Funding entity: EURATOM, 7th FP

Start-End date: 01/01/2013 - 31/12/2016

Duration: 4 years

Total amount UPM: 121,900 €

Role : Participant of the UPM research team

Scientific and Technological Experience

R&D projects funded through competitive calls

1. Name of the project: SANDA (Supplying Accurate Nuclear Data for Energy and Non-Energy Applications)

Funding entity : EURATOM, HORIZON2020 (number 847552)

Total amount: 100,667.00 €

Role : participant of the UPM research team, Task leader

Start-End date: 01/09/2019 - 31/08/2023

Duration: 4 years

2. Name of the project: ESFR-SMART (European Sodium Fast Reactor Safety Measures Assessment and Research Tools)

Funding entity: EURATOM, HORIZON2020 (number 754501)

Total amount: 91,188.00 €

Role : UPM principal investigator, Task leader

Start-End date: 01/09/2017 - 31/08/2021

Duration: 4 years

3. Name of the project: CHANDA: Solving Challenges in Nuclear Data

Funding entity: EURATOM, 7th Framework Programme (number 605203)

Total amount: 248,000.00 €

Role : UPM principal investigator (from october 2014 to the end of the project)

Start-End date: 01/10/2013 - 31/05/2018

Duration: 4 years - 6 months

4. Name of the project: ESNII plus: Preparing ESNII for Horizon 2020

Funding entity: EURATOM, 7th Framework Programme (number 605172)

Total amount: 78,256.00 €

Role : UPM principal investigator

Start-End date: 01/09/2013 - 31/08/2017

Duration: 4 years

5. Name of the project: NURESAFE: Nuclear Reactor Safety Simulation Platform

Funding entity: EURATOM, 7th Framework Programme (number 323263)

Total amount: 407,907.00 €

Role : participant of the UPM research team

Start-End date: 01/01/2013 - 31/12/2015

Duration: 3 years

6. Name of the project: ANDES: Accurate Nuclear Data for Nuclear Energy Long Term Sustainability

Funding entity: EURATOM, 7th Framework Programme (number 249671)

Total amount: 240,000.00 €

Role : participant of the UPM research team

Start-End date: 15/09/2010 - 31/10/2013

Duration: 3 years

7. Name of the project: CP-ESFR: Collaborative Project on European Sodium Fast Reactor

Funding entity: EURATOM, 7th Framework Programme (number 232658)

Total amount: 125,100.00 €

Role : participant of the UPM research team

Start-End date: 01/02/2009 - 31/01/2012

Duration: 4 years

8. Name of the project: NURISP: Nuclear Reactor Integrated Simulation Project

Funding entity: EURATOM, 7th Framework Programme (number 232124)

Total amount: 496,000.00 €

Role : participant of the UPM research team, Task leader

Start-End date: 01/01/2009 - 31/12/2011

Duration: 4 years

9. Name of the project: EUROTRANS: European Research Programme for the Transmutation of High Level Nuclear Waste in an Accelerator Driven System

Funding entity: EURATOM, 6th Framework Programme (number FI6W-CT-2004-516529)

Total amount: 40,500.00 €

Role : participant of the UPM research team

Start-End date: 01/04/2005 - 31/03/2009

Duration: 4 years

10. Name of the project: NURESIM: European Platform for Nuclear Reactor Simulations

Funding entity: EURATOM, 6th Framework Programme (number 516560)

Total amount: 435,000.00 €

Role : participant of the UPM research team

Start-End date: 01/02/2005 - 31/12/2008

Duration: 4 years

11. Name of the project: CRISSUE-S: Revisiting Critical Issues in Nuclear Reactors Design/Safety by using 3-D Neutronics/Thermalhydraulics Models: State-of-the-Art

Funding entity: EURATOM - 5th Framework Programme (number FIS5-2001-00099)

Role : participant of the UPM research team

Start-End date: 01/01/2001 - 01/01/2003

Duration: 2 years

R&D non-competitive contracts, agreements or projects with public or private entities

12. Agreement Spanish Nuclear Safety Council (CSN) - UPM for uncertainty propagation in neutronics calculations

Start date: 01/11/2012

Duration: 4 years

Role : UPM principal investigator

13. Agreement ENUSA Industrias Avanzadas S.A. - UPM for neutronics simulation

Start date: 01/10/2012

Duration: 1 year

Role : participant of the UPM research team

14. Agreement Spanish Nuclear Safety Council (CSN) - UPM about Burnup Credit in Criticality Safety

Start date: 01/10/2010

Duration: 4 years

Role : participant of the UPM research team

Scientific Production (Last 10 years)

Publications in JCR Journals

1. P. Romojaro, F. Álvarez-Velarde, O. Cabellos, **N. García-Herranz**, A. Jiménez-Carrascosa
On the importance of target accuracy assessments and data assimilation for the co-development of nuclear data and fast reactors: MYRRHA and ESFR
Annals of Nuclear Energy, Vol. 161 (2021)
[DOI: 10.1016/j.anucene.2021.108416](https://doi.org/10.1016/j.anucene.2021.108416)
2. A. Jiménez Carrascosa, **N. García-Herranz**
Use of similarity indexes to identify spatial correlations of sodium void reactivity coefficients
Nuclear Engineering and Technology, Volume 52, Issue 11, pp. 2442-2451 (2020)
[DOI: 10.1016/j.net.2020.04.021](https://doi.org/10.1016/j.net.2020.04.021)
3. P. Romojaro, F. Alvarez-Velarde, **N. García-Herranz**
Sensitivity methods for effective delayed neutron fraction and neutron generation time with SUMMON
Annals of Nuclear Energy 126, pp. 410-418 (2019)
[DOI: 10.1016/j.anucene.2018.11.042](https://doi.org/10.1016/j.anucene.2018.11.042)

4. G. Grasso, F. Lodi, P. Romojaro, **N. García-Herranz**, F. Alvarez-Velarde, D. López, E. Bubelis, G. Bandini
Stress-testing the ALFRED design – Part I: Impact of nuclear data uncertainties on Design Extension Conditions transients
Progress in Nuclear Energy 106, pp. 372-386 (2018)
[DOI: 10.1016/j.pnucene.2018.03.013](https://doi.org/10.1016/j.pnucene.2018.03.013)
5. E. Castro, S. Sánchez-Cervera, **N. García-Herranz**, D. Cuervo
Impact of the homogenization level, nodal or pin-by-pin, on the uncertainty quantification with core simulators
Progress in Nuclear Energy 104, pp. 218-228 (2018)
[DOI: 10.1016/j.pnucene.2017.10.001](https://doi.org/10.1016/j.pnucene.2017.10.001)
6. **García-Herranz N.**, Cuervo D., Sabater A., Rucabado G., Sánchez-Cervera S., Castro E.
Multiscale neutronics/thermal-hydraulics coupling with COBAYA4 code for pin-by-pin PWR transient analysis
Nuclear Engineering and Design 321, pp. 38-47 (2017)
[DOI: 10.1016/j.nucengdes.2017.03.017](https://doi.org/10.1016/j.nucengdes.2017.03.017)
7. S. Kliem, Y. Kozmenkov, J. Hadek, Y. Perin, F. Fouquet, F. Bernard, A. Sargeni, D. Cuervo, A. Sabater, S. Sanchez-Cervera, **N. Garcia-Herranz**, O. Zerkak, H. Ferroukhi, P. Mala
Testing the NURESIM platform on a PWR main steam line break benchmark
Nuclear Engineering and Design 321, pp. 8–25 (2017)
[DOI: 10.1016/j.nucengdes.2017.05.028](https://doi.org/10.1016/j.nucengdes.2017.05.028)
8. I.Spasov, S.Mitkov, N.P.Kolev, S. Sanchez-Cervera, **N. Garcia-Herranz**, A. Sabater, D. Cuervo, J.Jimenez, V.H.Sanchez, L.Vyskocil
Best-estimate simulation of a VVER MSLB core transient using NURESIM platform codes
Nuclear Engineering and Design 321, pp. 26-37 (2017)
[DOI: 10.1016/j.nucengdes.2017.03.032](https://doi.org/10.1016/j.nucengdes.2017.03.032)
9. Romojaro P., Álvarez-Velarde F., Kodeli I., Stankovskiy A., Díez C.J., Cabellos O., **García-Herranz N.**, Heyse J., Schillebeeckx P., Van den Eynde G., Žerovnik G.
Nuclear data sensitivity and uncertainty analysis of effective neutron multiplication factor in various MYRRHA core configurations
Annals of Nuclear Energy, 101, pp. 330-338 (2017)
[DOI: 10.1016/j.anucene.2016.11.027](https://doi.org/10.1016/j.anucene.2016.11.027)
10. Rochman D., Leray O., Hursin M., Ferroukhi H., Vasiliev A., Aures A., Bostelmann F., Zwermann W., Cabellos O., Díez C.J., Dyrda J., **García-Herranz N.**, Castro E., S. van del Marck, Sjostrand H., Hernandez A., Fleming M., Sublet J.C., Fiorito L.
Nuclear Data Uncertainties for Typical LWR Fuel Assemblies and a Simple Reactor Core
Nuclear Data Sheets, 139, pp. 1-76 (2017)
[DOI: 10.1016/j.nds.2017.01.001](https://doi.org/10.1016/j.nds.2017.01.001)
11. **N. García-Herranz**, A-L. Panadero, A. Martínez, S. Pelloni, K. Mikityuk, A. Pautz
Nuclear data sensitivity and uncertainty assessment of sodium voiding reactivity coefficients of an ASTRID-like Sodium Fast Reactor
EPJ Web of Conferences, EDP Sciences, Vol. 146, 09006 (2017)
[DOI: https://doi.org/10.1051/epjconf/201714609006](https://doi.org/10.1051/epjconf/201714609006)
12. Castro E., Ahnert C., Buss O., **García-Herranz N.**, Hoefler A., Porsch D.
Improving PWR core simulations by Monte Carlo uncertainty analysis and Bayesian inference
Annals of Nuclear Energy, Volume 95, pp. 148-156 (2016)
13. Sánchez-Cervera S., **García-Herranz N.**, Herrero J.J., Cuervo D.

Effects of cross sections tables generation and optimization on rod ejection transient analyses
Annals of Nuclear Energy, Volume 73, pp. 287-391 (2014)

14. Sánchez-Cervera S., **García-Herranz N.**, Herrero J.J., Cabellos O.
Optimization of multidimensional cross-section tables for few-group core calculations
Annals of Nuclear Energy, Volume 69, pp. 226-237 (2014)
15. Herrero J.J., Ochoa R., Martínez J.S., Díez C.J., **García-Herranz N.**, Cabellos O.
Nuclear Data Uncertainty Propagation to Reactivity coefficients of a Sodium Fast Reactor
Nuclear Data Sheets, Volume 118, pp. 535-537 (2014)
16. Ochoa R., Vázquez M., Alvarez-Velarde F., Martín-Fuertes F., **García-Herranz N.**, Cuervo D.
A comparative study of Monte Carlo-coupled depletion codes applied to a Sodium Fast Reactor design loaded with Minor Actinides
Annals of Nuclear Energy, 57, pp. 32-40 (2013)
17. Herrero J.J., **García-Herranz N.**, Cuervo D., Ahnert C.
Neighborhood-corrected interface discontinuity factors for multi-group pin-by-pin diffusion calculations for LWR
Annals of Nuclear Energy, Volume 46, pp. 106-115 (2012)
18. Cabellos O., Klix A., Fischer U., **García-Herranz N.**, Sanz J., Simakov S.
Impact of activation cross section uncertainties on the tritium production in the HFTM specimen cells
Journal of Nuclear Materials, 417 1-3, pp. 1307-1310 (2011)
19. Cabellos O., **García-Herranz N.**, Díaz de la Obra C., Alvarez-Cascos R., Sanz J., Ogando F., Sauvan P.
Propagation of Nuclear Data Uncertainties in Transmutation Calculations using ACAB code
Journal of Korean Physical Society, 59 N° 2, pp. 1268-1271 (2011)
20. Cabellos O., Fernández P., Rapisarda D., **García-Herranz N.**
Assessment of fissionable material behaviour in fission chambers
Nuclear Instruments and Methods in Physics Research A, 618, 248-259 (2010)
21. **García-Herranz N.**, Cabellos O., Alvarez-Velarde F., Sanz J., González-Romero E.M., Juan J.
Nuclear data requirements for the ADS conceptual design EFIT: uncertainty and sensitivity study
Annals of Nuclear Energy, 37, pp. 1570-1579 (2010)
22. Lozano J.A., Jiménez J. **García-Herranz N.**, Aragonés J.M.
Extension of the analytic nodal diffusion solver ANDES to triangular-Z geometry and coupling with COBRA-IIIc for hexagonal core analysis
Annals of Nuclear Energy, 37, pp. 380-388 (2010)

Scientific-Technical Documents

Co-author of 24 deliverables of European Projects in the last 10 years

G. Žerovnik, F. Alvarez-Velarde, O. Cabellos, L. Fiorito, **N. García-Herranz**, J. Heyse, I. Kodeli, S. Kopecky, B. Kos, P. Romojaro, A. Stankovskiy, G. Van den Eynde, *Recommendations for MYRRHA relevant cross section data to the JEFF Project*, ISBN 978-92-79-77162-0, [DOI: 10.2760/485552](https://doi.org/10.2760/485552), Publisher: Publications Office of the European Union (2017)

G. Žerovnik, P. Romojaro, A. Stankovskiy, L. Fiorito, I. Kodeli, P. Schillebeeckx, F. Álvarez-Velarde, O. Cabellos, C. J. Díez, G. Van den Eynde, **N. García-Herranz**, J. Heyse, A. Trkov, *Assessment of evaluations for MYRRHA*, JRC Technical Report, JRC103618, ISBN 978-92-79-63947-0, ISSN 1831-9424, [DOI:10.2789/27546](https://doi.org/10.2789/27546) (2016)

K. Suyama et al. , *Burn-up Credit Criticality Safety Benchmark Phase III-C*, OECD NEA /NSC /R (2015) 6, 253 Pages (2016)

Radulescu G. and John C. Wagner et al., *Burn-up Credit Criticality Safety Benchmark Phase VII. UO2 fuel: Study of Spent Fuel Compositions for Long-term Disposal*, OECD/NEA No. 6998, ISBN: 978-92-64-99172-9 (2012)

International and national conferences

- 29 contributions to international conferences in the last 10 years
- 20 contributions to national conferences
- Contributions to the OECD/NEA WPEC SG-46, 2019, 2020
- Contributions to the OECD Benchmark for Uncertainty Analysis in Best-Estimate Modelling (UAM) for Design, Operation and Safety Analysis of LWRs UAM benchmark, 2019, 2017, 2016, 2015, 2013

Technological results and knowledge transfer

Co-author of ACAB-2008: Inventory Code for Nuclear Applications, available at NEA Data Bank, NEA-1839 (<http://www.nea.fr/abs/html/nea-1839.html>)

J. Sanz, O. Cabellos, **N. García-Herranz**

ACAB: Inventory Code for Nuclear Applications: User's Manual V.2008, NEA Data Bank

Co-author of COBAYA core simulator: "COBAYA: Neutron diffusion code for Light Water Reactor analysis", integrated in the European Platform for nuclear reactor simulations developed during FP6 NURESIM and FP7 NURISP and NURESAFE projects (http://www.nuresafe.eu/docs/NURESIM-flyer_v2.pdf)

Participation in committees and Other

Scientific, technical and/or assessment committees

- Member of the Editorial Board of Annals of Nuclear Energy (April 2021 -)
- Member of the Expert Group on Uncertainty analysis in Modelling (EGUAM) of Working Party on Scientific Issues of Reactor Systems (WPRS), OCDE/NEA since February 2015
- Member of the French HCERES evaluation committee 2019 (Haut Conseil de l'Évaluation de la Recherche et de l'Enseignement Supérieur). Evaluation of "Département de Modélisation des Systèmes et Structures", Centre de CEA Saclay, 2019
- Member of 2 committees for recruitment of researchers (civil servant) for the Spanish research agency CIEMAT (2020, 2019)
- Member of 6 committees for recruitment of professors for Spanish universities (2016 – 2020)
- Evaluator of the Fellowships Programme "La Caixa" bank for post-graduate studies (2015, 2017)
- Jury member for 16 PhD defences : 11 at Spanish universities, 3 at Université Aix-Marseille (2020, 2018, 2017), 2 at École Polytechnique Fédérale de Lausanne (2019, 2020)

Specialised, lifelong, technical, professional and refresher training

- *Sensitivity/Uncertainty Analysis and Uncertainty Quantification in Reactor Physics Calculations*, OECD NEA, 30 hours, 13-17 March 2017. *SCALE sensitivity and uncertainty calculations*, OECD NEA, 30 hours, 3-7 June 2013. *SCALE lattice physics and depletion course*, OECD NEA, 30 hours, 21-25 May 2012