ANNUAL ACADEMIC REPORT

Academic Year

2023-2024

IIT
INSTITUTO DE INVESTIGACIÓN TECNOLÓGICA

Index

Director's greeting

Dear reader,

This report summarizes the work carried out at the Institute for Research in Technology (IIT) of the ICAI School of Engineering at the Comillas Pontifical University during the last academic year.

The overview presented in the annual report underlines the position we have been able to consolidate, both nationally and internationally, in our chosen areas of research. It showcases the strength of the research teams, who also make an important contribution to our internationally-oriented doctoral programs. The IIT thus continues a successful history of collaboration between the University and the world of industry, a partnership that we are celebrating in a special way this year as we mark the 40th anniversary of its founding.

All of the activity described in this report would not have been possible without the work and commitment of all the professionals at the institute: professors, researchers, administrative staff, post-graduate students and representatives of the industrial sector. If the work of the IIT has become an international benchmark in its areas of research over the past 40 years, it is without doubt entirely their achievement.

The goal is to build on our success and advance further in our areas of expertise thanks to our continuing commitment and our professionalism. We are convinced that this professionalism will enable us to continue enjoying the confidence of the national and international companies and organizations we collaborate with as well as the ICAI School of Engineering itself, the Comillas Pontifical University, and ICAI Engineers Association. We highly appreciate their valuable support.

We wish to continue earning this confidence by dint of our efforts to produce qualified professionals who are highly sought after by companies in the industrial sector, to encourage applied research which adds to the engineering knowledge base, and to pass on this knowledge so that it may be of use to society.

We are conscious that this is a difficult challenge in the current globalized and interdependent economy with faster an deeper technology change, especially in the energy, transport and telecommunication sectors. We face this challenge with enthusiasm, commitment and optimism. Technology is to play a crucial role in

the history of humanity over the upcoming decades and we want to be part of this adventure.

I cordially invite you to get to know us better by reading these pages.

Paloma Cucala García

1. Introduction

The Institute for Research in Technology (IIT) is a University Research Institute that belongs to the ICAI School of Engineering of Comillas Pontifical University. Its primary objective is to promote research and postgraduate training in various technological fields through participation in specific projects of interest to the industry and the administration. It is a nonprofit institute that seeks to be flexible and pragmatic in the way they work. Its funding comes mainly from projects contracted with companies and, therefore, meet the social demand proven.

The results of this research are specified in the following products:

• Advanced computer applications, usually developed to customer specifications and used in many different companies, and innovative engineering equipment design.

• Analysis, consulting and technical, statistical, regulatory and econometric studies developed for companies and institutions in various countries.

• Doctoral theses defended at the University and publications in conferences and international journals.

The core of IIT is composed of a group of Professors and Researchers. This group is supplemented by postgraduate researchers as Research Assistants, dedicated to the Institute exclusively. Work teams are formed between both groups for the development of research projects, some of which are made dissertations.

This report covers the period for the academic year 2023 - 2024, from September 1, 2023 to August 31, 2024.

2. Organizational structure

2.1 Management

The management of the IIT during the course 2023 - 2024 has been carried out by the following Professors and Researchers:

- **Chaves Ávila, José Pablo**. Deputy Director for Research Development
- **Cucala García, Asunción Paloma**. Director
- **Lumbreras Sancho, Sara**. Deputy Director for Research Results
- **Sigrist, Lukas**. Deputy Director for Economic Affairs

2.2 Council

The members of the Council of IIT during the course 2023 - 2024 were the following ones:

- **Chaves Ávila, José Pablo**. Deputy Director for Research Development
- **Cossent Arín, Rafael**. Reseacher Representative
- **Cucala García, Asunción Paloma**. Director
- **Fernández Rodríguez, Adrián**. Secretary General
- **Gómez San Román, Tomás**. Reseacher Representative
- **Lumbreras Sancho, Sara**. Deputy Director for Research Results
- **Paolis Robles, Carlo de**. IEF Representative
- **Ramos Galán, Andrés**. Reseacher Representative
- **Ríos Ocampo, Miguel Angel**. IEF Representative
- **Rivier Abbad, Michel**. Reseacher Representative
- **Rodilla Rodríguez, Pablo**. Reseacher Representative
- **Sigrist, Lukas**. Deputy Director for Economic Affairs

2.3 Area coordinators

The coordinators of the eight research areas that group the different activities carried out in the IIT during the course 2023 - 2024 are the following ones:

- **Aracil Fernández, Elisa María**. SMS Coordinator
- **Cantizano González, Alexis**. PCI Coordinator
- **Fernández Rodríguez, Adrián**. ASF Coordinator
- **Mateo Domingo, Carlos**. REDES Coordinator
- **Olmos Camacho, Luis**. RYE Coordinator
- **Paz Jiménez, Eva**. BIO Coordinator
- **Portela González, José**. ASI Coordinator
- **Ramos Galán, Andrés**. SADSE Coordinator
- **Rouco Rodríguez, Luis**. MAC Coordinator

2.4 Scientific advisory board

The members of the SAB are the following ones:

- **Andersson, Göran** (Chairman), ETH Zurich, Switzerland
- **Miranda, Vladimiro** (Vice chairman), INESC TEC, Univ. of Porto, Portugal
- **Hobbs, Benjamin F.** (Member), Johns Hopkins University, USA
- **Miyatake, Masafumi** (Member), Sophia University, Japan
- **Neuhoff, Karsten** (Member), DIW Berlin, Technical Univ. Berlin, Germany
- **Wehenkel, Louis** (Member), University of Liège, Belgium

2.5 Academic staff

The permanent staff of IIT consisted of the following Professors and Researchers:

- **Aracil Fernández, Elisa María**. Associate Professor
  Ph.D. in Sustainable Banking. Universidad Rey Juan Carlos de Madrid.
  Degree in Law. Universidad Nacional de Educación a Distancia (UNED).
  Degree in Business Administration. Universidad Complutense de Madrid.
  Areas of interest: Corporate strategy, sustainability, innovation and digitalization, development economics, savings and investment products, sustainable finance, financial markets, stakeholder capitalism.

- **Baringo Morales, Ana**. Assistant Professor
  B.S. degree in Electrical Engineering and the M.S. degree in Industrial Engineering. Universidad de Castilla-La Mancha.
  Master Degree in Secondary School Teaching, Universidad de Castilla-La Mancha.
  PhD in Science and Technologies Applied to Industrial Engineering, Universidad de Castilla-La Mancha (2016-2020)
  Areas of interest: Electricity markets, uncertainty modeling, virtual power plants, optimization models and automatic generation control.

- **Barrella, Roberto**. Research Assistant Professor
  PhD in Engineering Systems Modelling, Escuela Técnica Superior de Ingeniería (ICAI), Comillas Pontifical University
  Master's Degree Energy Engineering, Renewable Energy. Faculty of Civil and Industrial Engineering, Università degli Studi di Roma La Sapienza
  Bachelor's Degree Energy Engineering. Faculty of Civil and Industrial Engineering, Università degli Studi di Roma La Sapienza
  Areas of interest: Energy poverty, Residential Energy Demand, Energy Efficiency, HVAC systems, Energy Policy, Just energy transition, Climate change.

- **Batlle López, Carlos**. Senior Associate Professor
  Ph.D. in Industrial Engineering (Comillas)
  Electrical Engineer (Comillas)
  Areas of interest: Economics and regulation of the electricity industry. Modelling of electricity markets.

- **Bello Morales, Antonio**. Research Associate Professor
  Ph.D. in Industrial Engineering (Comillas), M.Sc. in Power Systems (Comillas), Mechanical Engineer (Comillas),
  Areas of interest: Risk management support, energy forecasting, energy market modelling, planning of electricity and gas markets, artificial intelligence.

- **Calvo Báscones, Pablo**. Assistant Professor
  Electromechanical Engineer (Comillas).
  M.Sc. in Industrial Engineering (Comillas)
  Areas of interest: Big data & analytics, intelligent systems, predictive maintenance, process automation, artificial vision & image processing.

- **Campos Fernández, Francisco Alberto**. Research Associate Professor
  Ph.D. in Industrial Engineering (Comillas)
  Mathematics Science degree (UCM)
  Areas of interest: Mathematical techniques of operations research. Stochastic optimization. Planning and operation of energy systems. Nash equilibrium. General equilibrium. Optimization under uncertainty. Hydrogen, Gas and Electricity Markets. Cryptology.

- **Castro Ponce, Mario**. Professor
  Ph.D. in Physics Science (UCM)
  Physics Science degree (UCM)
  Areas of interest: Statistical Mechanics, Nonlinear Physics, Theoretical Immunology, Bayesian Statistics and Epidemiology, Forest fires.

- **Centeno Hernáez, Efraim**. Professor
  Ph.D. in Industrial Engineering (Comillas)
  Electronics Engineer (Comillas)
  Master's Degree in Coaching Psychology (UNED)
  Areas of interest: Electric power system operation models. Hydrothermal coordination. Electric power markets. Just energy transition and energy poverty.

- **Chaves Ávila, José Pablo**. Research Associate Professor
  Ph.D. in Electrical Engineering (Comillas), Ph.D. in Electrical Engineering (Delft University of Technology - TU Delft, The Netherlands)), Ph.D. in Electrical Engineering (Royal Institute of Technology - KTH, Stockholm, Sweden), Economics (University of Costa Rica), M.Sc. in Electric Power Industry (Comillas), M.Sc. in Network Industries and Digital Economics (University Paris-Sud 11, France)
  Areas of interest: Energy economics, integration of renewable resources and distributed energy resources in the electricity sector, smart grids and regulation of the electricity and other energy sectors.

- **Contreras Bárcena, David**. Associate Professor
  Ph.D. in Industrial Engineering (Comillas)
  Computing Engineer (Comillas), Postgraduate in Management Information Systems (Comillas)
  Areas of interest: Wireless Networks. Bluetooth architecture. Information Retrieval Systems. Software development. IoT, Cloud and Big Data. Blockchain.

- **Cossent Arín, Rafael**. Research Associate Professor
  Ph.D. in Industrial Engineering (Comillas)
  Electrical Engineer (Comillas)
  Areas of interest: Power system economics and regulation, energy transition, integration of renewable and distributed generation, smart grids, hydrogen and decarbonization.

- **Cuadra García, Fernando de**. Professor
  Ph.D. in Industrial Engineering (Comillas)
  Electrical Engineer (Comillas)
  Areas of interest: Large-scale modelling, simulation and optimisation problems. Knowledge engineering. Intelligent CAD. Control theory. Power systems. Railways systems. Software engineering and graphical languages for the specification of digital systems.

- **Cucala García, Asunción Paloma**. Professor
  Ph.D. in Industrial Engineering (Comillas)
  Electronics Engineer (Comillas)
  Areas of interest: Modelling, simulation, design, management and control of railway systems, and their optimisation

- **Dueñas Martínez, Pablo**. Research Assistant Professor
  Ph.D. in Industrial Engineering (Comillas)
  Electrical Engineer (Comillas)
  Areas of interest: Mathematical modeling of energy systems, bottom-up decarbonization, energy regulation and policy, energy economics.

- **Echavarren Cerezo, Francisco Miguel**. Research Associate Professor
  Ph.D. in Industrial Engineering (Comillas)
  Electrical Engineer (Comillas)
  Areas of interest: Modeling, analysis and simulation of power systems.

- **Egido Cortés, Ignacio**. Senior Associate Professor
  Ph.D. in Industrial Engineering (Comillas)
  Electronics Engineer (Comillas)
  Areas of interest: Load-frequency control and voltage control. System modeling and control. Power system stability.

- **Fernández Cardador, Antonio**. Professor
  Ph.D. in Industrial Engineering (Comillas)
  Physics Science degree (UCM)
  Areas of interest: Systems modelling, analysis and simulation. Simulation techniques for optimisation and control problems. Design, management and control of railway systems.

- **Fernández Rodríguez, Adrián**. Research Associate Professor
  Ph.D. in Engineering (Comillas)
  Electrical Engineer (UPM)
  Master's Degree in Research in Engineering Systems Modeling (Comillas)
  Areas of interest: Train simulation, energy efficiency in railway operation and nature inspired optimisation.

- **Frías Marín, Pablo**. Senior Associate Professor
  Ph.D. in Industrial Engineering (Comillas)
  Electrical Engineer (Comillas)
  Areas of interest: Operation and planning of electric power systems. Power economics. Integration of distributed generation in power systems. Advanced electric machines. Electric Vehicles and Sustainable Mobility.

- **García Cerrada, Aurelio**. Professor
  Ph.D. in Electrical and Electronics Engineering (University of Birmingham, U.K.)
  Electrical Engineer (UPM)
  Areas of interest: Power electronics. Control of electrical drives. FACTS. System identification and control.

- **García González, Javier**. Professor
  Ph.D. in Industrial Engineering (Comillas)
  Electrical Engineer (UPC)
  Areas of interest: Decision support models in the electric power industry

- **García González, Pablo**. Professor
  Ph.D. in Industrial Engineering (Comillas)
  Electrical Engineer (Comillas)
  Areas of interest: Control. Power electronics. Power electronics aplied to the electric power systems (FACTS devices, active filters, HVDC, etc.). Electric power systems stability and control.

- **Gómez San Román, Tomás**. Professor
  Ph.D. in Industrial Engineering (UPM)
  Electrical Engineer (Comillas)
  Areas of interest: Economics and regulation of the energy sector. Planning and operation of transmission and distribution electricity networks. Integration of renewable and distributed energy resources in power systems. Power quality standards and regulation. Electric vehicles. Smart grids.

- **Linares Llamas, Pedro**. Professor
  Ph.D. in Agricultural Economics (UPM)
  Agricultural Engineering degree (UPM)
  Areas of interest: Energy economics. Energy planning models. Integration of renewable energies. Environmental economics. Environmental policy instruments. Multiple criteria decision making.

- **Lobato Miguélez, Enrique**. Professor
  Ph.D. in Industrial Engineering (Comillas)
  Electrical Engineer (Comillas)
  Areas of interest: Analysis, planning, operation and economics in electric power systems.

- **López López, Álvaro Jesús**. Research Associate Professor
  PhD in Engineering (Comillas)
  Electronics degree (Comillas), M.Sc. in Automatics and Electronics (Comillas)
  M.Sc. in Research in Engineering Systems Modeling (Comillas)
  Areas of interest: Industry 4.0, Machine Learning, IoT, Railway Power Systems, Railway System Simulation, Dynamic System Control.

- **López López, Gregorio**. Associate Professor
  PhD in Telecommunications Engineering. Universidad Carlos III de Madrid.
  Areas of interest: Optimization of M2M communications networks based on analysis and simulation, cybersecurity and data analytics for the IoT, and the use of technology and the Internet.

- **López Valdés, Francisco José**. Associate Professor
  Mechanical Engineering, Mechanics Universidad de Valladolid (Spain)
  PhD. Mechanical and Aerospace Engineering. University of Virginia (USA)
  Areas of interest: Biomechanics, Injury prevention, biological tissue characterization, injury thresholds, automotive safety

- **Lumbreras Sancho, Sara**. Associate Professor
  Ph.D. in Industrial Engineering (Comillas)
  M.Sc. Systems Modelling (Comillas)
  Electrical Engineer (Comillas)
  Areas of interest: Decision methods applied to complex problems. ---Tecniques:--- decision under uncertainty, stochastic optimization, Benders' decomposition, risk analysis, heuristics, metaheuristics, genetic algorithms, ordinal optimization. ---Areas of application:--- power systems, planning, network design, transmission expansion planning, wind energy, offshore windfarm design, finance, risk analysis, derivatives.

- **Martín Martínez, Francisco**. Research Associate Professor
  Electrical Engineer (Comillas)
  Master's degree in Research in Engineering Systems Modeling (Comillas)
  Ph.D. in Industrial Engineering (Comillas)
  Areas of interest: My research focuses on demand flexibility, energy usages, optimization models, and specifically on aggregation and microgrids issues. I am developing studies in electrical systems and the impact of different energy resources. I am also working with digital electronics systems for the control and monitoring of residential consumption.

- **Mastropietro, Paolo**. Research Associate Professor
  Ph.D. in Electrical Engineering (Comillas), Ph.D. in Electrical Engineering (Delft University of Technology - TU Delft, The Netherlands)), Ph.D. in Electrical Engineering (Royal Institute of Technology - KTH, Stockholm, Sweden), M.Sc. in Environmental Engineering (University of Rome Tor Vergata, Italy), Environmental Engineer (University of Rome Tor Vergata, Italy)
  Areas of interest: Power sector regulation; Security of supply; Capacity remuneration mechanisms; regional markets; tariff design and subsidies

- **Matanza Domingo, Javier**. Associate Professor
  Ph.D. in Industrial Engineering (Comillas)
  Telecommunications Engineer (Technical University of Valencia)

Areas of interest: Signal processing. Communication systems. Power Line Communication. Wireless communications.

- **Mateo Domingo, Carlos**. Research Associate Professor
  Ph.D. in Industrial Engineering (Comillas)
  Electronics Engineer (Comillas), Computer Systems Engineer (UNED)
  Areas of interest: Models of electricity distribution networks. Integration of distributed energy resources.

- **Muñoz San Roque, Antonio**. Professor
  Ph.D. in Industrial Engineering (Comillas)
  Electrical Engineer (Comillas)
  Areas of interest: Time series forecasting. Machine learning. Application of Artificial Intelligence techniques to the operation and maintenance of industrial processes. Electricity markets analysis and optimal operation.

- **Nobrega Barroso, Luiz Augusto**. Research Affiliate
  Ph.D. in Power Engineering and Operations Research (Federal University of Rio de Janeiro - UFRJ, Brazil)
  Mathematics Science degree (Universidade Federal do Rio de Janeiro - UFRJ, Brasil)
  Areas of interest: Power system economics. Stochastic optimization. Game theory. Energy policy.

- **Olmos Camacho, Luis**. Senior Research Associate Professor
  Ph.D. in Industrial Engineering (Comillas)
  Electrical Engineer (Comillas)
  Areas of interest: Regulation of the energy sector. Transmission of electricity. Power economics. System identification.

- **Ortega Manjavacas, Álvaro**. Assistant Professor
  Ph.D. in Electrical Engineering. University College Dublin, Ireland.
  Industrial Engineering, Itinerary of Electrical, Electronic and Automation.
  University of Castilla-La Mancha, Spain.
  Areas of interest: Modeling, control and stability of energy storage systems connected to transmission and distribution systems; and frequency estimation, control and stability in low-inertia systems.

- **Palacios Hielscher, Rafael**. Professor
  Ph.D. in Industrial Engineering (Comillas)
  Mechanical Engineer (Comillas)
  Areas of interest: Advanced data analysis (including vibration analysis, optical handwritten character recognition, image processing, artificial intelligence and data mining). Parallel processing. Thermoelectric applications. Failure detection and maintenance. Aviation safety. Cybersecurity.

- **Pizarroso Gonzalo, Jaime**. Assistant Professor
  Electromechanical Engineer. Universidad Pontificia Comillas.
  Master's Degree in Industrial Engineering (MII) and Master's Degree in Smart Industry (MIC). Universidad Pontificia Comillas.
  Areas of interest: Artificial Intelligence, Machine Learning, Explainable Artificial Intelligence.

- **Portela González, José**. Associate Professor
  PhD in Engineering (Comillas), Electronics Engineer (Comillas), M.Sc. in Research in Engineering Systems Modeling (Comillas)
  Areas of interest: Functional Data Analysis, Machine Learning, Neural Networks, time series models

- **Ramos Galán, Andrés**. Professor
  Ph.D. in Industrial Engineering (Universidad Politécnica de Madrid)
  Electrical Engineer (Universidad Pontificia Comillas)
  Areas of interest: Development of new algorithms and computer implementation. Modeling of complex systems. Mathematical techniques of operations research and their application to large-scale problems. Large-scale optimization techniques. Stochastic optimization. Benders decomposition. Planning and operation of electric energy systems -models for generation and transmission network planning, generation operation models-. Economy of the electric sector. Computational techniques and analytical methods for planning, operations, and control. Economics, market organization, cost structures, pricing, and risk management. Reliability, uncertainty, and probability, and stochastic system applications. Emerging methods for restructured systems. Generation system resource planning. Transmission system planning. Industry restructuring planning and policy issues.

- **Rivier Abbad, Michel**. Professor
  Ph.D. in Industrial Engineering (Comillas)
  Electrical Engineer (Comillas)
  Areas of interest: Electric power systems analysis, optimisation, regulation economic, operation and planning. Optimisation techniques.

- **Roch Dupré, David**. Associate Professor
  Ph.D. (with International Mention) in Engineering Systems Modeling.(Comillas)
  Electromechanical Engineer. (Comillas)
  M.Sc. in Industrial Engineering. (Comillas)
  Official Master's Degree in Research in Engineering Systems Modeling (MRE) (Comillas)
  Areas of interest: Socioeconomic indicators. Longevity Economy. Modeling, simulation, and optimization. Energy efficiency in electrified railway systems.

- **Rodilla Rodríguez, Pablo**. Senior Research Associate Professor
  Ph.D. in Industrial Engineering (Comillas)
  Electrical Engineer (Comillas)
  Areas of interest: Fundamental and quantitative electricity market modeling. Market design and regulation for wholesale electricity markets. Competition and strategic behavior analysis. Security of supply mechanisms in competitive power systems. Regulatory mechanisms focused on environmental policies

- **Rodríguez Mondéjar, José Antonio**. Associate Professor
  Ph.D. in Industrial Engineering (Comillas)
  Electronics Engineer (Comillas)
  Areas of interest: Communication and control in electric power systems and railway systems.

- **Rodríguez Santana, Simón**. Assistant Professor
  Bachelor's degree in Physics. Universidad Autónoma de Madrid.
  Master's degree on Theoretical Physics. Universidad Complutense de Madrid.
  PhD in Mathematical Engineering, Statistics and Operations Research.
  Universidad Complutense de Madrid.
  Areas of interest: Probabilistic Machine Learning, Bayesian Statistics, Approximate Inference, Operations Research

- **Rodríguez-Morcillo García, Carlos**. Research Associate Professor
  Ph.D. in Industrial Engineering (Comillas)
  Electronics Engineer (Comillas)
  M.Sc. in Communication Technologies and Systmes (UPM)
  Areas of interest: Embedded systems. Digital systems. Autonomous systems (batteries). HW design. PCB design. PCB manufacturing. Digital communications (wired and wireless). Communication protocols. Programmable logic. Microcontrollers programming.

- **Romero Mora, José Carlos**. Assistant Professor
  PhD in Engineering (Comillas)
  Electrical and Power Systems Engineer (University of Malaga), M.Sc. in Research in Engineering Systems Modeling (Comillas)
  Areas of interest: Energy Sustainability; Fuel Poverty; Energy Transition

- **Rouco Rodríguez, Luis**. Professor
  Ph.D. in Industrial Engineering (UPM)
  Electrical Engineer (UPM)
  Areas of interest: Modelling, simulation, simulation, control and identification of electric power systems

- **Sánchez Fornié, Miguel Ángel**. Research Associate
  Electromechanical Engineer de ICAI (Comillas)
  Nuclear Security Diploma (MIT)

Areas of interest: Power engineering. Power systems regulation. Power systems planning and operation.
Power systems asset management. Smart grids. Telecommunications systems and operations. Telecommunications for power systems. Cybersecurity, Big data analysis and artificial intelligence on power systems.

- **Sánchez Martín, Pedro**. Senior Associate Professor
  Ph.D. in Industrial Engineering (Comillas)
  Industrial Engineer (Comillas)

  Areas of interest: Transmission and generation electric system modeling. Industrial process planning and scheduling. Work system design. Manufacturing and logistics simulation

- **Sánchez Miralles, Álvaro**. Senior Associate Professor
  Ph.D. in Industrial Engineering (Comillas)
  Electronics Engineer (Comillas)

  Areas of interest: Smart grids. Smart cities. Security systems. Mobile robotics.

- **Sánchez Pérez, Pablo**. Assistant Professor
  Bachelor degree in Computer Science. Universidad Autónoma de Madrid.
  Master's degree in Research and Innovation in Information and Communication Technologies. Universidad Autónoma de Madrid.
  PhD degree in Computer and Telecommunication Engineering. Universidad Autónoma de Madrid.

  Areas of interest: Machine learning, recommender systems, information retrieval.

- **Sánchez Úbeda, Eugenio Francisco**. Senior Associate Professor
  Ph.D. in Industrial Engineering (Comillas)
  Electronics Engineer (Comillas)

  Areas of interest: Machine learning – Forecasting – Data analysis and visualization - Non-linear statistical modeling - Deep learning

- **Sanz Bobi, Miguel Ángel**. Professor
  Ph.D. in Industrial Engineering (UPM)
  Electrical Engineer (UPM)

  Areas of interest: Life condition monitoring and analysis of industrial processes. Modeling and simulation of the expected behavior of industrial components. Artificial Intelligence: knowledge-based systems, fuzzy logic, machine learning algorithms, reinforcement learning. Techniques for incipient detection of failure modes and risk assessment. Reliability. Predictive Maintenance. Asset Management. Image and voice treatment.

- **Sigrist, Lukas**. Research Associate Professor
  Ph.D. in Industrial Engineering (Comillas)
  Electrical and Electronics Engineer (École Plytechnique Fédérale de Lausanne - EPFL, Switzerland)
  Areas of interest: Modeling, analysis and control of electric power systems. Energy Systems Models.

- **Troncia, Matteo**. Research Assistant Professor
  Ph.D. in Industrial Engineering (University of Cagliari), M.Sc. in Electrical Engineering (University of Cagliari), B.Sc. in Electrical Engineering (University of Cagliari)
  Areas of interest: Electricity markets, system service markets, energy economics, integration of renewable and distributed energy resources in the electricity sector, smart grids, techno-economic appraisal and cost-benefit analysis for initiatives concerning the electricity sector, power system planning and operation.

- **Varo García, María del Valle**. Assistant Professor
  Bachelor's degree in Physics. Imperial College London.
  Master's degree in Theoretical Physics and Cosmology. Instituto de Física Teórica.
  PhD in Applied Mathematics. Universidad Carlos III de Madrid.

- **Ventosa Rodríguez, Mariano**. Professor
  Ph.D. in Industrial Engineering (Comillas)
  Electronics Engineer (Comillas)
  Areas of interest: Application of operations research in electric energy markets. Smart industry.
  Generative Artificial Inteligence.

- **Wuebben, Daniel Lewis**. Assistant Professor
  Ph.D. Doctor of Philosophy in English. City University of New York. EE.UU.
  Bachelor in English. Hunter College CUNY. EE.UU.
  Areas of interest: Energy Humanities, Communication of Climate Science and Energy Transitions, Ecocriticism, Community Engagement with Smart Grids, history of AI

- **Zamora Macho, Juan Luis**. Senior Associate Professor
  Ph.D. in Industrial Engineering (Comillas)
  Electronics Engineer (Comillas)
  Areas of interest: Drive control. System identification. Signal processing.

2.6 Associated academic staff

The following professors have collaborated with IIT as Associate Researchers:

- **Alfaya Sánchez, David**. Assistant Professor
  PhD in Mathematics . Universidad Autónoma de Madrid (UAM)
  Bachelor Degree in Mathematics. Universidad Autónoma de Madrid (UAM)
  Education, Culture and Sports).
  Computer Science Engineer. Universidad Autónoma de Madrid (UAM)
  Master in Mathematics and Applications . Universidad Autónoma de Madrid (UAM)
  Master in Research and Innovation in Communications and Information Technologies. Universidad Autónoma de Madrid (UAM)

  Areas of interest: Pure and applied mathematics.
  Study of the geometry of moduli spaces (specially moduli of decorated bundles including, among others, Higgs bundles, connections and parabolic structures). Information Retrieval, Information Geometry, Blockchain technologies and interactions between Artificial Intelligence and Mathematics.

- **Alonso Rivas, Eduardo**. Assistant Professor
  Electronics Engineer (Comillas)
  Automatics and Electronics degree (Comillas)
  M.Sc. in Research in Engineering Systems Modeling (Comillas)
  Ph.D. in Industrial Engineering (Comillas)

  Areas of interest: Biomedical electronics. Digital systems.

- **Arenas Pinilla, Eva María**. Associate Professor
  Ph.D. in Industrial Engineering (Comillas)
  Mechanical Engineer (Comillas)
  MSc Thermal Power and Fluids Engineering (University of Manchester. Institute of Science and Technology)

  Areas of interest: S-CO2 turbomachinery, hydro-powered pumping, hydraulic turbomachinery, energy poverty

- **Ayala Santamaría, Pablo**. Assistant Professor
  Ph.D. in Industrial Engineering (Comillas, Mechanical Engineer (Comillas),
  Master's degree in Research in Engineering Systems Modeling (Comillas)

  Areas of interest: CFD, fire modelling, fire protection installation, smoke movement

- **Ballesteros Iglesias, Yolanda**. Associate Professor
  Ph.D. in Chemistry Science (UAM)
  Chemistry Science degree (UAM)

  Areas of interest: Materials. Environment. Biomaterials. Nondetructive testintg (NDT). Adhesives.

- **Boal Martín-Larrauri, Jaime**. Associate Professor
  Ph.D. in Engineering Systems Modeling (Comillas ICAI)
  M.Sc. in Research in Engineering Systems Modeling (Comillas ICAI)
  Electronics Engineer (Comillas ICAI)
  Areas of interest: Autonomous mobile robots · Computer vision · Reinforcement learning · Internet of Things (IoT) · Industry 4.0 · Energy efficiency and flexibility

- **Cantizano González, Alexis**. Senior Associate Professor
  Ph.D. in Industrial Engineering (Comillas)
  Mechanical Engineer (Comillas), M.Sc. in Thermal Power and Fluids Engineering (University of Manchester Institute of Science and Technology - UMIST, U.K.), Psychology degree (UNED)
  Areas of interest: Fire Protection Engineering, Fire Dynamics, Computational Fluid Dynamics (CFD), Hydraulic and Thermal Turbomachines

- **Carnicero López, Alberto**. Senior Associate Professor
  Ph.D. in Industrial Engineering (Comillas)
  Mechanical Engineer (Comillas)
  Areas of interest: Numerical methods in engineering. Railway Catenary. Catenary-pantograph dynamic interaction

- **Cifuentes Quintero, Jenny Alexandra**. Assistant Professor
  Mechatronic Engineering (Universidad Nacional de Colombia).
  Master in Industrial Automation (Universidad Nacional de Colombia).
  Phd in Engineering- Mechanical and Mechatronic Engineering (Universidad Nacional de Colombia).
  Phd in Automation (Institute National des Sciences Appliquées de Lyon-France)
  Areas of interest: Modeling and analysis of dynamical systems, signal processing and pattern recognition using machine learning strategies.

- **Cledera Castro, Mª del Mar**. Associate Professor
  Industrial Engineer. Universidad Politécnica de Madrid.
  Ph.D. in Industrial Engineering. Universidad Pontificia Comillas.
  Areas of interest: Energy and Environment. Materials.

- **Fernández Bernal, Fidel**. Senior Associate Professor
  Ph.D. in Industrial Engineering (Comillas)
  Electrical Engineer (Comillas)
  Areas of interest: Electric Machines and Electric Drives, Electrical Generation, Renewable Generation, Wind Generation.

- **Figuerola-Ferreti Garrigues, Isabel Catalina**. Associate Professor
  Bachelor of Science in Economics. Queen Mary, University of London.
  Master in Economics. London School of Economics.
  PhD in Financial Economics. Queen Mary.University of London.

Areas of interest: Financial Econometrics, energy markets, commodity markets, Green Finance and ESG investment, risk management volatility and trading strategies.

- **Giannetti, Romano**. Professor
  Ph.D. in Electronics and Computing Engineering (University of Padua, Italy)
  Electronics Engineer (University of Pisa, Italy)
  Areas of interest: Measurement instrumentation and methodology. Biomedical instrumentation. Noise measurements.

- **González Arechavala, Yolanda**. Associate Professor
  Ph.D. in Industrial Engineering (Comillas)
  Computing Engineer (UPV-EHU)
  Areas of interest: Software engineering: software development process, programming paradigms, software quality assurance and control, CASE tools. RAMS: standards and analysis. Safety-critical and real time systems. Railway systems. Sustainability assessment of energy generation using LCA. Promotion of STEM vocations in women and provoke a change in trend.

- **Herraiz Martínez, Francisco Javier**. Associate Professor
  Engineer and Ph.D. degrees in Telecommunications. Carlos III University of Madrid (Spain)
  Areas of interest: Passive sensors and RFID systems. Electromagnetic metamaterials. Antennas. Microwave circuits.

- **Jiménez Octavio, Jesús**. Senior Associate Professor
  PhD Industrial Engineering (Universidad Pontificia Comillas)
  MSc Mechanical Engineering (Universidad Pontificia Comillas)
  Areas of interest: Computational mechanics; Biomechanics; Road Safety; Odontology

- **Laloux Dallemagne, Damián**. Associate Professor
  Ph.D. in Industrial Engineering (Comillas)
  Electrical Engineer (Comillas)
  Areas of interest: Modelling, analysis and control of electric power systems. Sustainable development.

- **López de Armentia Hernández, Sara**. Assistant Professor
  Bachelor Degree in Industrial Technology Engineering. Universidad Politécnica de Madrid.
  Master Degree in Materials Science and Engineering. Universidad Carlos III de Madrid.
  Areas of interest: Biomaterials, Composite materials, Nanocomposites, Carbon based materials, Additive manufacturing, Mechanical Characterisation.

- **Martínez Vílchez, Oibar**. Assistant Professor
  PhD in Physics: Complutense University of Madrid.
  Master's Degree in Teaching Compulsory Secondary Education, Upper Secondary Education, Vocational Training and languages: International University of La Rioja.
  Master's Degree in New Electronic and Photonic Technologies: Complutense University of Madrid.
  Physics Degree. Complutense University of Madrid.

- **Megía Macías, Ana María**. Assistant Professor
  Doctoral Degree in Science and Technology Applied to Industrial Engineering. Universidad de Castilla - La Mancha.

  Areas of interest: Production, diagnosis and applications of plasmas. --- Techniques: --- Plasmas for ion sources, cold atmospheric plasma, diagnostic tools with temporal resolution. --- Areas of application: --- Ion sources, particle beam medical therapies, surface cleaning and treatment, disinfection, plasma medicine.

- **Mochón Castro, Luis Manuel**. Associate Professor
  Ph.D. in Industrial Engineering (Comillas)
  Mechanical Engineer (Comillas)

  Areas of interest: Computacional fluid dynamic. Fluid control. Hydraulic energy. Heat transfer. Olehidraulic systems.

- **Mompó Pavesi, Emanuel Gastón**. Assistant Professor
  Ph.D. Mathematical Engineering, Universidad Carlos III de Madrid.
  M.Sc. Industrial Mathematics, Universidad Carlos III de Madrid.
  M.Sc. on Mathematics Teaching, Universidad Nacional de Educación a Distancia.
  B.Sc. & M.Sc. Mathematics, Universitat de València.

  Areas of interest: Non-linear dynamical systems. Statistical mechanics out of equilibrium. Complex systems.

- **Morales Contreras, Manuel Francisco**. Associate Professor
  Industrial Engineer ICAI, master in Mechanics
  PhD Economics and Business Administration ICADE

  Areas of interest: Sustainability and global supply chain management; lean and efficient operations; process innovation; hospitality and healthcare sectors.

- **Morales Polo, Carlos**. Assistant Professor
  Industrial Engineer.Comillas Pontifical University.
  PhD. Industrial Engineer. Comillas Pontifical University

  Areas of interest: Waste management and treatment. Water technologies. Energy use. Environmental Impact Study through Life Cycle Assesment.

- **Muñoz Frías, José Daniel**. Associate Professor
  Ph.D. in Industrial Engineering (Comillas)
  Electronics Engineer (Comillas)
  Areas of interest: Digital systems design. Computer architecture. Motor drives control. Design of embbedded systems for automatic control applications.

- **Paz Jiménez, Eva**. Assistant Professor
  PhD in Engineering (Comillas)
  Industrial Technical Engineering in Industrial Chemistry (UPM), M.Sc. in Production Engineering (UPM)
  Areas of interest: Biomaterials, Bone cements, Composite materials, Nanocomposites, Carbon based nanomaterials, Mechanical Characterisation.

- **Real Romero, Juan Carlos del**. Senior Associate Professor
  Ph.D. in Industrial Engineering (Comillas)
  Industrial Engineer (Comillas)
  Areas of interest: Adhesive bonding: adhesives suitable for each application; mechanical characterization of adhesive bonding; durability studies and failure modes; surface treatments to improve durability of the adhesive joints. Composites: preparation of polymer matrix composites reinforced by micro and nanoparticles; mechanical characterization; thermal analysis; applications as coatings; biomedical applications. Carbon based nanomaterials. Nanocomposites

- **Rodríguez Pecharromán, Ramón**. Senior Associate Professor
  Ph.D. in Industrial Engineering (Comillas)
  Electronics Engineer (Comillas)
  Areas of interest: Control systems. Railway electrification. Thermoelectricity.

- **Sáenz Nuño, María Ana**. Assistant Professor
  Ph.D. in Industrial Engineering (Comillas)
  Physics Science degree (UCM)
  Areas of interest: Dimensional metrology.

- **Sánchez Merchante, Luis Francisco**. Assistant Professor
  Telecommunications Engineer (Universidad Politécnica de Madrid)
  Master's degree in Multimedia and Communications (Universidad Carlos III de Madrid)
  PhD in Information Technology (Universidad Tecnológica de Compiègne)
  Areas of interest: Advanced analytics on Big Data platforms
  Machine Learning
  Smart cities

- **Santos Montes, Ana María**. Senior Associate Professor
  Ph.D. in Chemistry Science (UCM)
  Chemistry Science degree (UAM)

Areas of interest: Development, optimization and validation of chromatographic analytical methods for high-performance liquid chromatography (HPLC) to determine steroids, diuretics and contaminants in urine samples, feed and water. Analysis of the life cycle of crops for biofuels.

- **Valor Martínez, Carmen**. Professor
  Ph.D. in Information Sciences. Universidad Complutense de Madrid.
  Master in Business Administration (MBA). Universidad Carlos III de Madrid.
  MSc Business and Community. University of Bath.
  Areas of interest: Sustainable Consumption. Sustainable brands. Innovation for sustainability. Collaborative consumption. Social Change.

2.7 Pre- and postdoctoral fellows

The Research Assistants (PhD students and post-docs) that developed their activity at the IIT during the academic course 2023 - 2024 were the following ones:

- **Alvarez Quispe, Erik Francisco**. Bachelor's Degree in Mechanical and Electrical Engineering. National University of Engineering (Peru).
  Master's Degree in Electrical Engineering. State University of Campinas (Brazil).
- **Asensio Gil, Juan Manuel**. Master´s Degree in Engineering for Mobility and Safety. Universidad Pontificia Comillas.
  Master´s Degree in Industrial Engineering (Mechanical Engineering). Universidad Pontificia Comillas.
  Bachelor's Degree in Industrial Engineering (Mechanical Engineering). Universidad Pontificia Comillas.
  Bachelor's Degree in Higher Artistic Music Education. Real Conservatorio Superior de Música de Madrid.
- **Ávila Martínez, Régulo Enrique**. Bachelor Degree in Electrical Engineering. University of Oriente. Venezuela.
  Master degree in Renewable Energies in Electrical Systems. Carlos III University of Madrid.
  Ph.D. degree in Power Systems. Universidad Pontificia Comillas.
- **Baños Ramos, Andrea**. Degree in Economics. Carlos III University of Madrid.
  Master's Degree in Economics. Carlos III University of Madrid.
- **Barruso Recuero, Miguel Angel**. Bachelor's Degree in Engineering for Industrial Technologies. Universidad Pontificia Comillas.
  Official Master's Degree in the Electric Power Industry (MEPI). Universidad Pontificia Comillas.
  Master's Degree in Industrial Engineering (MII). Universidad Pontificia Comillas.
- **Bellido López, Francisco Javier**. Degree in Industrial Technologies. Universidad Politécnica de Madrid.
  Master in Industrial Engineering. Universidad Politécnica de Madrid.
  Master in Electrical Engineering. Universidad Politécnica de Madrid.

- **Benítez Domínguez, Álvaro**. Master in Aerospace Engineering. Universidad Carlos III de Madrid.
  Máster de Energías Renovables y Medio Ambiente. Universidad Politécnica de Madrid.
- **Bindu, Shilpa**. Bachelor's degree in Electrical and Electronics Engineering from National Institute of Technology (NIT) - Calicut, India.
  EIT- Innoenergy double Master's degree in Energy for Smart Cities at KTH Royal Institute of Technology Stockholm and Universidad Politécnica de Catalunya (UPC) Barcelona.
- **Blanco Castillo, Manuel**. Bachelor's Degree in Mechanical Engineering. University of Jaén.
  Master's Degree in Industrial Engineering. University of Málaga.
- **Brito Pereira, Paulo**. Degree in Electrical Engineering and Masters Degree in Industrial Engineering (University of Las Palmas of Gran Canaria).
  Masters Degree in the Electric Power Industry (Comillas Pontifical University).
- **Coll Franck, Anne Maren**. Bachelor's Degree in Industrial Technologies Engineering. University Carlos III of Madrid.
  Master's Degree in Industrial Mathematics. University Carlos III of Madrid.
- **Cubillo LLanes, Diego**. Bachelor's Degree in Engineering for Industrial Technologies. Comillas Pontifical University
  Official Master's Degree in Industrial Engineering. Comillas Pontifical University.
- **Díaz Pastor, Santos José**. Industrial Engineering. Polytechnic University of Madrid and the Karlsruher Institut für Technologie (KIT.
  Master's Degree in Industrial Engineering and the Master's Degree in the Power Sector. Universidad Pontificia Comillas.
- **Domínguez Gago, María**. Industrial Engineer. Universidad Pontificia Comillas.
  Ph.D. in Industrial Engineering. Universidad Pontificia Comillas.
- **Elabbas, Mohamed Abbas Eltahir**. Bachelor of Science in Electrical and Electronic Engineering. University of Khartoum, Sudan.
  Master of Sustainable Energy Technology. Delft University of Technology, The Netherlands.
- **Fernández Palomino, Luis Jesús**. Bachelor in Industrial Technologies Engineering. Universidad Carlos III de Madrid. Master in Industrial Mathematics. Universidad Carlos III de Madrid.
- **Galici, Marco**. PhD in Industrial Engineering. University of Cagliari, Italy
  Master Degree in Electrical Engineering. University of Cagliari, Italy
  Bachelor Degree in Electrical, Electronic and Computer Science Engineering. University of Cagliari, Italy.
- **García Aguilar, Javier**. Master's Degree in Industrial Engineering. Universidad P. Comillas
- **Gegúndez Nogueroles, Fernando**. Degree in Industrial Engineering. Polytechnic University of Madrid.
  Master's degree in Industrial Engineering. Polytechnic University of Madrid.

- **Gesteira Miñarro, Roberto**. BSc. in Telecommunication Engineering (ICAI)
  MSc. in Telecommunication Engineering (ICAI)
  MSc. in Cybersecurity (ICAI)
- **Gomes Soares Alcalá, Symone**. Ph.D. degree in Electrotechnical and Computer Engineering. University of Coimbra, Portugal,
  BSc degree in Computer Engineering. Pontifícia Universidade Católica de Goiás, Brazil.
- **Gómez González, Juan Luis**. Bachelor's degree in Physics. University of Seville.
  Master´s degree in Physics of Complex Systems. University of the Balearic Islands.
- **Gómez Pérez, Jesús David**. Electrical engineer and M.Sc. in electrical engineering. Universidad Tecnológica de Pereira (Colombia)
- **Gómez Pérez, María del Socorro**. Electrical Engineer and Master in Electrical Engineering. Universidad Tecnológica de Pereira (Colombia).
  Specialist in Analytics. Universidad Nacional de Colombia.
- **Gómez Sánchez, Stefanía**. Degree in Industrial Engineering. (Escuela Colombiana de Ingeniería Julio Garavito, Colombia)
  Master's Degree in Optimization. (Universidad Autónoma Metropolitana, México)
- **Güitta López, Lucía**. Degree in Electromechanical Engineer (Comillas)
  Master's Degree in Industrial Engineering (Comillas)
  Master in Smart Industry (Comillas)
- **Gutiérrez Guerra, Juan Francisco**. Chemical Engineering Degree. Instituto Tecnológico de Buenos Aires (Argentina).
  M.Sc. in Mechanical Engineering, Energy and Environment. Karlsruher Institut für Technologie (Germany).
  Master in Energy and Environment. Instituto Tecnológico de Buenos Aires (Argentina).
- **Herding, Leslie**. Bachelor of Engineering. Technische Hochschule Köln (Germany).
  Master in Research in Energy Efficiency and Sustainability in Industry, Transport, Construction and Town Planning. UPV/EHU (Bilbao).
- **Herrero Rozas, Luis Alberto**. Degree in Chemical Engineering. Universidad de Cantabria.
  Master's degree in Chemical Engineering. (Universidad de Cantabria (UC) and Universidad del País Vasco (UPV/EHU)
- **Insunza Díaz, Eloy Jesús del Gran Poder**. Industrial Engineering Master's Degree. Universidad Politécnica de Madrid.
  Generalist Engineer. École Centrale de Lyon.
  Industrial Technologies Engineering Degree. Universidad Politécnica de Madrid.
- **Labora Gómez, Francisco**. Bachelor's degree in Industrial Technologies. Universidad Pontificia Comillas.
  Master's degree in Industrial Engineering. Universidad Pontificia Comillas.

- **Lefranc, Léonard**. Master's Degree in General Engineering. École Centrale Paris.
  Master's Degree in Industrial Engineering. Universidad Pontificia Comillas.
  Master's Degree in Business Administration (MBA). Universidad Pontificia Comillas.
- **Mansouri, Seyedamir**. MSc and PhD degrees in Electrical Engineering. Islamic Azad University. Teherán. (Irán)
- **Martínez Velázquez, Miguel**. Bachelor's Degree in Engineering for Industrial Technologies.Comillas Pontifical University
  MSc in Wind Energy. Technical University of Denmark (DTU)
  Official Master's Degree in Industrial Engineering. Comillas Pontifical University
- **Marulanda García, Geovanny Alberto**. Electrical Engineer, Universidad Tecnológica de Pereira (Colombia)
  Master in Electrical Engineering, Universidad Tecnológica de Pereira (Colombia)
- **Mohammed Nour, Morsy Abdelkader Morsy**.
  Bachelor's degree in Electrical Engineering. Aswan University, Aswan, Egypt.
  Master's degree in Electrical Engineering. Budapest university of Technology and Economics, Budapest, Hungary.
- **Montero Guirao, Luis Manuel**. Bachellor's degree in Chemical Engineering from the Universidad de Granada.
  Master's degree in Chemical Engineering from the Universidad de Salamanca.
- **Morán Camacho, María**. Industrial Engineering. Energy Speciality. University of Seville.
- **Moreno, Valeria Karina**. Industrial Engineer . National Technological University (Argentina).
  Master's Degree in Energy Engineering. Polytechnic University of Catalonia (Spain)
- **Navarrete Cruz, Diana María**. Master degree in Data Mining and Business Intelligence (Complutense University of Madrid)
  Industrial Engineering (Universidad del Valle. Colombia)
- **Nemati, Hadi**. B.Sc. degree in Electrical Engineering (Shiraz University)
  M.Sc. degrees in Electrical Engineering (Isfahan University of Technology)
- **Ormeño Mejía, Eliana Carolina**. Bachelor's degree in Electrical Engineering. Escuela Superior Politécnica del Litoral (ESPOL), Guayaquil-Ecuador.
  Master's Degree in Energy Engineering. Universidad Politécnica de Madrid.
  Diploma in Electricity Markets of the Future and its Regulation. Pontificia Universidad Católica of Chile.
- **Oviedo Gómez, Andrés Felipe**. PhD in Engineering (2023), Universidad del Valle, Cali, Colombia.
  MSc Applied Economics (2017), Universidad del Valle, Cali, Colombia.
  BSc in Electronic Engineering (2014), Pontificia Universidad Javeriana, Cali, Colombia.

- **Paolis Robles, Carlo de**. Bachelor's Degree in Electromechanical Engineering. Comillas Pontifical University.
  Master's Degree in Industrial Engineering. Comillas Pontifical University.
- **Peña Yunda, Samuel**. Mechatronics engineer – Nueva Granada Military University (Bogota, Colombia)
  Master in Energy – KU Leuven (Leuven, Belgium)
  Master in energy for smart cities – KTH Royal Institute of Technology (Stockholm, Sweden).
- **Pérez Bravo, Manuel**. Graduado en Ingeniería de Tecnologías Industriales. Universidad de Sevilla
  Máster Universitario en Ingeniería Industrial. Universidad de Sevilla
- **Pérez Sánchez, Jaime**. Degree in Telecommunication Technologies and Services Engineering, by the Universidad Politécnica de Madrid (2013-2018)
  Master's Degree in Telecommunications Engineering, by the Universidad Politécnica de Madrid (2018-2020)
- **Polo Molina, Alejandro**. Master in Big Data & Visual Analytics. Universidad Internacional de La Rioja.
  Master in Big Data & Advanced Analytics. Universidad Pontificia Comillas.
  Degree in Mathematics. Universidad de Granada.
- **Rajabdorri, Mohammad**. Bachelor's degree of Electrical Power Engineering. Shiraz University, Iran.
  Master's in Electrical Power Systems. Shiraz University of Technology, Iran.
- **Rajora, Gopal Lal**. Master in applied Telecommunication & Engineering Management. Polytechnic University of Catalonia
  Master of Science in Finance. University of Siena.
  Bachelor of Technology in Electronics Instrumentation & Control. Rajasthan Technical University.
- **Reneses Botija, María**. Degree in Psychology. Universidad Complutense de Madrid.
  Degree in Anthropology. Universidad Autónoma de Madrid.
  Master's degree in Psychoanalysis and Philosophy of Culture . Universidad Complutense de Madrid.
  Master's degree in Secondary Education. Universidad Camilo José Cela.
- **Rezaeian-Marjani, Saeed**. Ph.D. in Electrical Power Engineering. Urmia University (Urmia, Iran)
  M.Sc. in Electrical Power Engineering. Urmia University (Urmia, Iran)
  B.Sc. in Electrical Power Engineering. Urmia University (Urmia, Iran)
- **Rico Díez, Olga**. Telecommunication Technologies and Systems Engineering degree. Universidad Politécnica de Madrid.
  Master's degree in Biomedical Engineering. Universidad Politécnica de Madrid.
- **Ríos Ocampo, Miguel Angel**. B.Sc and M.Sc in Electrical Engineering. Technological University of Pereira (UTP).

- **Rodrigo Tobías, Ignacio de**. Bachelor´s Degree in Electromechanical Engineering (Comillas Pontifical University)
  Official Master´s Degree in Industrial Engineering (Comillas Pontifical University)
  Master of Engineering in Mobility and Safety (Comillas Pontifical University)
- **Rodríguez Cuenca, Francisco**. Degree in Software Engineering. Polytechnic University of Madrid.
  Master's degree in Big Data and Advanced Analytics. Comillas Pontifical University.
- **Rodríguez Matas, Antonio Francisco**. Degree in Industrial Engineering (University of Seville)
  Master's Degree in Economics (Complutense University of Madrid)
  Master's Degree in Energy Management (Repsol)
- **Rodríguez Pérez, Néstor**. Universitary Master's Degree in Industrial Engineering - Pontifical University of Comillas, ICAI (2020)
  Master in Smart Grids - Pontifical University of Comillas, ICAI (2020)
  MSc in Smart Grids - University of Strathclyde (2020)
  Bachelor's Degree in Electromechanical Engineering - Pontifical University of Comillas, ICAI (2018)
- **Rodríguez Vilches, Rubén**. Bachelor's Degree in Mechanical Engineering. Universitat Politècnica de València. Master's Degree in Energy Engineering. Universitat Politècnica de Catalunya.
- **Ruiz Hernández, Miguel Ángel**. Bachelor´s degree in Industrial Engineering. University Carlos III of Madrid.
  MsC in Industrial Engineering. University of Puerto Rico.
- **Sarvarizadeh Kouhpaye, Miad**. Bachelor in Electrical Engineering. Shiraz University (Irán).
  Master in Electrical Power Systems. Shiraz University of Technology (Irán).
- **Segarra Tamarit, Ignacio**. BSc in Mathematics
  MSc in Banking and Quantitative Finance
- **Serna Zuluaga, Santiago**. Bachellor's degree in Chemichal Engineering. Rey Juan Carlos University.
  Master's degree in Chemichal Engineering. Autonomous University of Madrid and the Rey Juan Carlos University.
- **Sofokleous, Paraskevas**. Bachelor´s degree in Physics (Aristotle University of Thessaloniki, Greece)
  Master´s degree in Nanoscale Engineering (University of Lyon, France)
- **Sonowal, Devashish**. Bachelor's and Master's degrees in Mathematics. National Institute of Science Education and Research (NISER).
  Master's degree in Computational and Applied Mathematics. Universidad Carlos III de Madrid.
- **Stampatori, Daniele**. Energy engineer. University of Padua (Italia)
- **Suárez Porras, Jorge**. Degree in Engineering in Industrial Technologies. Universidad Pontificia Comillas.
  Master's degree in Energy Engineering. Aalborg University (AAU), Denmark.

- **Tomás Martín, Andrés**. University Degree in Communications Electronic Engineering. Complutense University of Madrid.
  Master's Degree in Energy. Complutense University of Madrid.
- **Valarezo Rivera, Orlando Mauricio**. Bachelor's degree in Electrical Engineering (Escuela Superior Politécnica del Litoral - ESPOL)
  Master's degree in Power System and its Automation (Shandong University)
  Master's degree in Computational Engineering and Mathematics (Universitat Rovira i Virgili)
- **Valdano, Manuel**. Mechanical Engineering. Universidad Nacional de Rio Cuarto (Argentina).
- **Verdugo Rojas, Norma Carolina**. Degree in Comercial Engineering. Universidad Técnica Federico Santa María, Valparaiso, Chile.
  Master's degree in Business Administration. Universidad Técnica Federico Santa María, Chile.
- **Vilaça Gomes, Phillipe**. Bachelor's Degree in Electrical Engineering. Federal University of Juiz de Fora, Brazil.
  Ph.D. Degree in Electrical and Computer Engineering. University of Porto, Portugal.
- **Vives Torres, Carmen María**. Bachelor's Degree in Engineering for Industrial Technologies. Comillas Pontifical University.
  Official Master's Degree in Industrial Engineering. Comillas Pontifical University.
  Master of Engineering in Mobility and Safety. Comillas Pontifical University.
- **Zuluaga Ríos, Carlos David**. B.Sc and M.Sc in Electrical Engineering. Universidad Tecnológica de Pereira(Colombia).
  Ph.D. in Electrical Engineering. Universidad Tecnológica de Pereira(Colombia).

2.8 Services staff

2.8.1 Systems administrator staff

The staff responsible for managing networks and computer systems consists of:

- **Lázaro Martín, Marco Antonio**. Technical Engineer in Management Computing
- **Martín Tena, Julián**. Computer Expert

2.8.2 Administrative staff

The staff that manage the documentation, the general and technical secretariat and the trips consist of:

- **García Lecuona, Paula**. Degree in Hispanic Philology (Universidad Complutense de Madrid)
- **Ruiz González-Mateo, Cristina**. Law and Legal Advisor Companies degree (Comillas)

- **Sánchez Alfayate, María Belén**. Social Education Diploma (Universidad Complutense de Madrid)
- **Sánchez Ortega, María Isabel**. Librarianship and Information Science Diploma (University of Granada)
- **Tamudo González, Isabel**. Criminology degree (UEM), Criminology diploma (UCM)

3. Research

3.1 Research areas

The IIT is divided into nine research areas.

3.1.1 Electric Power Systems (MAC)

Area dedicated to the development of computer tools for electrical studies related to such aspects as load flows, stability, transients, frequency-power control, power plant regulators, voltage control, design of systems of electric feeding, protection, harmonics, and the impact of the distributed generation.

Coordinator: Luis Rouco Rodríguez
Web page: https://www.iit.comillas.edu/research-area/mac

3.1.2 Smart and Sustainable Grids (REDES)

The Smartgrids and RES integration Group investigates the challenges of future power systems from a technical, economic and regulatory perspectives. On the one hand, it covers the techno-economic evaluation of the impact of distributed energy resources in distribution networks (such as distributed generation, demand management, electric vehicles and storage). Based on the cost & benefit and scalability & replicability analysis different proposals for standards and regulation are presented. On the other hand, the research in this area also covers the impact of high levels of renewable energy penetration in power systems, and new market and ancillary services designs for their optimal integration.

Coordinator: Carlos Mateo Domingo
Web page: https://www.iit.comillas.edu/research-area/redes

3.1.3 Energy Economics and Regulation (RYE)

Area centred on research into the organization, remuneration and regulation of the power systems (sector structure, market models, economic signals, tariffs and quality of service, etc.).

Coordinator: Luis Olmos Camacho
Web page: https://www.iit.comillas.edu/research-area/rye

3.1.4 Energy Systems Models (SADSE)

Area which goal is to provide assistance in the taking of decisions and in the technical-economic analysis of the generation, transport and distribution systems in the energy sector.

Coordinator: Andrés Ramos Galán
Web page: https://www.iit.comillas.edu/research-area/sadse

3.1.5 Fire Safety, Thermal and Fluids Engineering (PCI)

This area is dedicated to mechanical elements design and to running complex simulations using a computer, specially for general mechanical purposes as well as electromagnetism, wind grounds, etc.

Coordinator: Alexis Cantizano González
Web page: https://www.iit.comillas.edu/research-area/adi

3.1.6 Railway Systems (ASF)

This area aims to develop models and other custom-made software tools, safety analysis and quality control, related with different topics of railway systems. These topics include the infrastructure design and management, the power systems planification and operation, as well as the railway traffic planification and operation.

Coordinator: Adrián Fernández Rodríguez
Web page: https://www.iit.comillas.edu/research-area/asf

3.1.7 Intelligent Systems (ASI)

This area deals with the monitoring, diagnosis, reliability and maintenance of industrial processes, and modelling and prediction of industrial and economic systems.

Coordinator: José Portela González
Web page: https://www.iit.comillas.edu/research-area/asi

3.1.8 Bioengineering (BIO)

This group works to develop electronic instrumentation and microprocessors, power electronics, control engineering applications, signal analysis, electronic design, automatization and digital communications.

Coordinator: Eva Paz Jiménez
Web page: https://www.iit.comillas.edu/research-area/geac

3.1.9 Smart Management for Sustainability (SMS)

Area aimed at building and promoting firms' competitive advantages. Its research focuses on the two main strategic challenges faced by companies: transitions to sustainability under the framework of the Sustainable Development Goals (SDG), and Environmental, Social and Governance (ESG) management.

Coordinator: Elisa María Aracil Fernández
Web page: https://www.iit.comillas.edu/research-area/sms

3.2 Research projects

This section includes all the research projects developed at IIT during this academic year grouped by area and type of funding. A brief description of them and the most relevant data (collaborating institution, dates, staff involved) are also included.

3.2.1 Research and development projects

3.2.1.1 Private funding

- **Modeling and assessment of electrical networks´ requirements for the energy transition in Spain**
  Iberdrola España S.A.U. January 2019 - December 2023. (Michel Rivier Abbad, Tomás Gómez San Román, Rafael Cossent Arín, José Pablo Chaves Ávila, Leslie Herding, Andrés Ramos Galán, Sara Lumbreras Sancho)

  The main objective of the research is to analyze the impact on electricity networks of the connection of new renewable plants on the 2030 horizon under different possible scenarios, and to develop proposals to facilitate the decarbonisation objectives to be achieved in the most efficient possible way.

- **Analysis of the expansion and operation of the Spanish electricity system for a 2030-2050 time horizon**
  Iberdrola España S.A.U. January 2019 - December 2023. (Michel Rivier Abbad, Tomás Gómez San Román, Álvaro Sánchez Miralles, Francisco Martín Martínez, José Pablo Chaves Ávila, Teresa Freire Barceló, Timo Gerres, Andrés Ramos Galán, Sébastien Huclin)

  The main objective of this line of research is to model and analyze possible scenarios of investment and operation of energy resources for the Spanish electricity system in the 2030-2050 horizon. More specifically, the objective is to evaluate the potential and role that each generation, storage and consumption technology can play in the future mix of the electricity system, identifying the factors and scenarios that are most critical for each one of them.

- **Optimal design of ATO driving parameters for Metro de Barcelona to Line 1 for new trains**
  Bombardier European Investments S.L.U. April 2020 - December 2023. (Antonio Fernández Cardador, Asunción Paloma Cucala García, Adrián Fernández Rodríguez, Gonzalo Sánchez Contreras)

  The objective of this project is the design and implementation of ATO speed commands in Line 3 of Metro de Barcelona to minimise the energy consumption of new trains in this line. These ATO speed commands are selected and sent to the train by the traffic regulation system in real-time. For each inter-station a set of 4 speed commands are designed, the flat out command and 3 commands parameterized basically by a coast point and a regulation speed.

- **Optimal design of ATO driving parameters for Metro de Barcelona to Line 1 for new trains**
  Bombardier European Investments S.L.U. April 2020 - December 2023. (Antonio Fernández Cardador, Asunción Paloma Cucala García, Adrián Fernández Rodríguez, Gonzalo Sánchez Contreras, Fernando Conde Montero)

  The objective of this project is the design and implementation of ATO speed commands in Line 1 of Metro de Barcelona to minimise the energy consumption of new trains in this line. These ATO speed commands are selected and sent to the train by the traffic regulation system in real-time. For each inter-station a set of 4 speed commands are designed, the flat out command and 3 commands parameterized basically by a coast point and a regulation speed.

- **Traceable mechanical and electrical power measurement for efficiency determination of wind turbines**
  Dinnteco Spain S.L. September 2020 - September 2023. (María Ana Sáenz Nuño)

  New technologies for wind turbines are currently assessed in the field, are time-consuming to perform and highly affected by wind conditions. Shortening the time to market for these tests is one way to reduce costs and increase performance for this form of renewable energy. Indoor test benches can rapidly

record a wide range of data but require accurate torque and rotational speed measurements which currently lack traceability to national standards and are difficult to make for torque measurements above 1.1 NMm.
The project assess current methods and develop traceable methodology for torque measurements up to 5 MNm and rotational speeds up to 20 and 1600 revolutions per minute which covers the operational speeds on low-speed and high-speed shafts respectively. Standardised guidelines for traceably determining turbine efficiency on test benches developed along with new efficiency measurement methods for the electrical components of wind turbine nacelles. Project outputs give a better prediction of the energy output of proposed wind parks, provide greater certainty in investments opportunities and help accelerate the transition towards cleaner energy sources.

- **New 100% renewable, flexible and robust energy system for the integration of new generation, grid and demand-side technologies- Network Planning and reconfiguration**
  i-DE Redes Eléctricas Inteligentes, S.A.U. October 2020 - December 2023. (José Pablo Chaves Ávila, Fernando Emilio Postigo Marcos, Tomás Gómez San Román, Orlando Mauricio Valarezo Rivera, Carlos Mateo Domingo, Miguel Ángel Ruiz Hernández, Miguel Martínez Velázquez, Matteo Troncia, Andrés Tomás Martín)

  The main objective of the FLEXENER project is to research new technologies and simulation models in the field of renewable generation, storage systems and flexible demand management and distribution grid operation. The aim is to achieve a 100% renewable and decarbonised energy mix, effectively integrated into the electricity system of the future in a flexible, efficient and safe manner.
  This project supports the FLEXENER project by focusing on the challenges of distribution networks. The specific objective is to develop a series of tasks identified within the FLEXENER project:
  - Distribution grid flexibility solutions.
  - Analysis of requirements and simulations of future scenarios and their impact on the grid in the Iberian Peninsula.
  - Technological research into new markets, flexibility services and system regulation to achieve a 100% renewable energy mix with safe, efficient and clean energy.

- **FLEXENER: New 100% renewable, flexible and robust energy system for the integration of new technologies in generation, networks and demand - Market design**
  Iberdrola Generación España, S.A.U. October 2020 - December 2023. (Michel Rivier Abbad, José Pablo Chaves Ávila, Pablo Rodilla Rodríguez, Carlos Batlle López, Paolo Mastropietro, Paulo Brito Pereira, Shilpa Bindu, Matteo Troncia)

  This project is part of the FLEXENER project. It corresponds to one of the activities of said project. The main objective of the FLEXENER project is to investigate new technologies and simulation models in the field of renewable generation, storage systems and flexible demand management and operation of the distribution network. A 100% renewable and decarbonised energy mix is ??sought, effectively integrated into the electrical system of the future in a

flexible, efficient and safe way.
In this context, this project or activity has been in charge of designing configuration options for the electricity market that are adapted to the existence of a 100% renewable electricity system. The general configuration of the market has been analyzed (types of markets involved, their sequence, role of agents, type of agents), focusing in particular on capacity markets and balancing markets. The different options have been analyzed, identifying the advantages and disadvantages for a 100% renewable electricity system.

- **FLEXENER: New 100% renewable, flexible and robust energy system for the integration of new technologies in generation, networks and demand - Scenarios**
  Iberdrola Generación España, S.A.U. October 2020 - December 2023. (Michel Rivier Abbad, Tomás Gómez San Román, Álvaro Sánchez Miralles, Francisco Martín Martínez, Andrés Ramos Galán, José Pablo Chaves Ávila, Stefanía Gómez Sánchez, Leslie Herding, Teresa Freire Barceló)

  This project is part of the FLEXENER project. It corresponds to one of the activities of said project. The main objective of the FLEXENER project is to investigate new technologies and simulation models in the field of renewable generation, storage systems and flexible demand management and operation of the distribution network. A 100% renewable and decarbonised energy mix is ??sought, effectively integrated into the electrical system of the future in a flexible, efficient and safe way.
  In this context, this project or activity has been in charge of building future scenarios for 2030 that, based on the resources and technological equipment available at that time, determine an optimal mix of renewable generation technologies, storage systems and energy management. the demand that allows covering the demand for electricity with sufficient guarantees of supply reliability.
  These scenarios have served to feed other activities of the FLEXENER Project that analyze aspects of the detailed electrotechnical behavior of the electrical networks in these conditions to investigate the technical feasibility of the system and explore possible solutions to the technical problems they present.

- **New 100% renewable, flexible and robust energy system for the integration of new generation, grid and demand-side technologies- Technical studies of networks**
  Iberdrola Generación España, S.A.U. October 2020 - December 2023. (Luis Rouco Rodríguez, Francisco Miguel Echavarren Cerezo, Enrique Lobato Miguélez, Carlo de Paolis Robles)

  This project is part of the FLEXENER project. The main objective of the FLEXENER project is to investigate new technologies and simulation models in the field of renewable generation, storage systems and flexible demand management and operation of the distribution network. A 100% renewable and decarbonised energy mix is sought, effectively integrated into the electrical system of the future in a flexible, efficient and safe way. In this context, this project has been in charge of the assessment of the contribution to the stability

of the Spanish mainlad system of the solutions developed in activities A2, A3 and A4.

- **New 100% renewable, flexible and robust energy system for the integration of new generation, grid and demand-side technologies-Technical studies of networks**
  I-DE Redes Eléctricas Inteligentes, S.A. October 2020 - December 2023. (Luis Rouco Rodríguez, Lukas Sigrist, Andrés Tomás Martín)

  This project is part of the FLEXENER project. The main objective of the FLEXENER project is to investigate new technologies and simulation models in the field of renewable generation, storage systems and flexible demand management and operation of the distribution network. A 100% renewable and decarbonised energy mix is sought, effectively integrated into the electrical system of the future in a flexible, efficient and safe way. In this context, this project has been in charge of the assessment of the contribution to the distribution grid to the system stability.

- **[FLEXENER] – Model development of WALLBOX devices**
  Wall Box Chargers S.L. October 2020 - December 2023. (Luis Rouco Rodríguez, Carlo de Paolis Robles)

  This project is part of the FLEXENER project. The main objective of the FLEXENER project is to investigate new technologies and simulation models in the field of renewable generation, storage systems and flexible demand management and operation of the distribution network. A 100% renewable and decarbonised energy mix is sought, effectively integrated into the electrical system of the future in a flexible, efficient and safe way. In this context, this project will develop the simulation models of Wall-Box devices.

- **Flexible and efficient integration of CO2 generation technologies**
  Siemens Gamesa Renewable Energy Innovation & Technology S.L. January 2021 - December 2023. (Luis Rouco Rodríguez, Aurelio García Cerrada, Juan Luis Zamora Macho, Javier García Aguilar, Lukas Sigrist)

  This project will develop "fundamental models" for the design and analysis of wind-based generation technologies. Fundamental models are those derived from more detailed models that capture the most relevant dynamics of systems to be studied so that they can be included in the study of broader systems. These fundamental models will have various degrees of detail according to the purpose they will be intended for.

- **Enable New Occupant Seating Positions**
  Centre Européen d´Etudes de Sécurité et d´Analyse des Risques (CEESAR). March 2021 - June 2024. (Francisco José López Valdés, Jesús Jiménez Octavio, Alberto Carnicero López, Carlos Rodríguez-Morcillo García, Carmen María Vives Torres, Juan Manuel Asensio Gil, Manuel Valdano, Alessandra Porfido)

  The objective of the ENOP project is to generate reference data that can be used in the validation of HBMs and ATDs in new postures such as reclined postures and investigate new injury types, which might be expected in AV. To

this end, 15 PMHS sled tests of 15 mid-sized males in five different seating positions is performed (three PMHS tests per condition, no repeat tests on the same PMHS). These seating positions include various degrees of reclined seat back and seat pan inclination angles.

- **Optimal design of ATO driving parameters in the branches of Valles Line of FGC**

  Siemens Rail Automation S.A.U. May 2021 - December 2023. (Antonio Fernández Cardador, Asunción Paloma Cucala García, Adrián Fernández Rodríguez, Manuel Blanco Castillo)

  The objective of this project is the design and implementation of efficient ATO speed commands in FGC railway line in Tarrasa and Sabadell branches. These ATO speed commands are selected and sent to the train by the traffic regulation system in real-time. The new ATO speed commands must comply with technical, operational and comfort restrictions and will minimise the energy consumption.

- **Experimental proof-of.concept of electromagnetic selfsensing scaffolds**

  Universidad Pontificia Comillas. September 2021 - December 2023. (Francisco Javier Herraiz Martínez, Javier Matanza Domingo, Yolanda Ballesteros Iglesias, Juan Carlos del Real Romero, Romano Giannetti, José Daniel Muñoz Frías, Miguel Monteagudo Honrubia)

  The main objective of the project is the development of a novel scaffolds technology. These scaffolds are resonant in the GHz band. Thus, they can be interrogated by an electromagnetic signal and used as sensors. Their response signal will be used to control the regeneration of the bone. Moreover, it could be useful for infections detectecion. In order to obtain such an ambitious goal, different novel technologies will be used. In partircular, additive manufacturing techniques and nanomaterials are proposed. Finally, a demonstrator of the whole system will be develop to evaluate the viability of the proposed technology.

- **Crack propagation in endodontically treated molars**

  Universidad Pontificia Comillas. September 2021 - March 2024. (Jesús Jiménez Octavio)

  In the field of dentistry, there are currently numerous lines of research in common with engineering, especially in the development of new methodologies and prosthetic materials, such as implants, crowns and occlusal veneers. However, the pathologies and treatments that ultimately give rise to this type of surgery for tooth loss have not yet been addressed in depth from materials engineering.

  The pioneering works in which the load distribution and mechanical resistance of ceramic or polymeric prosthetic materials are analyzed with the support of computer simulation have been followed by more recent ones aimed at the propagation of cracks in restored teeth.

The objective of this project is to identify the cracking thresholds under chewing loads and bruxism of the first premolars and molars, considering healthy and endodontic teeth with openings of different invasive levels.

- **Integration of generic dynamic models of conventional generation, loads and RES in the dynamic model of CE grid**
  ENTSO-e. September 2022 - September 2023. (Lukas Sigrist, Illia Diahovchenko, Luis Rouco Rodríguez)

  The aim of the project is the development of methodologies and tools for the integration of generic dynamic models of conventional power generation, loads and RES in a grid model of CE.

- **3D scanning techniques as a tool for monitoring the evolution of venous leg ulcers**
  Universidad Pontificia Comillas. September 2022 - December 2023. (Ana María Megía Macías)

  The crossover between engineering and medicine is a field of enormous possibilities. This scientific project is about to change the way we approach the assessment of the evolution of chronic open ulcers. The main objective of this project is to evaluate the ability of typical engineering tools such as photogrammetry to be used to measure the evolution of chronic ulcers. Specifically, this new method is used to evaluate the effectiveness of cold atmospheric plasma treatment compared to traditional methods.
  Photogrammetry, a precise three-dimensional measurement technique, enable researchers to obtain objective data on the surface area, volume and other critical parameters of ulcers. This approach, combined with medical expertise, make it possible to establish essential correlations between treatment and wound evolution. This multidisciplinary approach demonstrates the synergy between engineering and medicine to address complex medical challenges.
  If the results support the efficacy of cold atmospheric plasma treatment, it could represent a significant advance in chronic ulcer care, with the potential to dramatically reduce healing times. Furthermore, this project not only highlights the importance of collaboration between disciplines, but also points to the critical role of precision engineering in medicine, leading the way h

- **Secondary voltage regulator for synchronous generators**
  Bahía Bizkaia Electricidad, S.L. September 2022 - September 2023. (Luis Rouco Rodríguez, Ignacio Egido Cortés, Álvaro Benítez Domínguez)

  This project is aimed ta supplying a licence of the secondary voltage regulator of synchronous generators developed by IIT. In addition, IIT will provide technical assistance for the integration of the regulator in the SCADA of BBE.

- **Voltage control system of the transmission grid**
  Red Eléctrica de España, S.A.U. November 2022 - November 2023. (Luis Rouco Rodríguez, Enrique Lobato Miguélez, Ignacio Egido Cortés, Álvaro Benítez Domínguez)

The main objetive of the project is to investigate the feasibility of controlling the voltages of the transmission grid with a tertiary proportional control system implemented at power plant level. In addition, it will be investigated the feasibility of secondary PI control system of pilot buses.

- **Detection of abnomal operation of bus power balance**
  Endesa Generación, S.A. November 2022 - November 2023. (Luis Rouco Rodríguez, Miguel Ángel Sanz Bobi, David Domínguez Barbero, Eloy Jesús del Gran Poder Insunza Díaz)

  This project is aimed at developing a tool for detecting the abnormal operation of bus power balance. Such abnormal operation can arise from measurement transformers and watt meters.

- **ATMOSPHERE. New methodologies for the storage, generation and safety of green hydrogen plants**
  Iberdrola Energía España S.A.U. December 2022 - June 2025. (Andrés Ramos Galán, Jesús María Latorre Canteli, Juan Francisco Gutiérrez Guerra, Pedro Sánchez Martín)

  In the project, a model is developed that determines the optimal sizing of the electrolyzers for the production of green hydrogen for industrial applications, which are hybridized together with hydrogen and electricity storage equipment, and renewable electricity production sources and all of this is connected to the national electricity grid.

Project of the Science and Innovation Missions Program 2022 of the State Program to Catalyze Innovation and Business Leadership of the State Plan for Scientific Research and Innovation 2021-2023 within the framework of the Recovery, Transformation and Resilience Plan financed by the Ministry of Science and Innovation (MIG-20221006)

- **Correlation of biometric data with cognitive and emotional states in vehicle interior scenarios and investigation of corrective stimuli and advanced control functions**
  Grupo Antolin Ingeniería S.A.U. December 2022 - October 2024. (Álvaro Jesús López López, Berta Ruiz González)

  The objective of the project is to develop cognitive models specialized in analyzing a series of variables related to the state of health of the occupants of a vehicle.

The models developed are based on data of a heterogeneous nature that may well have been collected in real scenarios or generated synthetically.

- **Assistance and maintenance of Middle Office models**
  Endesa Medios y Sistemas S.L. January 2023 - December 2023. (Antonio Bello Morales, Geovanny Alberto Marulanda García, Luis Manuel Montero Guirao)
  This project between IIT and Endesa focuses on the assistance and maintenance of Middle Office tools VALORE (with its three users LPM, HEPLASE, and SEIE), OMEGA, ACUARIO, AURIGA, and VALORE-CLOUD.

- **ENDESA Chair for applications of artificial intelligence to data-driven maintenance**
  Endesa Generación, S.A. January 2023 - December 2026. (Miguel Ángel Sanz Bobi, Antonio Muñoz San Roque, Francisco Javier Bellido López, Eugenio Francisco Sánchez Úbeda, Álvaro Jesús López López)
  The main goal of the Chair is to help ENDESA, in particular, and the energy sector in general, to take advantage of the opportunities offered by Artificial Intelligence by generating knowledge and disseminating it to society. Its main objectives are to investigate and share AI applications in the Maintenance and Management of generation assets to facilitate the energy transition towards a long-term sustainable model following the Sustainable Development Goals.

- **ATMOSPHERE. New methodologies for the storage, generation and safety of green hydrogen plants**
  Innomerics S.L. January 2023 - June 2025. (José Portela González, Alejandro Polo Molina)
  The project consists in the construction of a digital twin of a green hydrogen production plant and its validation with real operation data. IIT contributes in the development of the library of mathematical models representative of the different elements that constitute an industrial green hydrogen production plant and in the subsequent integration of these models with scientific machine learning algorithms, in order to merge models based on physical equations with operational data using machine learning techniques.
  In addition, IIT approaches the definition of the input data for the design of heat networks to take advantage of the waste heat from hydrogen production plants, as well as in their storage format and in the research of the algorithms for the calculation of the necessary models.

Project of the Science and Innovation Missions Program 2022 of the State Program to Catalyze Innovation and Business Leadership of the State Plan for Scientific Research and Innovation 2021-2023 within the framework of the Recovery, Transformation and Resilience Plan financed by the Ministry of Science and Innovation (MIG-20221006)

- **Hympulso: Comprehensive project on rail mobility through hydrogen: from generation to the track**
  Patentes Talgo S.L.U. January 2023 - July 2025. (Antonio Fernández Cardador, Asunción Paloma Cucala García, Adrián Fernández Rodríguez, Manuel Blanco Castillo)

  Eleven institutions are collaborating in this project, led by Patentes Talgo, to advance in the transition towards clean mobility based on green hydrogen. The project integrates the entire value chain in the generation of green hydrogen and its use in the railroad, also analyzing the impact that this transition has on the different assets of the railway infrastructure, such as the track or maintenance facilities.
  Within the consortium, the Railway Systems Area of IIT collaborates in the development of a prototype train powered by fuel cells and batteries. In particular, IIT is responsible for the development of the digital twin that simulates in detail the behavior of the hydrogen train, as well as the model that optimizes the driving of the train by combining the use of different energy sources (hydrogen cell, battery, catenary and regenerative braking). It also collaborates in real driving tests and energy efficiency analysis.

- **Specification of the Planning and Rescheduling modules of a TMS for Mass Transit (CBTC)**
  CAF SIGNALLING S.L. February 2023 - February 2025. (Asunción Paloma Cucala García, Antonio Fernández Cardador, Adrián Fernández Rodríguez)

  The objective of this project is the specification of the Planning and Rescheduling modules of a TMS (Traffic Management System) for Mass Transit (CBTC).

- **Improvement of european electricity market representation**
  Endesa Medios y Sistemas S.L. March 2023 - December 2023. (Efraim Centeno Hernáez, Luis Jesús Fernández Palomino)

  The final objective of the project is to carry out different developments in order to improve the quality of the long-term forecasts that are made with CODEX in the changing environment of MIBEL and the integrated European electricity market. In particular, the improvements during the year 2023 are focused on the updated representation of the profiles of renewable energies, demand and on expanding the representation of the European system.

- **Design and implementation of an algorithm for power line protection under high penetration of renewables**
  Gas y Electricidad Generación S.A. April 2023 - December 2023. (Antonio Muñoz San Roque, Luis Rouco Rodríguez, Lukas Sigrist, José Portela González)

  The objective of this project is the design and implementation of an algorithm for the protection of power lines in conditions of high penetration of RES.
  The proposed algorithm is based on the application of Machine Learning techniques for the detection and classification of faults based on a set of fault scenarios obtained both from real records and through simulation.

- **Energy storage methods in railway systems**
  Union Internationale des Chemins de Fer (UIC), ADIF, Infrabel, Network Rail, RFI. April 2023 - March 2025. (Antonio Fernández Cardador, Asunción Paloma Cucala García, Adrián Fernández Rodríguez, María Domínguez Gago)

  The goal of the project is to provide a decision-making tool based on simulation, and guidance to assist infrastructure managers when planning to increase the energy efficiency of railway stations by using the energy regenerated in braking trains by means of Energy Storage Systems located in stations.
  This goal of the project is decomposed into three specific objectives: (1) to study the latest and different technologies in energy storage that could be suitable for this application; (2) to develop a decision software tool based on simulation to analyse the best ESS solution for each station type, based on its consumption and traffic; (3) to develop an IRS (International Railway Solution) draft on the implementation of ESS technologies in railway stations to make them more sustainable.

- **Improvements in the temporal representation**
  Endesa Medios y Sistemas S.L. May 2023 - December 2023. (Antonio Bello Morales, Pablo Rodilla Rodríguez, Paulo Brito Pereira, Varios General Contratado)

  This project aims first to improve the time representation in ACUARIO and then to address further improvements in asset optionality (thanks to greater detail and granularity) and regulatory aspects to bring them in line with market reality.

- **Improvements in VALORE execution: Hourly executions and P48**
  Endesa Medios y Sistemas S.L. May 2023 - December 2023. (Antonio Bello Morales, Luis Manuel Montero Guirao, Geovanny Alberto Marulanda García, Pablo Rodilla Rodríguez)

  The purpose of this project is to improve the quality of forecasts made with VALORE by implementing a chronological hourly execution mode that takes into account temporal couplings, reengineering the optimization process associated with P48, and making modeling improvements regarding renewable energy spills. Additionally, there is a plan to optimize the resources required to size the Cloud containers based on different execution typologies.

- **Parameter estimation of turbine-governor systems of Lanzarote-Fuerteventura generators**
  Endesa Generación, S.A. June 2023 - October 2023. (Luis Rouco Rodríguez, Lukas Sigrist)

  The objective is to estimate the parameters of the turbine-governor systems of Lanzarote-Fuerteventura generators. A tool for parameter tuning of excitation and turbine-governor system models already developed for Endesa by IIT are used. The parameters of 28 generators are estimated.

- **Improvements in the medium-term probabilistic modeling of the demand for natural gas and electricity in Spain, Portugal and France**
  Endesa Medios y Sistemas S.L. June 2023 - September 2023. (Eugenio Francisco Sánchez Úbeda, Anne Maren Coll Franck)

  The main objective of the project is to carry out the necessary developments to improve the forecasts generated with MoDEM in the medium term, by including aspects such as self-consumption, cogeneration or gas prices.

- **Analysis and prediction of offshore wind farm generation using machine learning techniques**
  Universidad Pontificia Comillas. June 2023 - May 2024. (Antonio Muñoz San Roque, José Portela González, Eugenio Francisco Sánchez Úbeda, Eloy Jesús del Gran Poder Insunza Díaz)

  The objective of this research is twofold. On the one hand, meteorological data as well as wind turbine data will be analyzed. On the other hand, power generation prediction models will be created using different AI algorithms. For the study, wind data from the Alpha Ventus wind farm off the coast of Hamburg will be used. Finally, the prediction results using different algorithms will be compared.

- **Development of a multi-axis control system for test machines and systems**
  S.A. Española Ibertest. June 2023 - May 2026. (Juan Luis Zamora Macho, Aurelio García Cerrada)

  The aim of this project is to develop and program an application that automates all the control tasks of an industrial testing machine. The proposed system must allow all kinds of tests, both static and dynamic, whether single-axis or multi-axis. In addition, it must incorporate all the auxiliary functions required to facilitate its commissioning.

- **Analysis of the biofidelity of the cervical spine of the PIPER human body model**
  L'Inglesina Baby S.p.A. June 2023 - March 2024. (Francisco José López Valdés, Manuel Valdano, Varios General Contratado)

  The objective of the study is to assess the biofidelity of the cervical spine of the human body model (HBM) PIPER for children around 2 years old.
  The study will:
  - Scale the PIPER HBM to the adequate anthropometry of the individuals with ages 2-4 years old reported in the paper by Ouyang et al. (2005)

- Isolate the head and neck of the HBM and reproduce the boundary conditions of the test setup described in the aforementioned paper.
- Compare the response of the scaled PIPER model with the experimental curves reported in the paper.
- Optimize the values of the material properties of ligaments and intervertebral discs of the HBM so that the response of the model matches the experimental results reported in Ouyang et al. (2005).

- **Improvements in the executions with hourly detail**
  Endesa Medios y Sistemas S.L. July 2023 - December 2023. (Antonio Bello Morales, Luis Manuel Montero Guirao)

  This project is dedicated to enhancing the accuracy of future forecasts by implementing various advancements in VALORE-HEPLASE, specifically focusing on executions with hourly precision.

- **Analysis of the role of pumped-hydro power plants within the framework of the PNIEC in 2030**
  Iberdrola Energía España S.A.U. July 2023 - October 2023. (Andrés Ramos Galán, Pedro Linares Llamas, José Pablo Chaves Ávila, Michel Rivier Abbad, Tomás Gómez San Román)

  Report on the analysis of the role played by pumping within the framework of the 2030 PNIEC draft.

- **CODEX: Improving the renewable generation and the European market modelling**
  Endesa Medios y Sistemas S.L. August 2023 - December 2023. (Francisco Alberto Campos Fernández, Luis Alberto Herrero Rozas)

  The objective of this task is to implement in CODEX alternative methods of representing variables of interest in the long term, among which they are the wind, solar and demand profiles.

- **Analysis and joint modeling of the fundamental meteorological variables for the energy sector**
  Endesa Medios y Sistemas S.L. September 2023 - December 2023. (Eugenio Francisco Sánchez Úbeda, Anne Maren Coll Franck)

  The fundamental objective of the project is to carry out an analysis of the meteorological variables that affect the demand for electricity and the production with renewable energies for Spain, Portugal and France.

- **Artificial Intelligence for Energy Saving in Hotels**
  Substrate AI, S.A. September 2023 - May 2024. (José Portela González, Francisco Martín Martínez, Samuel Peña Yunda)

  This project aims to implement an Artificial Intelligence system for temperature control in hotels, with the goal of energy conservation. Environmental and cooling system data are analyzed, and clustering algorithms are employed to detect patterns. Using this insight, predictive models are developed for key

temperature management variables. An optimization model is constructed to enhance hotel comfort, taking into account current and predicted variables. A software is deployed, integrating predictive and optimization models to achieve desired room temperatures in the hotel.

- **Development of a functional time series model for forecasting residual demand curves in the Spanish day-ahead market**
  Endesa Medios y Sistemas S.L. September 2023 - December 2023. (José Portela González, Antonio Muñoz San Roque, Alejandro Polo Molina)
  The aim of the proposed collaboration is the development and implementation of a deterministic prediction model for residual demand curves in the day-ahead market. The model is a functional time series prediction model specifically designed for curve predictions in the market, taking into account the impact of the most relevant explanatory variables, as well as the temporal dynamics of the offers.

- **Applications of computational methods and artificial intelligence to the study of moduli spaces**
  Convocatoria de Financiación de Proyectos de Investigación Propios 2023. September 2023 - August 2026. (David Alfaya Sánchez, José Portela González)
  It is common to find applications of mathematics to AI and computation. Recent breakthroughs like ChatGPT have increased the interest on the opposite process: the ability of computers to help proving new theorems. This project deepens in this question, exploring the following lines of research in which AI and computation are used to study open problems related with moduli spaces which are very relevant in the current mathematical landscape.

  Analysis of the stability chambers of the moduli space of parabolic bundles:
  The geometry of these moduli spaces depends on certain weights which are chosen for their construction. These are grouped in stability chambers in which the moduli space remains constant, represented by regions in a hypercube and there exist transformations identifying moduli from certain different chambers. Our goal is to estimate the number of different moduli spaces that there exist and to study their birational geometry through the study of the geometry of these chambers with computer assisted techniques.

  Decompositions of motives of moduli:
  Motives are invariants which provide a lot of geometric information. Manipulating motivic formulas and understanding when can two different expressions represent the same variety is a problem of great interest. We will develop a software package for manipulating and comparing motives efficiently and we will apply it to Mozgovoy's conjecture on the L-Higgs moduli and to obtain formulas with positive coefficients for the moduli of vector bundles.

  Study of Markoff m-triples and its relation to Higgs moduli:
  Markoff triples are integral solutions to x^2+y^2+z^2=3xyz. They are structured in trees, subject of the famous Markoff Conjecture. m-triples are solutions to x^2+y^2+z^2=3xyz+m and their theory is jet to be developed. We

will use computational techniques to research conjectures about its structure and, starting from the relations between triples and points in the moduli of representations, we will explore the relations between m-triples and the Higgs moduli.

- **Self-sensing implants based on additive manufacturing techniques**
  Universidad Pontificia Comillas. September 2023 - December 2024. (Eva Paz Jiménez, Francisco Javier Herraiz Martínez, Paraskevas Sofokleous, Javier Matanza Domingo, Sara López de Armentia Hernández, Yolanda Ballesteros Iglesias, Romano Giannetti)

  The objective of this project is the manufacture of self-sensing implants for biomedical applications through 3D printing using filaments reinforced with ceramic particles. The development of functional materials that can provide particular properties beyond the mere structural support (biological, chemical, electromagnetic properties,...) has been enormous in recent years. In this project, it is intended to use polymeric filaments (PLA-based) for 3D printing by fused filament deposition (FDM), loaded with zirconia and hydroxyapatite ceramic particles. These particles give the polymer a high dielectric permittivity and high biocompatibility, which makes them ideal candidates for the design of electromagnetic sensors in the biomedical field.

- **Artificial intelligence for safety in e-scooters**
  Universidad Pontifia Comillas. September 2023 - November 2024. (Alberto Carnicero López, Luis Francisco Sánchez Merchante, Carlos Rodríguez-Morcillo García, Jesús Jiménez Octavio, Juan Manuel Asensio Gil, Francisco José López Valdés)

  The aim of the project is to analyze the positions and driving patterns of scooter users based on data obtained from an instrumented scooter, using artificial intelligence techniques. To achieve this, an experimental study is conducted with volunteers, and algorithms are developed for reconstructing a 3D model of the use

- **Multi Energy System Smart Linking Integration**
  Collaborative Research for Energy SYstem Modelling (CRESYM). October 2023 - September 2027. (Luis Olmos Camacho, Andrés Ramos Galán, Sara Lumbreras Sancho)

  A multinational consortium of world-class companies and universities in the energy sector will develop and model advanced strategies for coordinating the planning of the expansion and operation of different activities within the electricity, gas, and hydrogen sectors. This work takes place in coordination with a team of researchers from the universities of the consortium and in contact with leading professionals from the companies in it to propose solutions of relevance to these companies.

- **Monophasic osseointegrated dental implants**
  Clínica Dental Santamaría. October 2023 - September 2024. (Jesús Jiménez Octavio)

This project is focused on the analysis of the structural behavior of a single-phase osseointegrated dental implant. These also called mono-implants include the osseointegrated implant itself and the transmucosal abutment in a single piece, eliminating the structural weakness typical of a classic two-piece implant. For this reason, they can be manufactured in narrow diameters, being an option in cases of limited bone availability.

The purpose of the analysis will be to evaluate the structural resistance of this specific type of implants subjected to occlusal loads, when due to anatomical requirements the abutment is permanently deformed. The structural response will be evaluated under different loads and angulations, contrasting the commercial limits.

- **EXCOM: Adaptation of the model for execution with Gurobi and generation of water value curves for D+2**
  Endesa Medios y Sistemas S.L. October 2023 - December 2023. (Javier García González)
  The overall objective of the project is to enable the resolution of different EX-EX models using the GUROBI solver and to generate water value curves for day D and D+2 to address potential contingencies.

- **EXFACT: Adaptation of the model for the new Secondary Regulation Service and verification of hydro data integrity**
  Endesa Medios y Sistemas S.L. November 2023 - December 2023. (Javier García González)
  The overall objective of the project is to adapt the EXFACT model to the new Secondary Regulation Service and implement a validation process for the integrity of hydraulic data received from various sources to ensure the feasibility of the solution.

- **Identification of renewable power plants for frequency secondary regulation studies**
  Endesa. November 2023 - February 2024. (Luis Rouco Rodríguez, Ignacio Egido Cortés, Ana Baringo Morales)
  The aim of the work is the identification of renewable power plants models for frequency secondary regulation studies under the European platform Picasso.

- **Report Spain 2024 Cátedra Martín Patino - Energy Communities: current situation and outlook In Europe and Spain**
  Cátedra José María Martín Patino. November 2023 - June 2024. (Matteo Troncia, José Pablo Chaves Ávila, Jesús José Fernández García)
  The current energy transition is driven by four key factors transforming the electricity system: decarbonisation, decentralisation, digitalisation and democratisation. These elements aim to create a more sustainable, efficient and user-centred energy sector.

  These "4Ds" are interrelated, each supporting and reinforcing the others.

Digitalisation facilitates the management of decentralised energy resources; decentralisation promotes decarbonisation through the integration of renewables; and democratisation empowers energy communities, promoting a more distributed and sustainable energy model.

The role of energy communities transcends environmental contributions and extends to the social and economic spheres, thus serving broader societal interests. While the attractiveness of individual economic savings is a powerful motivating factor for joining energy communities, their successful deployment and market entry requires a multi-faceted approach to support, encompassing policy support, improved market access, infrastructure development and financial incentives.

The project aims to develop a report that presents the current situation of energy communities in Europe and Spain, and explores ways to encourage a more active role of consumers in electricity markets, detailing the specific incentives in Spain and the challenges for their integration into the national electricity system.

- **Wide-area oscillation of low frequency & IBRs**
  Collaborative Research for Energy SYstem Modelling (CRESYM). December 2023 - December 2027. (Luis Rouco Rodríguez, Lukas Sigrist)
  This collaboration supports the supervision of a doctoral student who is employee of Cresym and student of Comillas in the topic of the impact of inverter based resources on low frequency oscillarions. This research is also supported by RTE.

- **Design of railway traffic regulation algorithms of Mass Transit lines**
  CAF Signalling S.L. December 2023 - December 2025. (Asunción Paloma Cucala García, Antonio Fernández Cardador, Adrián Fernández Rodríguez)
  The aim of this project is the specification and design of rail traffic regulation algorithms for Mass Transit and with continuous communication signalling systems

- **Detection, recording, and inhibition system for ultrasound-based attacks on smart devices**
  TRC Informática, S.L. December 2023 - July 2024. (Javier Matanza Domingo, Eduardo Alonso Rivas, Romano Giannetti)
  The project addresses the detection and inhibition of ultrasound signals used in attacks on mobile devices (known as the Dolphin Attack). The goal is to implement a system for detecting this attack and inhibiting it through an interfering signal.

- **Collaboration with JRC on Scenario Discovery**
  Unisys Belgium N.V./S.A. December 2023 - April 2025. (Pedro Linares Llamas, Antonio Francisco Rodríguez Matas)

The goal of this collaboration is to support the research of JRC on Scenario Discovery, in the framework of their joint project with Pacific Northwest National Laboratory, USA

- **Assistance and maintenance of Middle Office models**
  Endesa Medios y Sistemas S.L. January 2024 - December 2024. (Antonio Bello Morales, Geovanny Alberto Marulanda García, Luis Manuel Montero Guirao)

  This project between IIT and Endesa focuses on the assistance and maintenance of Middle Office tools VALORE (with its three users LPM, HEPLASE, and SEIE), OMEGA, ACUARIO and VALORE-CLOUD.

- **Silver Economy Tracker - National and International Dissemination**
  Centro de Investigación Ageingnomics, Mapfre Global Risks, Compañía Internacional de Seguros y Reaseguros, S.A. January 2024 - December 2024. (Elisa María Aracil Fernández, David Roch Dupré, Pablo Calvo Báscones)

  This project aims to disseminate the Silver Economy Tracker. This tool measures, for all European countries, the advancement and progress of the silver economy using the Silver Economy Tracker methodology, proposed by the research team in previous works.

- **Prevention of cervical injuries of e-scooter riders**
  Fundación Mapfre. February 2024 - January 2025. (Francisco José López Valdés, Juan Manuel Asensio Gil, Manuel Valdano, Jaime Alvarez Fernández)

  Strategies to prevent cervical injuries in riders of electric scooters exposed to traumatic events

- **ABanca - Friendly aging Indicator**
  ABANCA Corporación Bancaria, S.A. February 2024 - November 2024. (Elisa María Aracil Fernández, Pablo Calvo Báscones, David Roch Dupré)

  This proposal includes the methodological development and measurement of the Senior-friendly Banking Index, taking into consideration the stakeholder networks or interest groups of ABANCA, with special attention to the group of clients and employees

- **CODEX: Investment optimization using heuristic strategies**
  Endesa Medios y Sistemas S.L. March 2024 - April 2024. (Francisco Alberto Campos Fernández, Luis Alberto Herrero Rozas)

  This project involves the completion of 2 tasks. The first task involves the integration of the heuristic method designed by Endesa-Enel to estimate the expansion of solar and wind capacity based on LCOE and cost recovery (IRR). The aim is to establish expansion values based on a renewables revenue target. Task 2 consists of determining and improving strategies and search algorithms for the equilibrium defined in the previous task.

- **Forecasting and characterization of offer strategies in the Spanish real-time constraint market**
  Endesa Medios y Sistemas S.L. March 2024 - July 2024. (José Portela González, Antonio Muñoz San Roque, Eloy Jesús del Gran Poder Insunza Díaz)

  This project aims to identify an optimal strategy for modeling and predicting the allocation of groups in the Spanish real-time constraint market and its Portuguese equivalent. To achieve this, residual demand curves will be established to characterize the offer strategy of agents in these markets, characterized by being a "Pay as Bid" system.

- **Improvements in VALORE execution**
  Endesa Medios y Sistemas S.L. March 2024 - December 2024. (Antonio Bello Morales)

  Current markets are undergoing a series of transformations due to the emergence of new factors and trends in the sector, which must be incorporated into the development of the company's future strategies. In this task, progress will be made in the hourly execution and in the detailed representation of renewable technologies (solar and wind) as well as nuclear, with a particular focus on improving their representation during periods when they set the market price.

- **Improvements in the integration of OMEGA and VALORE**
  Endesa Medios y Sistemas S.L. March 2024 - November 2024. (Antonio Bello Morales)

  The final objective of the project is to carry out different developments in order to improve the coordination between OMEGA and VALORE in the context of their respective Monte Carlo simulations.

- **Inclusion of France in the simulations**
  Endesa Medios y Sistemas S.L. March 2024 - December 2024. (Antonio Bello Morales)

  This project focuses on including France in OMEGA's simulations to improve forecasts and achieve better integration with current VALORE-LPM executions.

- **Improved characterisation of renewable assets**
  Endesa Medios y Sistemas S.L. March 2024 - October 2024. (Antonio Bello Morales)

  This project focuses on achieving a better characterization of the renewable resources in Endesa's portfolio, which is essential for proper risk management.

- **Improvements and extension of hourly execution**
  Endesa Medios y Sistemas S.L. March 2024 - November 2024. (Antonio Bello Morales)

  This project aims to improve the quality of future forecasts by carrying out different developments in VALORE-HEPLASE regarding executions with hourly detail.

- **Improvements in the treatment of correlations between assets and nuclear characterization based on fundamentals**
  Endesa Medios y Sistemas S.L. March 2024 - October 2024. (Antonio Bello Morales)

  The objectives of this project are:
  - Improve the representation of the dependency relationships both between renewable assets and between renewable assets and the electricity price.
  - To achieve a representation of the nuclear portfolio using information based on fundamentals.

- **Excom-Siroco Planning: Implementation of the hydraulic short circuit in turbine/pumping units**
  Endesa Medios y Sistemas S.L. April 2024 - June 2024. (Javier García González, Andrés Felipe Oviedo Gómez)

  The general objective of the project is to make the necessary developments so that the production version of the Excom-Siroco Planning model (ExSp) allows the consideration of the hydraulic short circuit in turbine-pumping groups equipped for it.

- **CODEX: Investment optimization using heuristic strategies**
  Endesa Medios y Sistemas S.L. April 2024 - May 2024. (Efraim Centeno Hernáez, Luis Jesús Fernández Palomino)

  This project involves the completion of 2 tasks. The first task involves the integration of the heuristic method designed by Endesa-Eon to estimate the expansion of solar and wind capacity based on LCOE and cost recovery (IRR). The aim is to establish expansion values based on a renewables revenue target. Task 2 consists of determining strategies and search algorithms for the equilibrium defined in the previous task.

- **Modeling the response of energy demand to the price of gas**
  Endesa Medios y Sistemas S.L. April 2024 - May 2024. (Eugenio Francisco Sánchez Úbeda, Anne Maren Coll Franck)

  The project's objective is to analyze and model the impact of the price of natural gas on the demand for electricity and gas in Spain.

- **Identification of the models to be used in the global weather scenario generator**
  Endesa Medios y Sistemas S.L. April 2024 - December 2024. (Eugenio Francisco Sánchez Úbeda, Anne Maren Coll Franck)

  The fundamental objective of the project is to design a set of models that allow the generation of realistic and coupled medium-term scenarios for the main meteorological variables, directly influencing system demand for electricity and renewable production for Spain, Portugal, and France.

- **Generation-grid models**
  Iberdrola Renovables Energía, S.A.U. April 2024 - December 2024. (Luis Rouco Rodríguez, Francisco Miguel Echavarren Cerezo, Enrique Lobato Miguélez)

  The aim of this work is to develop generation-grid models for simulation and analysis. Wind generator based on DFIG and MSG and solar PV inverters models will be developed.

- **Improvements in the execution of VALORE-LPM in the Cloud**
  Endesa Medios y Sistemas S.L. April 2024 - December 2024. (Antonio Bello Morales)

  The purpose of this project is to improve the quality of the forecasts made with VALORE-LPM by implementing enhancements to achieve a more efficient execution of Monte Carlo simulations, maximizing the use of the technological resources currently available.

- **CODEX: Improvements in the modelling**
  Endesa Medios y Sistemas S.L. May 2024 - July 2024. (Francisco Alberto Campos Fernández, Luis Alberto Herrero Rozas)

  This project consists of carrying out 4 tasks. The first task consists of improving the integration of Iberia-Europe states. Task 2 consists of the integration of the hydro paths provided by Endesa-Enel. The third consists of the review of the representation of the market splitting between Spain and Portugal. Finally, the last task consists of improving the representation of spillages of Spain and Portugal.

- **CODEX: modelling improvement**
  Endesa Medios y Sistemas S.L. May 2024 - July 2024. (Efraim Centeno Hernáez, Luis Jesús Fernández Palomino)

  This project consists of carrying out 4 tasks. The first task consists of improving the integration of Iberia-Europe states. Task 2 consists of the integration of the hydro paths provided by Endesa-Enel. The third consists of the review of the representation of the market splitting between Spain and Portugal. Finally, the last task consists of improving the representation of spillages of Spain and Portugal.

- **Improvements in the integration of VALORE LPM and VALORE SENP**
  Endesa Medios y Sistemas S.L. May 2024 - December 2024. (Antonio Bello Morales, Pablo Rodilla Rodríguez, Rodrigo Saldaña Esteban, Devashish Sonowal)

  This project aims to improve the quality of forecasts made with VALORE-SENP by implementing evolutionary updates to achieve Monte Carlo execution and proposing modeling improvements in the optimization process.

- **Improvements in the characterisation of renewable assets and capturing negative prices in simulations**
  Endesa Medios y Sistemas S.L. June 2024 - December 2024. (Antonio Bello Morales)

  This project aims to improve the quality of future predictions by carrying out different developments in VALORE-HEPLASE around the consideration of negative prices in forecasts and a more detailed representation of renewable assets.

- **Technical report on titanium screws**
  Thales Alenia Space España. June 2024 - July 2024. (Juan Carlos del Real Romero, Eva Paz Jiménez)

  Tensile and shear tests for mechanical characterization of titanium bolts

- **Modeling the evolution of electricity demand profiles in Spain**
  Endesa Medios y Sistemas S.L. July 2024 - October 2024. (Eugenio Francisco Sánchez Úbeda, Anne Maren Coll Franck)

  The aim of the project is to analyse and model the evolution of hourly profiles of electricity demand in mainland Spain.

3.2.1.2 Public funding

- **RC4ALL: Responsible consumption for all**
  Ministerio de Ciencia e Innovación (MCI), Agencia Estatal de Investigación (AEI). May 2020 - December 2023. (Eugenio Francisco Sánchez Úbeda, Antonio Muñoz San Roque, José Portela González, Ignacio Navas Pascual, Francisco Rodríguez Cuenca)

  The main objective of the RC4ALL project (Responsible Consumption for All) is to develop a system that, based on the specific information on consumption per device of a relatively small number of representative customers and complementing it with information from external sources, is capable of generating personalized recommendations that improve the efficiency of consumption for the entire customer base of the company. Machine Learning and Big Data techniques will be used.

Project Retos- Colaboración RTC2019-007380-3 funded by Ministerio de Ciencia e Innovación (MCI) and Agencia Estatal de Investigación (AEI)

- **Development of movement behavior models of complex chronic patients**
  Ministerio de Ciencia e Innovación (MCIN), Agencia Estatal de Investigación (AEI). June 2020 - November 2023. (Eugenio Francisco Sánchez Úbeda, Rafael Palacios Hielscher, Antonio Muñoz San Roque, José Portela González, Carlos Rodríguez-Morcillo García, Alejandro Polo Molina)

  The aim of this project, coordinated with Virgen del Rocío University Hospital (HUVR), is to investigate how the deterioration of mobility may reflect changes in the patient's clinical condition, and its degeneration in the domain of integrated care of complex chronic patient.
  To fulfill this objective, an IoT infrastructure and information system is developed. Based on the collected data on patients mobility, machine learning techniques are applied to create patterns capable of modeling and characterizing movement in the patients in order to explain aspects of the clinical evolution of patients.

  Project PID2019-110747RB-C22/ funded by
  MCIN/AEI/10.13039/501100011033

- **Biophysics of immune response: receptors, cells and populations**
  Ministerio de Ciencia e Innovación (MCIN), Agencia Estatal de Investigación (AEI), 10.13039/501100011033. June 2020 - February 2024. (Mario Castro Ponce, Alberto Carnicero López, Miguel García Sánchez)

  The immune response involves multiple stages operating at different spatial and temporal scales. In recent years there has been increasing recognition of the role of physical processes in the effectiveness of the response, starting with the region of physical contact between cells (the so-called immunological synapse). In general, it is not possible to speak of the immune response at a scale but an interaction between scales. On the other hand, although the exact molecular structure of the T cell receptor was discovered in August 2019, this knowledge does not fully determine the immune response as it is a dynamic process out of equilibrium, which requires the use of the traditional tools of statistical physics.
  The central objective of the project is to quantify through modeling, simulation, and data analysis the role of the biophysical aspects of the immune response operating at different scales, always focusing on the explanation of experimental data, discrimination between alternative theories and the generation of new hypotheses. To achieve this objective, a study is proposed separating these scales and choosing the methodology that best adapts to their characteristics (large/small concentrations, fluctuations, spatial properties versus well-mixed, etc...) and the available experimental data.
  At the molecular level, we will model the cooperation of T-cell receptors (TCR)

to determine the dominant mechanism in the amplification of sensitivity by TCR nanoclusters. Combining stochastic models, image analysis and Bayesian inference, we will quantify the dynamics and function of these nanoclusters. This approach will extend to cytokine-activated competition processes.
At the cellular level, we propose the quantitative study of cell deformation at the synapse. In the first phase, we will use an experimental model of a collaborating group (hydrothermal carbon) to validate simulation models based on finite elements and generate effective models of this deformation. In the second phase, we will model the cell membrane using the phase-field method. Finally, we will extend classical models of statistical physics (Smoluchowski model) to study the intracellular dynamics of organelles in viral infections.
At the population level, we will introduce compartmental models that allow us to contrast hypotheses on the maturation dynamics of T lymphocytes in the thymus, with special emphasis on symmetry/asymmetry in the selection of double negative cells, and we will use the models to extract the most parsimonious mechanism from the analysis of experimental data. Following the compartmental models, we will study the role of latency in the severity of HIV infection. The model will be contrasted with experimental data where the role of drugs reversing latency will be analyzed. At all levels, exhaustive use of statistical inference methods will be made, for which the transversal problem of the models' identifiability and new measures of sensitivity and synergy of the models' parameters will be analyzed.
The research team is multidisciplinary (Physics, Mathematics, and Mechanical engineering) and will have a work team made up of biologists, mathematicians and physicists and experimental collaborators who will provide us with empirical data to validate the models.

Grant PID2019-106339GB-I00 funded by
MCIN/AEI/10.13039/501100011033/

- **MODESC – Platform of innovative models for speeding the energy transition towards a decarbonized economy**
  Ministerio de Ciencia e Innovación (MCIN), Agencia Estatal de Investigación (AEI). September 2020 - December 2023. (Tomás Gómez San Román, Michel Rivier Abbad, José Pablo Chaves Ávila, Andrés Ramos Galán, Pedro Linares Llamas, Leslie Herding, Teresa Freire Barceló)

  The aim of the project is the development of a global platform that integrates innovative energy simulation and impact assessment models that allow speeding the decarbonization of the electricity system including the electrification of the energy demand. Several scenarios in the horizon

2030-2050 are considered.

Grant RTC2019-007315-3 funded by MCIN/AEI

- **Stability analysis of large power systems with 100% of non-synchronous generators**

  Ministerio de Ciencia e Innovación (MCI). September 2020 - August 2024. (Aurelio García Cerrada, Régulo Enrique Ávila Martínez, Luis Rouco Rodríguez, Francisco Javier Renedo Anglada)

  The future sustainability of the Worlds Energy System (WES) rests on a massive and distributed penetration of renewable energy sources and their substantial increase in the generation mix. This phenomenon is already taking place at an ever-increasing pace (that is bound to speed up in the future) thanks to facilitating technologies such as power electronics. Therefore, conventional synchronous technology will gradually move from its dominant position towards a situation in which coordination with other and newer technologies will be mandatory. In fact, a situation in which the whole electricity demand of certain regions is supplied by electronic converters from renewable energy sources, at least temporarily, is possible or is already occurring. In this new situation there exists the urgent need to rethink current paradigms regarding the control and operation of conventional electric energy systems in order to address future scenarios (lower system inertia, faster dynamics, controller interactions, etc.). The main objective of this project is to provide the in-depth analysis of the control, operation and technology requirements for the newly created breed of electricity networks of low-to-nil conventional generation with increasing numbers of smart components (generators and loads, for example). This type of systems must include (a) alternating current (AC) sub-grids because of the large number of existing AC loads and the necessity of maintaining the compatibility with the conventional grid and (b) direct current (DC) sub-grids where most of the renewable-based generation can be more naturally integrated (see solar energy, for example), energy storage (batteries) can also be easily interfaced and some domestic and industrial loads can be connected (computers and electrical drives, for example). Currently, the operation of hybrid (DC/AC) electric grids is possible thanks to the use of electronic Voltage Source Converters (VSCs, abbreviated). This project will address the following specific topics:
  "Modelling, analysis, control, and quality of electrical grids with low-to-nil conventional generation in order to improve their flexibility thanks to the use of power electronics while similar levels of voltage control, quality and reliability

of supply to those already achieved with conventional systems can be reached."

This project is supported by the Spanish Government through the 2019 edition of its pre-doctoral contract programme with reference number PRE2019-088084

- **OneNet- One network for Europe (Horizon 2020. Grant agreement No. 957739)**

  European Commission. October 2020 - March 2024. (José Pablo Chaves Ávila, Tomás Gómez San Román, Rafael Cossent Arín, Luis Olmos Camacho, Javier Matanza Domingo, Gregorio López López, Leandro Lind, Orlando Mauricio Valarezo Rivera, Matteo Troncia, Jesús José Fernández García, Miguel Ángel Ruiz Hernández, Shilpa Bindu, David Ulrich Ziegler)

  OneNet addresses the growing needs of TSOs and DSOs to have real-time insight into the operation of
  their networks to work in a closely coordinated way, while unlocking and enabling new flexibility markets in a fair and open way. Goal is to enable a cost-effective, seamless and secure bidirectional power flow to and from network customers as active players while supporting grid operators in their system responsibilities.
  The challenges that OneNet addresses are:
  • The need to unlock markets of flexibility at every level to address all the possible needs of network operators
  • The need to effectively support both TSOs and DSOs system-level operation through providing flexibility for 'frequency balancing' and 'non-frequency' ancillary services among others
  • The need for TSOs and DSOs to secure power supplies in the context of ever-increasing RES penetration, decreasing network outages,
  • The need for TSOs and DSOs to gain near real-time insight into the operation of the networks and to can optimise them in near real-time, and
  • The need for improved efficiency of grid reinforcements and stabilization of future costs of grid connection.
  Comillas is leader of WP10– From OneNet demonstrators to EU wide implementation of coordinated
  market schemes and interoperable platforms for standardized system products.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 957739

- **RESPONSE. integRatEd Solutions for POsitive eNergy and reSilient CitiEs (Horizon 2020. Grant agreement No. 957751)**
  European Commission. October 2020 - September 2025. (Gregorio López López, Javier Matanza Domingo, Rafael Cossent Arín, José Pablo Chaves Ávila, Tomás Gómez San Román, Carlos Rodríguez-Morcillo García, Néstor Rodríguez Pérez, María Reneses Botija, Farid Bagheri-Gisour Marandyn)

  RESPONSE supports the Lighthouse cities of Dijon (FR) and Turku (FI) and their Fellow cities Brussels (BE), Zaragoza (ES), Botosani (RO), Ptolemaida (GR), Gabrovo (BU) and Severodonetsk (UA) to facilitate them deliver positive energy blocks and districts. Through RESPONSE ,the two LHs will achieve a local RES penetration of 11.2 GWh/y, energy savings of 3,090 MWh/y and an emission reduction of 9, 799 tons CO2eq/y within their districts. To achieve this goal, RESPONSE demonstrates 10 Integrated Solutions (ISs), comprising of 86 innovative elements (technologies, tools, methods), that are being monitored with specific impact metrics (KPIs). It attracts the interest of various stakeholders by generating innovative business models enabling the upscale and replication of the solutions forming a validated roadmap for sustainable cities across Europe and beyond. RESPONSE adopts an energy transition strategy, which includes 5 Transformation Axes (TAs), encompassing the 10 ISs. TA#1 focuses on transforming existing and new building stock into Energy Positive and Smart-ready. TA#2 focuses on the decarbonization of the electricity grid and the district heating/cooling systems, supporting fossil-based regions in transition and the development of energy communities. TA#3 proposes grid flexibility strategies and novel storage systems for optimizing energy flows, maximize self-consumption and reduce grid stress. TA#4 links existing CIPs with apps and other digital infrastructure to enable digitalisation of services and connected city ecosystems, integrating also smart e-Mobility to promote the decarbonisation of the mobility sector. TA#5 offers interdisciplinary citizen engagement and co-creation practices putting citizen at the forefront of shaping the cities they live in and towards the development of each city's 2050 own bold city-vision. Special focus is given to creating resilient and safe cities increasing quality of life and lowering the impacts of climate change.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 957751

- **REDREAM. Real consumer engagement through a new user-centric ecosystem development for end-users´assets in a multi-market scenario. (Horizon 2020. Grant agreement No. 957837)**
  European Commission. October 2020 - April 2024. (Álvaro Sánchez Miralles, Francisco Martín Martínez, Miguel Ángel Sanz Bobi, Carmen Valor Martínez, Álvaro Erdozain Vila, Alessandra Porfido, José Carlos Romero Mora, Roberto Barrella, Efraim Centeno Hernáez, Miguel Martín Lopo, Gopal Lal Rajora, Alejandro Rodríguez Gallego, Bad´r Ghorbal, Javier Matanza Domingo, Rubén Rodríguez Vilches, Olga Rico Díez)

  This project not only enables the effective participation of the consumers/prosumers in the energy market, but also drives a profound change turning traditional company's value chain into value generation chain, based on a revolutionary Service Dominant Logic paradigm. The main objective of the REDREAM project is to effectively move the consumer (as a residential, industrial and tertiary consumer) participation to the centre of the energy market through an open and co-creative ecosystem where all stakeholders will actively interact. This ambitious challenge will require the collection of demand response tools and services (energy and non-energy) capable of enabling the capacity for the consumers of participating in the energy market through an improvement of predictability of consumption patterns and consumer behaviour.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 957837

- **RAYUELA. Empowering and educating young people for the internet by playing (Horizon 2020. Grant agreement No. 882828)**
  European Commission. October 2020 - October 2023. (Gregorio López López, Mario Castro Ponce, Álvaro Jesús López López, Javier Matanza Domingo, Sara Lumbreras Sancho, Yolanda González Arechavala, Carlos Rodríguez-Morcillo García, Rafael Palacios Hielscher, David Contreras Bárcena, Francisco Javier Herraiz Martínez, Jaime Pérez Sánchez, Luis Francisco Sánchez Merchante, Gabriel Antonio Valverde Castilla)

  The RAYUELA project is a 3-years project beginning in October 2020 with a budget of 5M EUR. The consortium involves 17 partners from 9 countries and is co-ordinated by Universidad Pontificia Comillas. The project brings together experts from different areas of knowledge from all over Europe to develop an interactive story-like game that, on the one side, will allow minors to learn good practices on the use of the Internet and associated technology by playing, and, on the other side, will allow modelling, in a friendly and non-invasive

manner, online habits and potential risk profiles related to cybersecurity and cybercriminality, providing Law Enforcement Agencies with scientifically sound foundations to define appropriate policies.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 882828

- **Implementing network codes**
  Research Council of Norway (RCN), Statkraft, Statnett, Ministry of Petroleum and Energy, Nord Pool. January 2021 - December 2024. (Paolo Mastropietro)
  The project investigates the implementation of European Network Codes and Guidelines'. These are detailed rules on electricity trade intended to improve and harmonize the EU internal energy market. They could have far-reaching consequences for how we use our electricity network, but so far, they have largely escaped scholarly attention. This project asks several fundamental questions: i) how have network codes and guidelines been designed and outlined at the general level? ii) how have they been further specified in various 'terms, conditions and methods' (TCMs) across Europe? iii) how have they actually worked in practice? iv) have they been able to deliver on the fundamental goal of increasing the efficiency of electricity trade within Europe?

- **ECEMF. European Climate and Energy Modelling Forum (Horizon 2020. Grant agreement No. 101022622)**
  European Commission. May 2021 - December 2024. (Sara Lumbreras Sancho, Andrés Ramos Galán, Luis Olmos Camacho, Carlos Mateo Domingo, Dilayne Santos Oliveira, Miguel Martínez Velázquez, María del Socorro Gómez Pérez)
  The aim of ECEMF is to provide the knowledge to inform the development of future energy and climate policies at national and European levels. In support of this aim, ECEMF proposes a range of activities to achieve five objectives and meet the four challenges set out in the call text.
  ECEMF's programme of events and novel IT-based communications channel will enable researchers to identify and co-develop the most pressing policy-relevant research questions with a range of stakeholders to meet ambitious European energy and climate policy goals, in particular the European Green Deal and the transformation to a climate neutral society.
  Answers will be provided by the first inclusive and open full-scale model comparison exercise on achieving climate neutrality in Europe, including from the outset over 20 models and 15 top research groups, to produce a coherent and relevant evidence-base for energy and climate policy impact assessment.

ECEMF's evidence-base will support the development of policy-relevant insights which will be communicated to and discussed with the key decision makers via a range of novel methods, including interactive embeddable visualisation blocks, policy briefs, workshops and high-profile events.
This loop of knowledge co-production stands on two pillars.
First, ECEMF will advance the state-of-the-art of energy and climate modelling by enabling sharing of: input data using open standards, methods for model comparison building on the vast experience of the consortium, scientific software tools such as the IIASA scenario explorer and hands-on training for researchers.
Second, ECEMF will be established as a long-term, open and welcoming European focal-point for researchers and policy makers with unparalleled international connections to the EMF, JMIP, IAMC and IPCC. Through extensive links to ongoing H2020 projects, research and policy communities & networks ECEMF will reduce fragmentation of the European energy and climate research landscape.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101022622

- **BIO-FlexGen- Highly-efficient and flexible integration of biomass and renewable hydrogen for low-cost combined heat and power generation to the energy system (Horizon 2020. Grant agreement No. 101037085)**
  European Comission. September 2021 - August 2024. (José Pablo Chaves Ávila, Timo Gerres, Paolo Mastropietro, Pablo Rodilla Rodríguez, Paulo Brito Pereira, Javier Matanza Domingo, Gregorio López López, Jesús María Latorre Canteli, Luca De Rosa, Rafael Cossent Arín, Elisa María Aracil Fernández, David Roch Dupré, Shilpa Bindu, Juan Francisco Gutiérrez Guerra, Santiago Serna Zuluaga, Andrés Ramos Galán)

  BIO-FlexGen aims to significantly increase the efficiency, flexibility and cost effectiveness of renewable energy-based combined heat and power plants (CHP), enabling them to play a key role in integrating fluctuating renewable energy into the energy system, and therefore making a significant contribution to the decarbonisation of the energy system.

  Comillas will contribute to:
  1) the socio and techno-economic evaluation of the of CHP technology under different scenarios and contexts.
  2) analyse the barriers (market, regulatory, business models, etc.) for CHP deployment

3) contribute to the integration of digitalization strategy.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101037085

- **Next generation urban rail transport: smart planning and regulation for capacity and energy efficiency [FUTURRAIL]**
  MCIN/AEI /10.13039/501100011033 y por la Unión Europea NextGenerationEU/ PRTR. July 2022 - June 2025. (Asunción Paloma Cucala García, Antonio Fernández Cardador, Adrián Fernández Rodríguez, Manuel Blanco Castillo, Fernando Conde Montero, María Domínguez Gago)

  The main objective of the FUTURRAIL project is to provide an integrated model to manage transport capacity efficiently in highly demanded urban and metropolitan railway lines, and software tools to implement it. This way, it will be possible to increase the transport capacity in urban railway lines maximizing the usage of the rail infrastructure.
  The project is structured into three main pillars:
  -Planning module: related to infrastructure and new signalling systems.
  -Timetabling and transport demand coverage: related to the generation of efficient timetables.
  -Traffic operation platform: related to traffic operation and regulation of trains in real-time.

Grant CPP2021-008372 funded by MCIN/AEI/ 10.13039/501100011033 and by "European Union NextGenerationEU/PRTR".

- **BeFlex- Boosting Engagement to increase FLEXibility**
  European Commission. September 2022 - August 2026. (José Pablo Chaves Ávila, Carmen Valor Martínez, Javier Matanza Domingo, Tomás Gómez San Román, Pablo Calvo Báscones, Matteo Troncia, Shilpa Bindu, Jesús José Fernández García, Eliana Carolina Ormeño Mejía, Valeria Karina Moreno, Miguel Ángel Ruiz Hernández, Morsy Abdelkader Morsy Mohammed Nour, Leslie Herding)

  Be-Flex project aims to overcome the existing limitations by demonstrating the implementation of versatile solutions that enable grids to become adaptable to upcoming scenarios, boosting mechanisms that will provide benefits to all actors in the energy market (from market and system operators to final users), giving response to all type of consumers' needs. BeFlex aims at increasing energy system flexibility, enhancing cooperation among DSOs and with TSOs and easing participation of all energy-related actors through the validation and large-scale demonstration of adapted and proven cross-sectoral services, interoperable data exchange platforms for smart grids operation and the creation of required system architecture framework that will enable the creation of new business models providing additional value to meet consumers' needs in compliance with a stable regulatory framework.
  Comillas is in charge of: 1) developing the Regulatory Framework and Proposal for Efficient Flexibility Mechanisms, 2) Define the value proposition and engagement strategies of market actors 3) Guide the project the evaluation, lessons learnt, market uptake of the solutions and scalability of the project.

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101075438

- **eFORT- Establishment of a FramewORk for Transforming current EPES into a more resilient, reliable and secure system all over its value chain (Horizon Europe. Grant agreement No. 101075665)**
  European Commission. September 2022 - August 2026. (Gregorio López López, José Pablo Chaves Ávila, Javier Matanza Domingo, Rafael Palacios Hielscher, Néstor Rodríguez Pérez, Miguel Ángel Sánchez Fornié, Lukas Sigrist, María del Valle Varo García, Mario Castro Ponce, Jaime Pérez Sánchez, Farid Bagheri-Gisour Marandyn)

  Prompted by the need to comply with environmental and societal concerns, Electrical Power and Energy Systems are undergoing an unprecedented transformation, demanding urgent upgrades to make them more reliable, resilient and secure. Modernization of current grids will greatly reduce the frequency and duration of power blackouts, diminish the impact of disruptive

events and restore service faster when outages occur, creating broad benefits to society and economy. eFORT approach will enable the further upgrading of the energy grid without affecting the security of supply and increasing their reliability and resiliency against extreme weather events, manmade hazards and equipment failures. eFORT addresses this complex challenge by gathering a consortium of 23 partners, from 10 EU countries, that provides the needed expertise. The project will put in place a set of solutions at the cyber and physical layers for detecting, preventing and mitigating vulnerabilities and threats. Among them, an interoperable Intelligent Platform will set a common foundation for grid characterization and vulnerability overseeing, as well as gather information from smart grid components and apply heavy-duty algorithms, whereas Asset Management developments will strengthen grid infrastructure robustness, which will be empowered by the addressed Digital Technologies. All these elements will be validated in relevant environments coming from 4 demo cases covering the whole grid value chain: (i) a transmission network (The Netherlands); (ii) a remote distribution grid (Italy); (iii) a digital substation in Ukraine; and (iv) a micro-grid in Spain. Moreover, eFORT relies on several horizontal actions aiming at empowering EPES players by establishing a common regulatory and standardisation framework, performing technical and cost-benefit analysis, and evaluating new related business models and replication potential, in the pathway towards a more sustainable energy system.

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101075665

- **Counteracting the REduction of Synchronous Inertia in Power Systems (CRESIPS): PID2021-1-125628OB-C21**

  Agencia Estatal de Investigación (AEI). September 2022 - August 2025. (Aurelio García Cerrada, Francisco Miguel Echavarren Cerezo, Fidel Fernández Bernal, Luis Rouco Rodríguez, Enrique Lobato Miguélez, Ignacio Egido Cortés, Álvaro Ortega Manjavacas, Régulo Enrique Ávila Martínez, Jorge Suárez Porras)

  Modern power systems are characterised by (a) a gradual reduction of the number of synchronous generators powered by fossil or nuclear (fully controllable!) fuels; (b) proliferation of fast acting and smart generation units; (c) proliferation of renewable resources, not always fully controllable (wind and solar are two clear examples); and (d) proliferation of smart and robust loads.
  The main objective of the coordinated project (with Comillas [SP1] and Uni. de Alcalá [SP2]) is the comprehensive and holistic analysis and design of modern frequency-control-proving solutions in power systems with a high penetration

of renewable resources with no inertia. First subproject (SP1) will review the concept of inertia in modern power systems and its importance in frequency and angle stability, with special attention to modern technology scenarios. Along these lines, SP1 will firstly review the concept of inertia in grid codes. Secondly, it will review currently used inertia estimation techniques. Since nowadays it seems that frequency does not change uniformly across the power system any more, SP1 will investigate inertia global estimation and estimation at bus level. Thirdly, the project will study algorithms to control variable inertial levels across the power system taking advantage of the flexibility of electronic generation and modern energy storage systems such as batteries or supercapacitors. Finally, SP1 will set up an experimental test rig to validate the most important contributions. The test rig will be integrated in the Electric Machine Laboratory of ICAI School of Engineering (Comillas) where several motor+synchronous generator groups are being prepared to have speed and voltage control. Unlike in SP2, the experimental focus will be placed on a system-wide approach.

Project PID2021-1-125628OB-C21 funded by MCIN/AEI/ 10.13039/501100011033 and by "ERDF a way of building Europe".

- **HVDC-Wise - HVDC-based grid architectures for reliable and resilient WIdeSprEad hybrid AC/DC transmission systems (Horizon Europe. Grant agreement No. 101075424)**
  European Commission. October 2022 - April 2026. (Lukas Sigrist, Aurelio García Cerrada, Phillipe Vilaça Gomes, Illia Diahovchenko, Saeed Rezaeian-Marjani)

  The HVDC-WISE project overall objective is to propose, analyse, design, and validate HVDC-based grid architecture concepts that enable the deployment of reliable and resilient widespread AC/DC transmission grids to achieve the European energy transition. The HVDC-WISE project aims to: a) Propose a set of innovative HVDC-based grid architecture concepts (technological solutions) to harness the full potential of HVDC to increase the R&R of the AC/DC system and reduce the associated threats of HVDC systems, while providing transmission capacity. b) Provide the necessary tools and methodologies to analyse the R&R levels of future AC/DC systems integrating the different HVDC-based grid architecture concepts enabling their selection and design. c) Validate the proposed HVDC-based grid architecture concepts (using the provided tools) implemented on three complementary realistic use cases representing different grid situations in Europe.

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101075424

- **AVANHID. Advanced hydraulic generation systems: modeling, control and optimized integration to the energy system**
  MCIN/AEI /10.13039/501100011033 y por la Unión Europea NextGenerationEU/ PRTR. October 2022 - September 2025. (Andrés Ramos Galán, Luis Rouco Rodríguez, Jesús María Latorre Canteli, Jesús David Gómez Pérez, Lukas Sigrist, Ignacio Egido Cortés, Pablo Dueñas Martínez, Francisco Labora Gómez, Régulo Enrique Ávila Martínez)

  Development of an advanced model of hydraulic simulators that can be validated in the rehabilitation project and improvement of the turbine and pumping capacities that are currently being developed in the Torrejón-Valdecañas complex (Tajo basin). Therefore, these advanced hydraulic generation systems are integrated into Iberdrola's generation portfolio. The optimization of the economic operation of a hydraulic basin and of a generation portfolio requires the development of economic optimization models.

Grant CPP2021-009114 funded by MCIN/AEI/ 10.13039/501100011033 and by "European Union NextGenerationEU/PRTR".

- **DEFINER. Management of flexible electricity demand in markets with very high penetration of renewable energies**
  MCIN/AEI /10.13039/501100011033 y por la Unión Europea NextGenerationEU/ PRTR. October 2022 - September 2025. (Andrés Ramos Galán, Pablo Rodilla Rodríguez, Jesús María Latorre Canteli, Paolo Mastropietro, Antonio Bello Morales, Carlos Batlle López, Erik Francisco Alvarez Quispe, Diana María Navarrete Cruz, Pedro Sánchez Martín)

Study of how flexible demand, with a focus on electricity markets and hydrogen production, is integrated into the electricity market, adequately contributing to flexibility in demand management as a necessary mechanism to maximize the integration of renewables and the reduction of CO2 emissions.

Grant CPP2021-008786 funded by MCIN/AEI/ 10.13039/501100011033 and by “European Union NextGenerationEU/PRTR”.

- **OptiREC. Local markets for energy communities: designing efficient markets and assessing the integration from the electricity system perspective**
  Ministerio de Ciencia e Innovación (MCIN). December 2022 - July 2025. (Andrés Ramos Galán, José Pablo Chaves Ávila, Jesús María Latorre Canteli, Matteo Troncia, Seyedamir Mansouri, Orlando Mauricio Valarezo Rivera, Jesús José Fernández García, Javier García González, Morsy Abdelkader Morsy Mohammed Nour)

  The project address several of the challenges that limit the effectiveness and proliferation of energy communities. OptiREC develops methods, tools, and solutions for optimal design, operation, and integration into energy systems and energy markets for local energy communities. To ensure effective implementation, energy communities need to be assessed and integrated from several different perspectives. These aspects include the design and internal operation of the energy communities’ participants and assets, aggregation of energy communities and integration into distribution networks, as well as design and participation of local flexibility markets and participation in wholesale markets.

Grant TED2021-131365B-C43 funded by MCIN/AEI/ 10.13039/501100011033 and by “European Union NextGenerationEU/PRTR”

- **DIAMOND. Delivering the next generation of IAMs for net-zero, sustainable, development (Horizon Europe. Grant agreement No. 101081179)**
  European Commission. December 2022 - November 2026. (Sara Lumbreras Sancho, Luis Olmos Camacho, Andrés Ramos Galán, María del Socorro Gómez Pérez)

  Further development of IAMs and their interface with sectorial models. Development by Comillas of an interface between the power system expansion planning model openTEPES and several IAMs.

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101081179

- **Improvement of tools for the analysis of AC/DC hybrid power systems with massive penetration of renewable energy sources and test-case scenarios (TED2021-130610B-C22)**
  MICIU/AEI /10.13039/501100011033 y por la Unión Europea NextGenerationEU/PRTR. December 2022 - November 2024. (Aurelio García Cerrada, Andrés Tomás Martín, Francisco Miguel Echavarren Cerezo, Fidel Fernández Bernal, Luis Rouco Rodríguez, Enrique Lobato Miguélez, Ignacio Egido Cortés, Javier García Aguilar, Carlos David Zuluaga Ríos)

  Meshed DC grids have been possible for many years but the fantastic development of Voltage Source Converter (VSC) technology has made them practical, now. A hybrid DC-AC grid can make power systems more flexible than conventional AC systems although the specific advantages would strongly depend on the size of the power converters and energy reserves available. More specifically: DC/AC converter stations can support the voltage control in the AC system reducing the risk of voltage instability in the AC grid; DC/AC converter stations can support the AC system with additional damping in case of power oscillations in the AC grid, reducing the risk of angle instability due to poor damping in the AC grid; a DC grid can quickly supply additional power in a controlled manner to an area of the AC grid in case of emergency by extracting it from another area or from internal storage elements, reducing the risk of frequency instability. Noticeably, a DC grid can connect asynchronous AC grids to make a more efficient use of the spinning reserves in both systems.
  The purpose of this subproject is threefold. Firstly, researchers use tools for the analysis and operation of hybrid AC/VSC-based DC system, already developed in previous projects, to investigate all the above advantages and contributions of VSC-based DC grids at system level and, when necessary, extended those tools. Secondly, researchers collaborate with the other subproject to elaborate demonstration cases for the above properties to be tested in a laboratory

prototype the other subproject built. The prototype have to be scaled to represent important characteristics of a real power system. Finally, researchers simulate the case studies experimentally verified in characteristic test power systems in the literature (larger size, voltage and power than those of the prototype) to confirm the results obtained. Among others, these simulation cover two specific aspects: (a) the two subprojects collaborate to use similar real-time platforms they are currently equipped with and (b) long term simulation runs are carried out to validate the results from the smart energy management systems investigated by members of the other subproject. A clear understanding of the potential contributions of DC meshed grids to improve the flexibility of AC bulk power systems should help to integrate renewable energy sources (often non-dispatchable) to the generation mix and, consequently, to the decarbonization of the electricity sector, which could then supply clean electricity to many other industrial sectors.

Grant TED2021-130610B-C22 funded by MICIU/AEI/10.13039/501100011033 and by “European Union NextGenerationEU/PRTR”.

- **Rwanda Integrated Clean Cooking Plan- Phase II**

  Sustainable Energy for All (SE4All). January 2023 - December 2023. (Fernando de Cuadra García, Andrés González García, Pablo Dueñas Martínez, José Ignacio Pérez Arriaga, Carlos Mateo Domingo, Rafael Palacios Hielscher, Santos José Díaz Pastor, Olga Rico Díez)

  Project for Sustainable Energy for All (SEforALL), towards the development of an Integrated Clean Cooking Plan for Rwanda, supported by geospatial information. Collaboration between the IIT-Comillas and MIT.
  This is the Phase II of the project, devoted to the implementation and development of methods and tools, and the elaboration of some integrated plans (examples).
  The methodology proposed for the preparation of integrated plans will include a large-scale optimization tool, with widespread use of geospatial information, which proposes detailed solutions (at a national level) on infrastructure developments and pricing policies (subsidies), seeking the maximum benefit/cost ratio. The benefits will be social, environmental and health-related, but the model must also include business benefits - as such a large-scale transformation needs to attract investment in a sustainable way. The tool will produce detailed and georeferenced results, to allow the planner to carry out sensitivity analyses with respect to input parameters and constraints.

- **Myoelectric orthoses with implantable electrodes: optimization of bionic reconstruction**
  Instituto de Salud Carlos III. January 2023 - December 2025. (Romano Giannetti, José Daniel Muñoz Frías)

  Peripheral nerve injuries manifest themselves as loss of motor function and loss of sensitivity, which can be very disabling for the patient. Despite the progress made in recent years in reconstructive surgery, the results do not always allow a functional limb. Therefore, myoelectric orthoses (exoskeletons) have been developed to improve the function of the affected limb (also known as bionic reconstruction). Current models are composed of sensors on the skin to communicate muscle contraction to the orthosis, often with a weak and unstable signal for various reasons (movement, sweat, etc.). In addition, the high cost of these orthoses makes it impossible to use them in national health systems such as the one in our country.
  The objective of our project is to improve human-machine communication sensors. To this end, we propose four phases: 1. modification of the current electromyography sensors; 2. encapsulation of the sensor with 3D printing with autologous cells; 3. implantation of these sensors in an animal model; 4. pilot study in patients with these lesions with no other therapeutic alternative. Finally, we propose the development and 3D printing of these orthoses in order to reduce their price.

- **Day-ahead market price simulation tool [HESIME] (CPP2022-009809)**
  Ministerio de Ciencia, Innovación y Universidades (MICIU), Agencia Estatal de Investigación (AEI) /10.13039/501100011033, y por la Unión Europea NextGenerationEU/ PRTR. April 2023 - March 2026. (Luis Olmos Camacho, Andrés Ramos Galán, Stefanía Gómez Sánchez, Pedro Sánchez Martín)

  The objective of the HESIME project is the research, definition, design and development of a disruptive system for simulating the behaviour of the daily market in Spain for future years (horizons 2030 and 2050) considering different scenarios of system evolution based on the use of artificial intelligence techniques, mathematical programming and the application of advanced algorithms based on the above. HESIME will make it possible to anticipate the behaviour of the market, given its current design, depending on the energy policies that are planned to be applied, with a reliability never before achieved. This tool will make it possible to calculate the price signals produced by the market, which are critical for investment planning and their impact on consumers, as well as the operating regimes of each existing technology or new technology entering the electricity system.

Grant Day-ahead market price simulation tool [HESIME] (CPP2022-009809) funded by MICIU/AEI/ 10.13039/501100011033 and by the “European Union NextGenerationEU/PRTR”.

- **SEAO2-CDR. Strategies for the evaluation and assessment of ocean-based carbon dioxide removal (Horizon Europe. Grant agreement No. 101081362)**
  European Commission. June 2023 - May 2027. (Pedro Linares Llamas, Varios General Contratado, Antonio Francisco Rodríguez Matas)

  Strategies for the Evaluation and Assessment Of Ocean based Carbon Dioxide Removal (SEAO2-CDR) is an ambitious project that develop OCDR beyond current feasibility studies by establishing the mechanisms and frameworks required to support the evaluation and application of archetypal biological, chemical and physical OCDR techniques. Common assessment processes, governance structures and technologies are used to explore system-level interactions between different approaches in order to deliver the insights, tools and guidelines required for the safe and effective implementation of OCDR. These advancements enable SEAO2-CDR to establish the extent to which OCDR can support climate change mitigation and adaptation strategies, and hence the transition to a climate-neutral and resilient society and economy.

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No. 101081362

- **Open Modelling toolbox for development of long-term pathways for the energy system in Africa**
  European Commission. July 2023 - June 2026. (Luis Olmos Camacho, Andrés Ramos Galán, Sara Lumbreras Sancho, Mohamed Abbas Eltahir Elabbas, Francisco Labora Gómez)

  OpenMod4Africa aims to develop an Open Energy System Modelling Toolbox (hereinafter referred to as OM4A Toolbox), which is adapted to African needs and uses based on collaboration between African and European partners. The toolbox provide science-based results to policymakers and local actors, to assist them in analyzing the environmental, social and economic synergies and trade-offs to be achieved in a clean energy transition in African countries, as well as the impact of increasing clean energy generation. The capacity-building program, replication strategy and strong involvement of African academic

institutions and other stakeholders guarantees that OpenMod4Africa can help increase African energy modeling competence and establish a network of local experts and users of the open Toolbox in the long term.

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No. 101118123

- **Maintenance and support of SMAS3**
  Réseau du Transport d´Electricité (RTE). September 2023 - August 2024. (Luis Rouco Rodríguez)

  This project is aimed at provided RTE with the maintenace and support of SMAS3 and its interafce wi Eurostag.

- **REliabatility and REsilience of Island Power Systems (PID2022-141765OB-I00)**
  MCIN/AEI /10.13039/501100011033/ y por FEDER, UE. September 2023 - August 2027. (Lukas Sigrist, Enrique Lobato Miguélez, Mohammad Rajabdorri, Miad Sarvarizadeh Kouhpaye, Luis Rouco Rodríguez, Ignacio Egido Cortés)

  Island power systems (IPSs) are different from large interconnected systems because they are smaller in size and they are usually not interconnected to other systems. The lack of technical and economic support from neighboring systems makes IPSs more vulnerable to disturbances and causes higher system operating costs than interconnected systems. In addition to the small size, the increasing penetration of RES further challenges the reliability and in particular, frequency stability. Cascading failures underlie recent black-outs in IPSs and the mitigation of the propagation of such failures is widely recognized as a crucial aspect in increasing resilience. This proposal aims at addressing reliability and resilience of IPSs under high penetration of RES from an operation planning point of view by considering both preventive and corrective actions. This proposal consider preventive, frequency-stability-based power system splitting as a preventive action that can potentially enhance resilience, whereas preventive frequency-dynamic-based and corrective load-shedding-driven economic dispatches and unit commitments are implemented to improve reliability and frequency stability in particular.

Grant PID2022-141765OB-I00 funded by MCIN/AEI/10.13039/501100011033 and by "ERDF Cofunded by the European Union"

- **Transport and policies for the transition to a low-carbon economy in Spain (PID2022-136376OB-I00)**

  Ministerio de Ciencia, Innovación y Universidades (MICIU), Agencia Estatal de Investigación (AEI), Fondo Europeo de Desarrollo Regional (FEDER). September 2023 - August 2027. (Pedro Linares Llamas, José Carlos Romero Mora, José Pablo Chaves Ávila)

  The energy transition is one of the most important challenges facing our economies in the coming years in order to reduce greenhouse gas emissions (to which the energy sector contributes 60-70% globally). This transition requires moving away from fossil fuels and towards a more decarbonised, more distributed, and more consumer-centred energy system, while maintaining an affordable and reliable energy service.

  Spain is one of the countries with the most ambitious targets for decarbonisation, renewable energy penetration and energy savings (European Climate Foundation, 2019), as set out in the National Integrated Energy and Climate Plan 2021-2030 (currently under review). Meeting these targets will require effective, efficient and equitable policies to be deployed in order to achieve them at the lowest possible cost, while ensuring the fairness of the transition. It is therefore essential to design these policies correctly, based on a rigorous assessment of similar policies and appropriate modelling of the expected effects of these policies.

  The challenge is particularly complex in sectors such as transport or industry, where emission trends show little improvement, and which are additionally crucial for employment and economic growth.

  In this context, the objectives of the proposal are:

  - To improve the energy-economic-environmental modelling capacity for Spain, to expand the capabilities to represent the expected evolution of energy use in Spain and the potential impacts of different policies. In particular, we aim to improve the modelling of the transport sector, industry, the so-called circular economy, and of consumer decisions on energy efficiency, which are not yet sufficiently explored. We also aim to improve the representation of robust and flexible decision-making in the construction of energy scenarios. Where possible, these developments will be integrated into integrated models such as TIMES.
  - Using the developed models, or other models based on micro-data, to evaluate different policy instruments for energy transition contributing to a better design and implementation. In particular, we intend to evaluate transport decarbonisation policies (both fiscal and technological), energy efficiency subsidies for households, and transport fuel poverty policies.

Grant “Evaluation of policies for energy transition” (PID2022-136376OB-I00) funded by MICIU/AEI/ 10.13039/501100011033 and by ERDF/EU.

- **Probabilistic modelling of complex systems with uncertainty: from molecules to human interactions**

  Ministerio de Ciencia de Innovación (MCI) / Agencia Estatal de Investigación (AEI). September 2023 - August 2026. (Mario Castro Ponce, Juan Luis Gómez González, Jaime Pérez Sánchez)

  Some of the most exciting phenomena that have aroused scientific curiosity in recent decades (such as genomics, the emergence of pandemics, the collaborative economy, or the immune response to a pathogen) are collective phenomena out of equilibrium and result from the interactions of simple basic units. In these systems converge (although to different degrees) a set of similar problems common to Complexity science: they occur at different scales (many of them unobservable), they cannot be explained by knowledge of the essential components, and, finally, they are fluctuating, and uncertainty cannot be controlled experimentally. Although many of these problems have already been successfully addressed in recent years, pursuing a unifying theory that is universally valid in all situations is unrealistic. While some patterns can be transferred from one field to another, it is imprecise to generalize from pure metaphor to the quantitative, systematic, and rigorous scientific analysis that characterizes physics. However, it is possible to unify the methodology by considering the specific knowledge of the problem. The novelty of this project is to focus on the universality of the probabilistic description of uncertainty to systematically model each problem using the language of probability. Specifically, using Bayes' Theorem to capture the particular mechanism and the evolution of uncertainty. In the case of physicochemical phenomena, this is reduced to the probabilistic inference of the model parameters. However, as microscopic knowledge of the problem becomes less detailed, the weight of probabilistic modeling becomes more important. In particular, we propose to study diverse systems, from the physics of vapor reservoirs (which gives rise to fractal surfaces) to the dynamics of a sharing economy system, where modeling is based on the maximum entropy principle to determine the variability of mobility patterns in a bike-sharing system, Other examples are epidemiology or immunology. We combine Langevin equations and Markov chains to, through stochasticity, integrate experimentally unobservable degrees of freedom, again described by probability distributions compatible with empirical evidence. In summary, we propose a theoretical framework with uncertainty at the heart of the problem. However, we illustrate it (in the absence of genuinely universal models) using examples from various disciplines. The project team has established expertise in these problems to achieve the project objectives. We also introduce machine learning methodology to analyze experimental data

and use it to generate new hypotheses. The project's ultimate goal is to realize models that can help to contrast alternative hypotheses of a problem and help, with the help of experiments, to falsify those contradictory to them.

- **Emerging porcine influenza and coronaviruses**
  Ministerio de Ciencia e Innovación (MCI)/Agencia Estatal de Investigación (AEI). September 2023 - August 2026. (Mario Castro Ponce)

  Influenza viruses and coronaviruses have caused some of the deadliest pandemics in humans, and pigs are natural reservoirs. Swine influenza A viruses (swIAV) and porcine respiratory coronavirus (PRCV) are enzootic in pigs, infecting airway epithelial cells. However, they differ in their pathogenicity and immune response. Cattle are the natural host for influenza D virus (IDV), but it is now an emerging virus in swine (swIDV), and its pathogenesis is unknown. The genetic diversity of the swine influenza virus is enormous and continues to increase, with many "reassortant" genotypes co-circulating and constituting a zoonotic threat with proven pandemic characteristics. The pandemic potential of PRCV and swIDV is not known.
  We compare the transmission, pathogenesis, and host tropism of six different genotypes of swIAV, swIDV, and PRCV to answer the following four questions:
  1) What are the transmission dynamics of swIVs and PRCV between pigs and from pigs to ferrets? The latter is a model for humans.
  2) What key early events and immune mediators govern the outcome of swIV and PRCV exposure that may tip the balance toward mild or severe disease?
  3) What is the zoonotic potential of swIV and PRCV? Do some new H1 swIAV genotypes pose a higher risk than those already known? How efficiently do swIDV and PRCV replicate in the human airways?
  What viral traits can contribute to host switching?
  4) Can an integrated mathematical model of viral replication, transmission, pathogenesis, and immune control identify key events in virus-host interaction to inform control strategies?
  We perform in vivo studies (Q1, 2) in the porcine and ferret host and in vitro studies (Q3) in discrete cultures of the porcine, human, and ferret airways, with maximum similarity to the in vivo situation. Finally, we use novel mathematical models to provide quantitative information from the integrated data (Q4).

  Our results help predict the zoonotic potential, transmission, and pathogenicity of existing and emerging swIVs and PRCVs.

- **Synthetic distribution system of continental United States**
  National Renewable Energy Laboratory (NREL). September 2023 - June 2025. (Carlos Mateo Domingo, Tomás Gómez San Román, Pablo Dueñas Martínez)

  The Reference Network Model USA (RNM-US) is used to build a synthetic atlas of the distribution system of the Continental United States. A set of representative networks are planned in detail from substations to low voltage consumers, and compared with actual networks. The model designs the electrical equipment (power lines, transformers, switching devices, capacitors, voltage regulators, etc.) of the distribution system to deliver power to

consumers, aiming to minimize system costs while complying with the technical and geographical constraints of every distribution area.

- **Conteracting the reduction of inertia from synchronous generators in electric energy systems: diagnosis and solutiion placement**
  Ministerio de Ciencia e Innovación (MCI). November 2023 - October 2027. (Aurelio García Cerrada, Jorge Suárez Porras)

  Inertia in bulk electric power systems is been gradually reduced due to the integration of renewable energy sources which substitute conventional synchronous generators, because the former resources are most often interfaced with the grid though electronic power converters with no rotating masses. Inertia is important in bulk electric power systems to maintain stability (especially frequency and angle stability) and its reduction must be addressed to ease the sustainability of electric power systems in the future.
  This research project will try to understand the nature and extend of the problem described, and will study possible solutions and their optimal distribution.

- **New tools for the integration of energy systems: Spain´s role in Europe´s energy transition [ONESYSTEM] (CPP2022-009711)**
  Ministerio de Ciencia, Innovación y Universidades (MICIU), Agencia Estatal de Investigación (AEI) /10.13039/501100011033, y por la Unión Europea NextGenerationEU/ PRTR. November 2023 - January 2028. (Pablo Rodilla Rodríguez, Carlos Batlle López, Paolo Mastropietro, Antonio Bello Morales, Devashish Sonowal, Miguel Angel Barruso Recuero)

  The main energy carriers that will lead the energy transition are electricity and decarbonised gases, in particular green hydrogen. In the energy system of the future, the decarbonisation of industrial cooling/heating processes, the central role of hydrogen, the activation of demand and the coordination of the different energy vectors and markets through efficient economic signals will be key aspects. This necessary transformation of the economy in general and the energy sector in particular poses innumerable challenges. In this context, it will be essential to have tools to evaluate strategies that allow the Spanish economy to be relevant in the European decarbonization process.

  In order to provide solutions to the current challenges and constraints, the aim of the ONESYSTEM project is to research and develop tools for the integration of energy carriers that allow the exploitation of synergies between them to improve the efficiency of energy supply and minimise the cost of decarbonising the economy. These tools are of two types: modelling tools and regulatory tools. The former are based on the development of techno-economic analyses, which are essential in a context of unparalleled technological and economic uncertainty. The latter, crucial in a sector in which public-private coordination is essential, are focused on the design of the regulatory framework necessary for the appropriate development of new business models. This project aims to develop models for analysing possible future routes for the integration of energy systems, focusing on Spain and its interaction with the rest of Europe. As part of the project, it will also seek to ensure that the tools developed can be replicated

in other European markets.

Grant New tools for the integration of energy systems: Spain's role in Europe's energy transition [ONESYSTEM] (CPP2022-009711) funded by MICIU/AEI/ 10.13039/501100011033 and by the “European Union NextGenerationEU/PRTR”.

- **Development of a new voltage control system for the penetration of renewable electricity production, storage and demand flexibilisation [PERAL] (CPP2022-009713)**
  Ministerio de Ciencia, Innovación y Universidades (MICIU), Agencia Estatal de Investigación (AEI) /10.13039/501100011033, y por la Unión Europea NextGenerationEU/ PRTR. December 2023 - November 2026. (Luis Rouco Rodríguez, Enrique Lobato Miguélez, Ignacio Egido Cortés, Francisco Miguel Echavarren Cerezo, Álvaro Benítez Domínguez, Fernando Gegúndez Nogueroles)

  This project is aimed at developing a voltage control system for renewable energy sources, storage and flexible demand that complies with the procedure of voltage control in the Spanish mainland transmision grid.

Grant Development of a new voltage control system for the penetration of renewable electricity production, storage and demand flexibilisation [PERAL] (CPP2022-009713) funded by MICIU/AEI/ 10.13039/501100011033 and by the “European Union NextGenerationEU/PRTR”.

- **Digital Twin for Europe**
  European Commission. January 2024 - December 2026. (Javier Matanza Domingo, José Pablo Chaves Ávila, Néstor Rodríguez Pérez, Gregorio López López, Miguel Ángel Sánchez Fornié, José Portela González, Carlos Mateo Domingo)

The TwinEU project is at the forefront of transforming the energy sector through a series of innovative actions aimed at enhancing the capabilities, interoperability, and performance of Digital Twins (DTs) across Europe.

- Cross-Domain Federated DTs: Bridging the gap between different DTs by utilizing existing Smart Grid standards, open APIs, and integration with TensorFlow Hub, fostering a seamless exchange of data and models across various stakeholders.

- HPC-coupled Federated DTs Infrastructure: Leveraging High-Performance Computing (HPC) to boost the computational power of DTs, ensuring faster and more accurate data processing for real-time applications.

- Dataspace Adaptation for Pan-European DTs: Facilitating the sharing and exchange of AI/ML models and data across Europe, with a focus on improving interoperability, lifecycle management, and cross-stakeholder collaboration.

- Closed Loop Adaptive Digital Twins: Evolving DTs to be context-aware, autonomous, and adaptive, capable of real-time decision-making and self-learning to enhance grid monitoring and operation.

- Immersive Metaverse-oriented DTs: Integrating DTs with immersive technologies to create user-friendly and engaging Metaverse-oriented experiences, improving workflows and stakeholder collaboration in smart grids.

The project's objective is to set the stage for a more integrated, efficient, and innovative energy sector, paving the way for smarter grids and a sustainable future.

- **Injury mitigation to promote vision-zero achievement**

  Unión Europea. June 2024 - May 2028. (Francisco José López Valdés, Manuel Valdano, Luis Francisco Sánchez Merchante)

  Until now, the approach to road safety has primarily focused on analyzing the most common types of injuries based on road user types and crash characteristics. However, recognizing the need for a more comprehensive and proactive strategy, there is a growing consensus to shift the paradigm towards a user-centric approach that considers the specific needs (incl. their diversity) and behaviors of road users.
  IMPROVA project will focus on current knowledge regarding the conditions and mechanisms leading to serious injuries of all road user types, and both physical and psychological long-term consequences as well as future scenarios regarding the overall crash occurrence considering changes due to vehicle automatization. IMPROVA will introduce a formula that will predict a likelihood of
  sustaining LTC. This will allow stakeholders to estimate physical and psychological long-term consequences due to road traffic accidents in a compact manner directly after the crash. HBMs will be specifically upgraded in their capabilities to depict LTC-relevant injury mechanisms. This will be

achieved through validation of mode responses against experimental tests and through the development and tailoring of risk curves, using the latest available biomechanical data. Virtual
testing procedures will be developed and demonstrated for future application environments, specifically through the involvement of industrial partners and NCAP labs.
IMPROVA network consisting of NCAPs, US, Australian and Asian entities and medical and psychological expert panel group will help the harmonization not only of the knowledge of the long-term consequences but also to harmonize the data collection, evaluation of such injuries leading to LTC and to use appropriate tools validated for this purpose. The communication with regulatory authorities, NCAPs, rescue team and end-user will enable the awareness of the topic and implementation of appropriate countermeasures.

3.2.2 Consultancy and technological support

3.2.2.1 Private funding

- **ACG-IIT maintenance services**
  Acciona Generación Renovable S.A. January 2022 - December 2024. (Ignacio Egido Cortés, Luis Rouco Rodríguez)

  Acciona participates in the secondary regulation in the Spanish power system. Acciona is using two licenses of AGC-IIT for its two regulation zones. This project covers the AGC-IIT maintenance services

- **Hydrogen regulation and potential in Europe**
  Ohmium. September 2022 - September 2023. (José Pablo Chaves Ávila)

  This project consists of advising Ohmium on the relevant regulations and potential for hydrogen production in Europe.

- **Assistance and maintenance of tools CODEX, SIROCO and DESI**
  Endesa Medios y Sistemas S.L. January 2023 - December 2023. (Francisco Alberto Campos Fernández, Efraim Centeno Hernáez, Luis Alberto Herrero Rozas, Enrique Lobato Miguélez, Javier García González)

  Assistance and maintenance of tools CODEX, SIROCO-Ofertas Y DESI developed by IIT for Endesa

- **Investigation on the oscillations in excitation system of Cofrentes NPP generator**
  Iberdrola Generación Nuclear, S.A.U. March 2023 - December 2023. (Luis Rouco Rodríguez, Fidel Fernández Bernal, Jorge Suárez Porras, Andrés Tomás Martín)

  The aim of the work is to investigate the oscillations of the excitation system of Cofrentes nuclear power plant generator.

- **Supply of the AGC-IIT and commissioning in the BBE SCADA system**
  Bahía Bizkaia Electricidad, S.L. May 2023 - December 2024. (Ignacio Egido Cortés, Luis Rouco Rodríguez)

  BBE participates in the secondary regulation in the Spanish power system. This project consists in the supply of AGC regulator AGC_SRS-IIT to BBE and the assistance to both BBE and the SCADA provider in its integration in the system.

- **Development of the universal access to electricity strategy in Bolivia, based on a geo-referenced electricity access plan**
  Inter-American Development Bank (IADB). May 2023 - April 2024. (Rafael Palacios Hielscher, Andrés González García, José Ignacio Pérez Arriaga, Santos José Díaz Pastor, Hagos Meresa Weldu)

  The objective of this consultancy is to support the government of Paraguay and ANDE in the development of a national electrification plan as a basis for achieving the goal of universal energy access by 2030.
  The project includes the following phases:
  1. Development of a georeferenced database in GIS format. This database should include the location of the communities and their buildings, the energy consumption of the communities, the location of existing power lines, access roads, protected areas, identification of the concession areas of the distribution companies, socioeconomic information of the communities, among other relevant information for the development and monitoring of the plan. The database will be prepared using available information to be provided to the consulting firm and data obtained remotely through satellite information or other means of support.
  2. Estimation of rural electrification demand at a 2030 horizon (or other proposed by the consulting firm), adequate for the development of the plan.
  3. Preparation of the national electrification plan, optimized at the lowest overall cost, and georeferenced that considers the technical and economic feasibility and national technical regulations for grid extensions and off-grid supply systems such as solar mini-grids with storage and photovoltaic home systems. The plan should be based on the estimated energy consumption of the communities. Based on this, and the projected costs of the energy solutions, the plan should size the energy solutions to be implemented to provide access to electricity in the communities, estimate the investment needs of capital costs (CAPEX), operation and maintenance costs (OPEX) and administration costs for the projects. The plan should be based on a global cost optimization to develop an execution and investment plan to achieve universal access by 2030. Finally, scenarios and sensitivities should be developed, estimating the reduction of emissions from the use of renewable technologies and their final results database.
  4. Proposal of an investment plan for the execution of the plan (2023-2030), which identifies the investments required and the financing mechanisms to finance the electrification projects proposed in the plan. The definition of this plan requires analyzing the conditions of economic, technical and environmental sustainability of the proposed business models (grid supply, mini-grids and individual systems), the institutional and regulatory framework and the sources of capital and financing mechanisms used for the development

of projects for access to electricity in other countries in the region, as well as in Africa and Asia, and which are relevant to Paraguay.
5. Present a template with the technical specifications for the projects resulting from the national electrification plan.
6. Develop a methodology for updating and monitoring the national electrification plan.
7. Identification and presentation of the risks and mitigation measures identified for the implementation of the national electrification plan.

- **Migration of the residual demand curve prediction model in the day ahead market.to the Cloud environment**
  Endesa Medios y Sistemas S.L. June 2023 - September 2023. (José Portela González, Alejandro Polo Molina)

  The main objective of this project is to migrate the residual demand curve forecasting model in the Spanish day-ahead market to the cloud environment. Taking as inputs different variables of the electricity market, the model applies dimension reduction techniques together with regression models to estimate the curves.

- **Feasibility of grid connection of Cepsa's H2 production plants**
  Compañía Española de Petróleos, S.A. (CEPSA). June 2023 - December 2023. (Luis Rouco Rodríguez, Francisco Miguel Echavarren Cerezo, Enrique Lobato Miguélez)

  This collaboration is aimed at investigating the feasibility of grid connection of Cepsa's H2 production plants in Huelva and Algeciras.

- **Support in the preparation of the application to the call on innovative energy storage systems**
  Glide Energy. June 2023 - October 2023. (Luis Rouco Rodríguez, Andrés Ramos Galán, Francisco Miguel Echavarren Cerezo, Rafael Cossent Arín)

  This work is aimed at supporting Glide Energy in the preparation of the application to the call of the Spanish Ministry of Ecological Transition on innovative energy storage systems.

- **Quantitative assessment of Regional Cost Allocation Methods in the West African Power Pool**
  CESI S.p.A. July 2023 - July 2024. (Luis Olmos Camacho, Mohamed Abbas Eltahir Elabbas, Stefanía Gómez Sánchez)

  Application of several methodologies for the computation of electricity transmission tariffs to allocate the cost of the regional transmission grid in the West Africa Power Pool (WAPP). Analysis of the results and derivation of relevant policy conclusions.

- **ACG-IIT installed in Nexus. Maintenance services**
  Nexus Energía S.A. July 2023 - July 2024. (Ignacio Egido Cortés, Luis Rouco Rodríguez)

Nexus participates in the secondary regulation in the Spanish power system. Nexus is using one license of AGC-IIT for its regulation zone. This project covers the AGC-IIT maintenance services

- **Supply of the AGC-IIT and commissioning in the Nexus SCADA system**
  Nexus Energía, S.A. July 2023 - December 2024. (Ignacio Egido Cortés, Luis Rouco Rodríguez)

  Nexus participates in the secondary regulation in the Spanish power system. This project consists in the supply of AGC regulator AGC_SRS-IIT to Nexus and the assistance to both Nexus and the SCADA provider in its integration in the system.

- **Flexibility provided by the storage capability of H2 duct**
  Enagás S.A. September 2023 - November 2023. (Luis Rouco Rodríguez, Pedro Sánchez Martín)

  This work investigates the flexibility provided by the storage capability of a H2 duct. It is assumed that H2 is produced with renewable intermittent energy sources.

- **Contribution of energy storage systems to the congestion management in the Spanish transmission system**
  Q-Energy Private Equity, S.G.E.I.C., S.A. September 2023 - October 2023. (Luis Rouco Rodríguez, Francisco Miguel Echavarren Cerezo)

  The aim of this work is to investigate the contribution of energy storage systems to the congestion management in the Spanish transmission system.

- **Migration of the demand scenario generator MODEM to the cloud environment**
  Endesa Medios y Sistemas S.L. September 2023 - December 2023. (Eugenio Francisco Sánchez Úbeda)

  The main objective of this project is the migration of the demand scenario generator MODEM to the cloud environment. MDDEM consists of a set of models based on machine learning techniques, in charge of generating coherent probabilistic predictions for the medium term of the demand.

- **Court appearance as expert**
  Cartera Vimira 24, S.L. September 2023 - October 2023. (Luis Rouco Rodríguez)

  This work has consisted of a court appearance as an expert related to the connection conflict of Monte da Croa wind farm.

- **Feasibility of grid connection of Cepsa's H2 production plants**
  Repsol Renewable And Circular Solutions, S.A. September 2023 - December 2023. (Luis Rouco Rodríguez, Francisco Miguel Echavarren Cerezo)

  This collaboration is aimed at investigating the feasibility of grid connection of Repsol's H2 production plants in Repsol en Vizcaya, La Coruña and Portugal.

- **Analysis of recent milestones in European legislation relevant to heavy-duty transport**
  Asociación Ibérica de Gas Natural, Hidrógeno y Gas Renovable para la Movilidad (GASNAM). October 2023 - April 2024. (Rafael Cossent Arín, Pedro Linares Llamas, Santiago Serna Zuluaga, Manuel Pérez Bravo)

  The aim of the project is to create a set of summary fact-sheets about the main recent milestones within European legislative framework relevant to the heavy-duty transport sector.

  These milestones include: the Renewable Energy Directive (RED III), the Alternative Fuels Infrastructure Regulation (AFIR), the FuelEU Maritime and ReFuelEU Aviation initiatives, the Heavy-Duty Vehicle CO2 Emissions Standards Regulation, the Gas Package, and the Regulation on the Methane Emissions Reduction.

- **Impact in the performance of the AGC of Magnon of the hybridization of a PV plant and a biomass plant**
  Magnon Green Energy, S.L. October 2023 - November 2023. (Ignacio Egido Cortés, Luis Rouco Rodríguez)

  Magnon participates in the secondary regulation in the Spanish power system. This project is focused on the impact in the performance of the AGC of Magnon of the hybridization of a PV plant and a biomass plant

- **Electricity Market Modelling**
  REPSOL S.A. November 2023 - April 2024. (Luis Olmos Camacho, Andrés Ramos Galán, Stefanía Gómez Sánchez)

  The objective of this collaboration is to develop a tool focused on determining the evolution of prices in the Spanish peninsular electricity system markets in the 2023 to 2050 horizon, as well as to apply this tool to a case, or set of scenarios, representative of the possible evolution of the Spanish system. This tool must consider an evolution of those factors that have a relevant impact on prices that is consistent with the evolution projections of the electricity system developed by the Ministry for Ecological Transition and Demographic Challenge (MITECO) within the National Integrated Energy and Climate Plan (PNIEC) 2021-2030 and the Long Term Decarbonization Strategy 2050.

- **Follow up pf excitation system of Cofrentes NPP generator performance**
  Iberdrola Generación Nuclear, S.A.U. November 2023 - May 2024. (Luis Rouco Rodríguez)

  The aim of the work is to Follow up pf excitation system of Cofrentes NPP generator performanc.

- **Analysis of the emission factors per km for heavy-duty road vehicles powered by natural gas**
  GASNAM-Neutral Transport. December 2023 - February 2024. (Rafael Cossent Arín, Manuel Pérez Bravo, Pedro Linares Llamas)

The aim of the collaboration is to analyze the values of the emission factors per unit of distance traveled published in June 2023 by MITERD in order to understand the underlying assumptions and calculation procedure. Likewise, the emission factors reported by manufacturers are analyzed and compared using the VECTO tool of the European Commission.

- **The objective of the project is to analyze the default values given to the well to tank (WtT) emission factors in Regulation (EU) 2023/1805 and analyze the impact of new regulatory measures**
  GASNAM-Neutral Transport. December 2023 - February 2024. (Rafael Cossent Arín, Manuel Pérez Bravo, Pedro Linares Llamas)

  The objective of this collaboration is to analyze the default values given to the well to tank (WtT) emission factors in Regulation (EU) 2023/1805, compare them with the values provided by other studies and available sources, and evaluate the impact that these values would have the achievement of the objectives regarding the reduction of methane leaks set by the corresponding European regulation.

- **Supply of the AGC-IIT and commissioning in the Alpiq SCADA system**
  Alpiq Energía España S. A. U. December 2023 - June 2025. (Ignacio Egido Cortés, Luis Rouco Rodríguez)

  Alpiq participates in the secondary regulation in the Spanish power system. This project consists in the supply of AGC regulator AGC_SRS-IIT to Alpiq and the assistance to both Alpiq and the SCADA provider (the current one and the future one) in its integration in the system.

- **Assistance and maintenance of tools CODEX, SIROCO and DESI**
  Endesa Medios y Sistemas S.L. January 2024 - December 2024. (Francisco Alberto Campos Fernández, Efraim Centeno Hernáez, Luis Alberto Herrero Rozas, Enrique Lobato Miguélez, Javier García González, José Portela González)

  Assistance and maintenance of tools CODEX, SIROCO-Ofertas Y DESI developed by IIT for Endesa

- **Analysis of the emissions reduction potential of a beer brewing company**
  Overview Effect, S.L. January 2024 - May 2024. (Pedro Linares Llamas, Manuel Pérez Bravo, Léonard Lefranc, Rafael Cossent Arín)

  The goal of the project is to analyse the technical and economic aspects of the different options available for the decarbonization of teh scope 3 emissions of a beer brewing company.

- **Local flexibility market and sandbox proposal for the AD-GRHID project**
  Magtel Operaciones S.L.U. February 2024 - September 2024. (Tomás Gómez San Román, José Pablo Chaves Ávila, Miguel Ángel Ruiz Hernández, Miguel Martínez Velázquez, Eliana Carolina Ormeño Mejía)

In the first part of the project, a cost/benefit analysis is carried out to identify the benefits derived from the provision of flexibility services by a microgrid connected to a distribution transformer and its associated costs. It also establishes the technical-economic basis of the agreement between the distributor and the microgrid manager to determine the price of the provision of those services.
In the second part of the project, a proposal for a regulatory sandbox is made to implement the local flexibility market business model, identifying the barriers and the necessary regulatory developments so that this business model can be scaled at a national level as required by European regulations.

- **Spillage of a solar pv plant connected to Escatron bus**
  Repsol Renovables S.A. February 2024 - September 2024. (Luis Rouco Rodríguez, Francisco Miguel Echavarren Cerezo, Enrique Lobato Miguélez)

  This collaboration is aimed at estimating the spillage of a renewable generation plant connected to Escatron bus.

- **Guide on new fuels for sustainable transport and their regulatory treatment**
  GASNAM-Neutral Transport. February 2024 - March 2024. (Rafael Cossent Arín, Manuel Pérez Bravo, Santiago Serna Zuluaga, Pedro Linares Llamas)

  The objective of the collaboration is to prepare a technical guide on the new fuels defined in the European regulation approved in recent years (RED III, regulations on CO2 emission standards for new heavy-duty vehicles, FuelEU, etc.), as well as the regulatory treatment they receive.

- **Assessment express rehabilitations 2024**
  Fundación Naturgy. February 2024 - September 2024. (Roberto Barrella, José Carlos Romero Mora, Efraim Centeno Hernáez)

  This project aims to carry out a mixed assessment (with objective and subjective data) of the impact on energy poverty of the shallow renovations carried out by the Naturgy Foundation and the collaborating NGOs within the framework of the Solidarity Fund for Energy Rehabilitation. The impact analysis is carried out based on the characteristics of the home and the energy bills before and after the refurbishment, comparing the actual expenditure with the required energy expenditure of the household. The calculation of a hidden energy poverty indicator is also proposed to measure the objective impact of the intervention on energy poverty. Finally, the subjective indicators of inadequate temperature (both in winter and summer) are estimated to analyse the change in the perception of comfort in the dwelling.

- **Assessment of recent regulatory and policy developments relevant to the competitiveness of LNG as a marine fuel**
  Axpo Iberia S.L. March 2024 - April 2024. (Rafael Cossent Arín, Santiago Serna Zuluaga)

  The aim is to assess recent regulatory and policy developments that can act as drivers or barriers to the competitiveness of LNG as a marine fuel. This is achieved through the following tasks:

i. Select and understand key regulatory developments at EU level, International Maritime Organization (IMO) requirements, and national legislation in Spain.

ii. Among the key regulatory documents selected, those dispositions deemed most relevant to the competitiveness of LNG as a marine fuel are evaluated in order to identify the main regulatory and policy-risks to the use of LNG.

iii. Perform a set of scenario-based numerical analyses exploring the impact of alternative regulatory and policy developments on the LNG competitiveness in terms of greenhouse gas emission reduction an economics.

- **Test to evaluate the participation of a wind farm in Alpiq's BSP (SRS service)**
  Alpiq Energía España S. A. U. March 2024 - April 2024. (Ignacio Egido Cortés, Luis Rouco Rodríguez)
  Alpiq participates in the secondary regulation in the Spanish power system. This project consists in the tests to evaluate the participation of a new wind farm in Alpiq's BSP (SRS service)

- **Study of production management of fuel blending plant at Repsol Technology Lab**
  REPSOL S.A. March 2024 - June 2024. (Pedro Sánchez Martín)
  The objective of the proposed collaboration is to develop a study for the improvement of the management of the fuel blending plant located at REPSOL Technology Lab.

- **Proyecto de Integración TSO-DSOs en Brasil**
  PSR Soluçoes e Consultoria em Energia Ltda. April 2024 - December 2024. (José Pablo Chaves Ávila, Carlos Batlle López, Matteo Troncia)
  This project aims to develop recommendations to improve TSO-DSO coordination in the Brazilian system. For this purpose, IIT collaborates in the following tasks:
  1. to contribute recommendations to the review of international experience in the integration between the Distribution System Operator (DSO) and the Transmission System Operator (TSO), including proposals for conceptual designs, pilot projects carried out, case studies, among others. Among the main subtopics related to international experience, special attention is given to the institutional concepts of distribution and transmission system operators, the regulation and business models applicable to the networks, and critical analysis and/or proposals for regulatory modification in the countries analyzed.
  2. Provide recommendations, contributions and critical analysis of the proposed formulation for the Brazilian System, including price signals provided to decentralized agents, products to be provided by and to the DSO, physical interface between the transmission and distribution systems, allocation of responsibilities between DSO, TSO and agents, management mechanism of the products offered, institutional arrangements for the operational interface of both networks and governance model, related to the process of operation, planning and information flow between the TSO and DSO.

3. Details of international practical experiences on TSO-DSO (regulations, tools used, information and/or commercial structures, etc.)

- **Elaboration of the S2F Pilot project proposal**
  I-DE Redes Eléctricas Inteligentes, S.A, ANELL, GASELEC, ENERCOOP, CONILENSE, CUERVA, E-REDES, E-DISTRIBUCIÓN REDES DIGITALES, Viesgo, UFD. April 2024 - May 2024. (Tomás Gómez San Román, José Pablo Chaves Ávila, Matteo Troncia, Miguel Ángel Ruiz Hernández, Orlando Mauricio Valarezo Rivera)

  The objective of the collaboration is to prepare the three reports required by the CNMC Circular 8/2021 for the presentation of a pilot project for 10 electricity distributors in Spain. The pilot project deals with implementing flexibility solutions in distribution networks, with two use cases: local flexibility markets and flexible connections.

- **Development of an interactive application for data analysis using neural networks and the neuralsens methodology for interpretability**
  Cátedra Santalucía de Analytics for Education. April 2024 - June 2024. (Jaime Pizarroso Gonzalo, José Portela González)

  This project is a collaborative initiative proposed by the Instituto de Investigación Tecnológica (IIT) with the Cátedra Santalucía de Analytics for Education.

  The project's main goal is to create a functional application designed in R, allowing interactive data analysis. The application will facilitate the understanding of complex datasets through advanced neural network techniques and the NeuralSens interpretability framework. This tool aims to support educational and research purposes, particularly for students and researchers in data science fields.

  The application will be distributed among students at Universidad Pontificia Comillas and Cátedra Santalucía, supporting their learning and research activities. It will facilitate advanced data analysis and model interpretability, contributing to the fields of machine learning and data science.

  Key Features and Deliverables
  - Interactive Analysis: The application will include features for importing data, training linear and neural network models, and performing sensitivity analysis.
  - NeuralSens Methodology: Incorporates the NeuralSens methodology for detailed data interpretation and model understanding.
  - User Interface: The tool will have a user-friendly interface with components such as a top bar for primary functions, a sidebar for dataset and model management, and a main panel for detailed data views and model summaries.
  - Data Import and Preparation: Supports CSV and XLSX file formats for data import, with detailed guides for data preparation to ensure compatibility and ease of use.
  - Training and Analysis: Provides functionalities for training both linear and

neural network models, with options for advanced configurations like cross-validation and hyperparameter tuning.

- **Efficiency of thermal units ABO1 and SRI3 in the solution of thermal constraints of distribution grid of Asturias**
  Aboño Generaciones Eléctricas, S.L.U. April 2024 - June 2024. (Enrique Lobato Miguélez, Francisco Miguel Echavarren Cerezo, Luis Rouco Rodríguez)
  Assessment of the contribution of thermal unit ABO1 to the operation and reliability of distribution grid of Asturias.

- **Analysis and improvement of optimization models of the Colombian electricity system**
  XM S.A. E.S.P. May 2024 - December 2024. (Andrés Ramos Galán)
  The project consists of:
  • Analysis of the numerical difficulties arising from the creation of the model and proposals for improvement.
  • Improvements in the use of Gurobi optimizer parameters to reduce resolution time.
  • Analysis of the mathematical formulations used in the model for its possible strengthening for optimization.

- **Migration.to the cloud environment of the GBD Database for evaluating predictive models**
  Endesa Medios y Sistemas S.L. May 2024 - July 2024. (José Portela González)
  The main objective of this project is to migrate the data storage system to the cloud environment for the execution of forecast models of residual demand curves in the Spanish daily market.

- **Application of the ENTSO-e cost-benefit analysis method to Aguayo II pumped-hydro storage 2024**
  Repsol Generación Eléctrica, S.A.U. June 2024 - September 2024. (Andrés Ramos Galán, Luis Olmos Camacho, Luis Rouco Rodríguez, Enrique Lobato Miguélez)
  Report on the application of the ENTSO-e 2024 cost-benefit analysis method to Aguayo II pumped-hydro storage.

- **Training and exploration in Artificial Intelligence techniques for risk detection in high voltage insulators through leakage current monitoring**
  VERESCENCE La Granja S.L. June 2024 - October 2024. (Miguel Ángel Sanz Bobi, Gopal Lal Rajora)
  The objective of this collaboration is to carry out training and subsequent application of machine learning algorithms aimed at characterizing the condition of high voltage electrical insulators through monitoring the leakage current and the most relevant environmental factors.

- **Analysis and quantification of the impact of decarbonisation measures for industry and transport in European regulation.**
  pHYnix Iberia S.L. June 2024 - July 2024. (Rafael Cossent Arín, Santiago Serna Zuluaga, Léonard Lefranc)

  The aim of the project is to analyse the measures to promote the decarbonisation of the transport and industrial sectors included in European regulation, with a view to estimating the potential penetration of electrolytic hydrogen or its derivatives in these sectors.

- **Support to the Assessment of impacts and risks derived from climate change in Spain**
  Tecnalia. July 2024 - February 2025. (Pedro Linares Llamas)

  Participation in a group of experts supporting the project "Assessment of impacts and risks derived from climate change in Spain". This group, with a consultive character, will bring an external and independent perspective on the methodology and sources to analyze in the different sectoral chapters, collectively or individually.

- **Analysis of the legislative piece Orden TED/728/2024 developing the mechanism to promote biofuels and other renewavle fuels for transport purposes**
  Asociación Ibérica de Gas Natural, Hidrógeno y Gas Renovable para la Movilidad (GASNAM). August 2024 - September 2024. (Rafael Cossent Arín, Santiago Serna Zuluaga)

  The aim of the collaboration is to produce a summary regarding the main legislative changes introduced in the aforementioned Order that affect the transport sector. This analysis pays particular attention to the promotion of biofuels, as well as to the transposition of provisions contained in the recently revised European Renewable Energy Directive. In this regard, the limits and targets set for fuel suppliers are examined, with a special focus on the national transposition decisions concerning areas where Member States have some degree of flexibility, or on elements whose transposition remains pending.

3.2.2.2 Public funding

- **Least cost electrification study and mini-grid portfolio readiness assessment for Pakistan**
  World Bank. June 2021 - September 2023. (Rafael Palacios Hielscher, Andrés González García, José Ignacio Pérez Arriaga, Santos José Díaz Pastor, Hagos Meresa Weldu)

  The Government of Pakistan adopted sustainable development goals (SDGs) in February 2016. As a part of SDGs, the government has targeted universal energy access by 2030. This project aims to analyze both grid extension and off-grid systems as a potential solution for providing energy access to unelectrified population, allowing to electrify 32 million households.
  The World Bank (WB) is supporting Pakistan's energy sector through "Pakistan Sustainable Energy Program" which includes this project to assist the

Government in identifying solutions to achieve universal energy access in Pakistan.
The organizations involved in this project will use the Reference Electrification Model (REM) and the Village Data Analytics (VIDA) for the LCES and mini-grid portfolio assessment respectively. The chosen model and analytical tool have been successfully used for similar activities worldwide.
The Least-Cost Electrification Study (LCES) shall include:
(i) Geospatial analysis (grid and off-grid) - The detailed geospatial analysis will consider, based on good practice and international experience, possible least-cost options for electrification, provide a sound strategic basis to implement systematically staged grid extensions and the deployment of off-grid technologies (mini-grids and standalone systems) powered by cost-effective renewable energy solutions where appropriate.
(ii) Recommendations for implementation – Recommendations on policies, actions and investments needed to achieve the goal of universal electricity access by 2030, including proposed intermediate targets, corresponding investment financing frameworks, an action plan to address the enabling policy and institutional framework, and capacity strengthening initiatives for key sector institutions and agencies involved.
The Mini-Grid Portfolio Assessment shall support mini-grid pipeline development to assist the World Bank in conducting its due diligence on a potential mini-grid investment operation and provide useful evidence and data to sector agencies and stakeholders.

- **Licensing and application of a reference network model by a colombian distribution system operator**
  Empresas públicas de Medellín E.S.P. October 2021 - December 2026. (Carlos Mateo Domingo, Fernando de Cuadra García, Tomás Gómez San Román)

  The objective of the project is to license and support EPM in the use of a reference network model, to determine the expansion needs in real distribution networks of Empresas Públicas de Medellín (EPM). The tool provides support in investment decisions in distribution system operators by DSOs, allowing to analyze future demand scenarios, as well as higher penetrations of distributed energy resources.

- **Consulting services for the tariff reform in Slovenia**
  Agencija za Energijo. May 2022 - December 2023. (Tomás Gómez San Román, José Pablo Chaves Ávila, Nicolás Mariano Morell Dameto, Eliana Carolina Ormeño Mejía)

  Consulting services for the study on the Slovenian tariff reform project (preparation of expert opinions, participation in explanatory meetings, participation in public consultation, etc.)

- **Haiti National electrification analysis - Consultancy services for the assessment of electrification options**
  World Bank (WB). August 2022 - April 2024. (Rafael Palacios Hielscher, Andrés González García, José Ignacio Pérez Arriaga, Michel Rivier Abbad, Hagos Meresa Weldu)

  Following the Government of Haiti's request for advisory services, the World Bank appointed Comillas and Waya Energy, with the collaboration of Trama TecnoAmbiental TTA and Castalia, to undertake a National Electrification Analysis (NEA) of Universal Electricity Access Options in Haiti. The objective of the NEA is to provide analysis and insight on various power supply modes options (grid extension, mini grids, standalone systems, meshed grids...) which the World Bank may use to assist in providing advisory services to the Government of Haiti for the preparation of a National Electrification Strategy (NES).
  The World Bank is responsible for undertaking the NEA with funding from Policy Dialogue funds and Energy Sector Management Assistance Program (ESMAP). The NEA is designed to help the World Bank to deliver integrated and flexible advisory services to the Government so as to build its capacity to achieve sector development targets.
  The scope of work encompasses the following tasks: (a) identify, review and analyze output (e.g., reports, data) of previous efforts supporting electrification planning in the country, several of which have strong synergies with related sectors including water, health, education, ICT; (b) assess the robustness of existing material and highlight gaps, updates or modifications required c) actively support any additional analysis require to develop a geospatial least cost electrification plan and (d) identify potential options and arrangements for scaling up electrification in Haiti in line with national access targets.
  This work will produce an analysis of the electricity services and options that could be provided based on the information shared by the Government and other sector stakeholders to assist the World Bank in providing advisory services to the Government. Any further detailed site-specific analysis will be conducted by the designated country agencies if, and when, the decision to undertake electrification projects is made. It is those site-specific analyses, and not the World Bank's NEA, that will determine specific vulnerability, risk and mitigation actions associated with different modes of electricity supply.

- **Data processing for world health organization global status report on road safety**
  World Health Organization (WHO). September 2023 - September 2023. (Luis Francisco Sánchez Merchante, Manuel Valdano)

  The goal of the proposal is to assist World Health Organization in processing large amounts of data to prepare their periodic report about Road Safety.

3.2.3 Services and analysis projects

3.2.3.1 Private funding

- **Academic coordination in the preparation of the study «The impact of energy poverty on the social vulnerability of the population attended by the Spanish Red Cross in the context of the inflationary crisis»**
  Cruz Roja Española. January 2023 - December 2023. (Roberto Barrella, José Carlos Romero Mora, Efraim Centeno Hernáez)

  The main objective of this applied research project is to analyse the different situations and dimensions of energy poverty experienced by the population assisted by the Spanish Red Cross in the context of the inflationary crisis we are experiencing in Spain and the rest of Europe.
  The research and academic coordination carried out offers an analysis of the attended population based on the characteristics that are most relevant in the context of energy poverty: socio-demographic data, efficiency and housing conditions, economic, occupational and school situation of household members, risk of poverty and/or social exclusion (AROPE), objective and subjective dimensions of energy poverty, family strategies to combat energy poverty and its risks, consequences and degree of social protection.
  The project is based on the coordination and cooperation of/with the parties involved for the realisation of the study with a double quantitative/qualitative approach.

- **Technical support for the tools DECA, HADES and MODEM**
  Endesa Medios y Sistemas S.L. January 2023 - December 2023. (Eugenio Francisco Sánchez Úbeda, José Portela González, Javier García González)

  The objective of this project is to provide ENDESA with technical support and maintenance of the tools DECA, MODEM, HADES, EXLA and EXCOM developed by IIT.

- **Simulation using FDS of an event in Vallada**
  Investigation Service Technologies (IST). February 2023 - October 2023. (Pablo Ayala Santamaría)

  The objective of this collaboration is to carry out two numerical simulation using FDS of a fire incident in a wharehouse located at Vallada.

- **Statistical analysis of data from the study «The impact of energy poverty on the social vulnerability of the population attended by the Spanish Red Cross in the context of the inflationary crisis»**
  Cruz Roja Española (CRE). May 2023 - September 2023. (Roberto Barrella, José Carlos Romero Mora)

  The main objective of the project is to carry out a statistical analysis of the data from the study "The impact of energy poverty on the social vulnerability of the population attended by the Spanish Red Cross in the context of the inflationary crisis". This objective can be broken down into three sub-objectives:
  1. Preparation of the database provided by the Spanish Red Cross for the study

and preliminary descriptive analysis.

2. Obtaining the main aggregated energy poverty indicators and the AROPE indicator for the sample of households.

3. Factor analysis and disaggregated study of the sample to identify the determinants of energy poverty in the households attended by the Spanish Red Cross in the context of the inflationary crisis.

The statistical analysis takes into account the following elements (among others): socio-demographic data, education, origin, income, employment, housing, and the variables that make up the AROPE.

- **Digitilization of electrical distribution networks: indicators and investments**
  Fundación Naturgy. May 2023 - November 2023. (Rafael Cossent Arín, Tomás Gómez San Román, José Pablo Chaves Ávila, Gregorio López López, Javier Matanza Domingo, Miguel Ángel Sánchez Fornié, Carlos Mateo Domingo, Néstor Rodríguez Pérez, Miguel Ángel Ruiz Hernández)

  The objective of the proposed collaboration is to develop a report on "Digitalization of electrical distribution networks: indicators and investments". This report is a continuation of the first report published in September 2021, which delves into the following aspects:

  - Indicators to measure how digitized the networks are and establish the correspondence between the service provided (performance) and the degree of digitization.
  - Current trends in investments in network digitilization and the most relevant innovation projects in the European and Spanish context, identifying the main challenges for their deployment.

- **Briefing about the EU green hydrogen strategy in Africa assessed from the perspective of PCD and sustainable development in partner countries**
  Trans European Policy Studies Association aisbl (TEPSA). July 2023 - September 2023. (Timo Gerres, Rafael Cossent Arín)

  In line with the European Union (EU) 's goal to achieve climate neutrality by 2050, the European Commission introduced a new external energy strategy as part of the REPowerEU plan in April 2022. The strategy focuses on preferred partnerships with potential exporting countries to ensure a stable supply of renewable energy imports and enable 10 million tons of renewable hydrogen imports annually by 2030.

  The Briefing evaluates the strategy's alignment with Policy Coherence for Development by assessing its support for African partner countries to achieve their Sustainable Development Goals (SDGs), analysing partnership agreements with Namibia and Egypt, as well as considering Africa's energy transition status and uncertainties in the global renewable hydrogen trade.

- **Discerning leadership: systematisation of content and methodologies in MOOCs and a book.**
  Universidad Pontificia Comillas. September 2023 - October 2024. (David Roch Dupré)

This project, a continuation of DISCERN_2 , tries to systematize the contents of the LiDE program on discerning leadership in 3 online MOOC courses and a book.

- **Assessment of alternatives for the European electricity market reform, and a pragmatic proposal**
  Fundación De Los Bancos Y Cajas De Ceca (FUNCAS). December 2023 - February 2024. (Pedro Linares Llamas, Rafael Cossent Arín, José Pablo Chaves Ávila, Tomás Gómez San Román, Michel Rivier Abbad, Pablo Rodilla Rodríguez)

  Elaboration of a publication about the electricity market reform

3.2.3.2 Public funding

- **EDucation for DIgitalisation of Energy. Sector Skills Alliances for implementing a new strategic approach ("Blueprint") to sectoral cooperation on skills**
  Education, Audiovisual and Culture Executive Agency. January 2020 - December 2023. (Fernando de Cuadra García, Carlos Mateo Domingo, Miguel Ángel Sánchez Fornié, Álvaro Jesús López López, Juan Carlos del Real Romero, Pablo García González, María Belén Sánchez Alfayate)

  The EDDIE project aims at creating a Sector Skills Alliance (SSA) by bringing together all the relevant stakeholders in the energy value chain such as industry, education
  and training providers, European organisations, recruiters, social partners and public authorities. The main objective of this SSA is to develop a long-driven Blueprint for the
  digitalisation of the European energy sector to enable the matching between the current and future demand of skills necessary for the digitalisation of the energy sector and
  the supply of improved Vocational Education and Training (VET) systems and beyond.

3.3 Publications

3.3.1 Books

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- J.P. Chaves, R. Cossent, T. Gómez, P. Linares, P. Mastropietro, M. Rivier, P. Rodilla, *"Una evaluación de las opciones de reforma del mercado eléctrico europeo y una propuesta pragmática".* Publisher: Fundación de las Cajas de Ahorros (FUNCAS). ISBN: 978-84-17609-77-1. May 2024.

3.3.2 Chapters in books

- D. Alfaya, M. Oliva Calero, E. Alonso, S. Cano Casanova, J. Rodrigo, M. Villanueva Pesqueira, *"Maths Team Contest: refinamiento y ampliación de metodologías docentes".* Chapter in the book "Buenas prácticas en docencia". Publisher: Universidad Pontificia Comillas. Pp. 213-218. ISBN: 978-84-8468-762-7. February 2024.

- R. Barrella, J.L. Becerra García, *"Energía para todos: un proyecto de aprendizaje y servicio".* Chapter in the book "Buenas prácticas en docencia". Publisher: Universidad Pontificia Comillas. Pp. 53-59. ISBN: 978-84-8468-762-7. February 2024.

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- S. Lumbreras, A. Rayón, *"La revolución de la Inteligencia Artificial".* Chapter in the book "Informe España 2023". Editors: Blanco Martín, Agustín; Mora Rosado, Sebastián; López Ruiz, José Antonio. Publisher: Universidad Pontificia Comillas. Pp. 72-124. ISBN: 978-84-8468-605-7. November 2023.

- M.V. Montes Gan, M.R. Salas Labayen, O. Martín Carrasquilla, M.A. Sáenz-Nuño, N. López Salas, R. Arroyo Sanz, *"El juego de fuga como actividad de evaluación de los conocimientos aprendidos: escape room "Esperanza para el futuro""*. Chapter in the book "Buenas prácticas en docencia". Publisher: Universidad Pontificia Comillas. Pp. 141-147. ISBN: 978-84-8468-762-7. February 2024.

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- C. Puente-Rueda, M.A. Sáenz-Nuño, J. Zamora, C. Puente, *"Solar energy and reused materials in the recycling of plastics".* Chapter in the book "New materials for a circular economy". Editors: García Peñas, Alberto; Sharma, Gaurav. Publisher: Materials Research Forum LLC. Pp. 70-104. ISBN: 978-1-64490-262-2. September 2023.

- E.F. Sánchez-Úbeda, *"Papel cero en las asignaturas de estadística: Python como lenguaje vehicular".* Chapter in the book "Buenas prácticas en docencia". Publisher: Universidad Pontificia Comillas. Pp. 205-212. ISBN: 978-84-8468-762-7. February 2024.

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3.3.3 Publications in journals

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- J. Abenojar, S. López de Armentia, J.C. del Real-Romero, M.A. Martínez, *"Kinetic study of Anaerobic Adhesive curing on copper and iron base substrates"*, Materials, vol. 17, nº. 12, pp. 2886-1-2886-15. ISSN: 1996-1944. June 2024/June 2024.

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- S. Gómez, L. Olmos, A. Ramos, M. Rivier, *"A bi-level framework to analyse the use of FTRs as a long-term risk hedging instrument in the European electricity context".* June 2024. Ref: IIT-24-181WP.

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- M.A. Sanz-Bobi, C. Mateo, R. Palacios, G.L. Rajora, et al., *"Results in brief. A modular open-source toolbox to streamline energy system operation and planning".* Technical report in Comisión Europea. January 2024.

- L. Sigrist, S. Lumbreras, *"Investigando desde las raíces".* Electronic press in Universidad Pontificia Comillas. Madrid (Spain). December 2023.

- S.S.J. Sinha, G. Sharma, M. Martínez, M. Nour, P. Frías, Z. Rather, S.S. Rao, *"Recommendations for deployment of smart charging for electric vehicles in India".* Technical report in Fraunhofer Institute for Energy Economics and Energy System Technology. May 2024.

- M. Troncia, S. Bindu, J.P. Chaves, G. Willeghems, H. Gerard, M. Lacerda, *"Techno-economic assessment of proposed market schemes for standardized products".* Technical report in European Commission. December 2023.

- M. Troncia, M.A. Ruiz, E.C. Ormeño-Mejía, J.J. Fernández García, N. Morell, L. Herding, M. Valarezo, S. Bindu, J.P. Chaves, T. Gómez, D. Davi, S. Gallego, S. Cianotti, C. Manaresi, A. Christensson, A. Malot, T. De Marco, F. Lucidi, *"Regulatory framework for fostering flexibility deployment: roles, responsibility of agents & flexibility mechanism designs".* Technical report in Comisión Europea. April 2024.

- C. Valor, *"Baños de bosque para la acción climática".* Electronic press in Fundación Telefónica. Madrid (Spain). November 2023.

- M. Ventosa, *"2024: El año en el que la inteligencia artificial lo cambió todo".* Electronic press in Universidad Pontificia Comillas. Madrid (Spain). July 2024.

- S. Yeh, S. Paltsev, J. Reilly, D. Daniels, P. Linares, *"Designing resilience for multi-system dynamics of future transportation".* Technical report in Chalmers tekniska högskola; Massachussets Institute of Technology; Statens väg- och transportforskningsinstitut; Universidad Pontificia Comillas. July 2024.

- D. Ziegler, M. Troncia, E.C. Ormeño-Mejía, N. Rodríguez Pérez, M. Valarezo, J.P. Chaves, *"Cluster demo results evaluation and success metrics analysis– Western Demo".* Technical report in European Commission. December 2023.

4. Teaching

The experience that the IIT holds in various technological fields is a valuable input for the different Bachelor's and Master's degrees offered by the ICAI School of Engineering

This section presents the Bachelor and Master Theses that have been supervised by IIT staff during the last academic year, and the list of Master courses where IIT Researchers have participated as lecturers.

4.1 Supervised undergraduate theses at IIT

4.1.1 Bachelor's Degree in Engineering for Industrial Technologies

- *A censorship-resistant inflation feed: Development and technical implementation of anunbiased, decentralised and transparent measurement of economic inflation.*
  Rísquez Gámez, Mateo. Supervised by Pablo Zulaica Pérez.

- *Abastecimiento eléctrico mediante bicicleta estática*
  Sáez Jaén, Juan. Supervised by Fidel Fernández Bernal, Luis Manuel Mochón Castro.

- *Análisis de Ciclo de Vida Social de Salinas en España*
  Llamera Villa, Lucía. Supervised by José Carlos Romero Mora.

- *Análisis de datos de los hogares del proyecto "Energía para Todos" y evolución a un programa de rehabilitación energética*
  Río Lozano, Ana del. Supervised by Roberto Barrella .

- *Análisis de Sensibilidad de Simplificaciones En Problemas de Optimización Lineal*
  García-Mina Peñaranda, José María. Supervised by Sara Lumbreras Sancho.

- *Análisis de un conjunto de datos de ingresos y altas hospitalarias mediante técnicas deaprendizaje automático*
  Conde Rosado, Ignacio. Supervised by Álvaro Jesús López López, Sara Lumbreras Sancho.

- *Análisis de vida útil de un implante dental monofásico*
  Calvo Ichaso, Alberto. Supervised by Jesús Ramón Jiménez Octavio.

- *Análisis del comportamiento de un modelo a escala en caso de incendio mediante simulaciones numéricas*
  Umpiérrez Roldán, Javier. Supervised by Pablo Ayala Santamaría.

- *Análisis del diseño óptimo de una hidrogenera bajo diferentes perfiles de utilización*
  Wiegner Moreno, Irene Erika. Supervised by Rafael Cossent Arín.

- *Análisis del potencial de apoyo de las herramientas comerciales de Inteligencia Artificial (IA) a estudios de investigación biomecánica.*
  Atucha Badiola, Lucía. Supervised by Jesús Ramón Jiménez Octavio.

- *Análisis numérico del sistema de ventilación en caso de incendios de un tramo de línea de metro mediante modelos híbridos 1D-3D*
  Latorre Cucala, Juan. Supervised by Pablo Ayala Santamaría.

- *Analytical Calculation of Partial Derivatives in Deep Neural Networks*
  Ortiz González, Alonso. Supervised by Jaime Pizarroso Gonzalo.

- *Aplicación de técnicas de IA para procesamiento de señales eléctricas de un turbogenerador de 1198MVA.*
  Huertas Torrontero, Pedro. Supervised by Jorge Suárez Porras, Luis Rouco Rodríguez.

- *Are ground-source heat pumps ready for decarbonizing residential heating and cooling?*
  Alonso Albertos, Rodrigo. Supervised by Pablo Dueñas Martínez.

- *Caracterización de las nuevas tecnologías y modelos de negocio en el trasporte urbano*
  Balbás Morcillo, Isabel. Supervised by Manuel Pérez Bravo.

- *Circuitos didácticos para las asignatura de electrónica biomédica*
  Ramírez-Montesinos Furones, Juan. Supervised by Romano Giannetti .

- *Comparative analysis of electricity distribution network investment plans in the UK and Spain: Recommendations for the Spanish case*
  Rodríguez Martín, Cristina. Supervised by Miguel Ángel Ruiz Hernández, Tomás Gómez San Román.

- *Conexión con medidores de energía Wibee*
  Arellano Rico, Fernando. Supervised by Francisco María Martín Martínez.

- *Construcción de indicadores sintéticos/compuestos para la medición de realidades socioeconómicas.*
  Domingo Parellada, David Jesús de. Supervised by David Roch Dupré.

- *Creación de un Digital Twin (Gemelo Digital): Aplicación a la detección y monitoreo de personas*
  Mantaras Torres, Mateo. Supervised by Pablo Calvo Báscones.

- *Desarrollo de un módulo de localización para una silla de ruedas autónoma*
  Palanca Calvo, Alejandro. Supervised by Jaime Boal Martín-Larrauri.

- *DIFERENCIAS ZONALES EN LA TABLA DE PRIMERA Y SEGUNDA DIVISIÓN ESPAÑOLA: ANÁLISIS CUANTITATIVO DE MÉTRICAS EN CUATRO TEMPORADAS*
  García Muñoz, Rubén. Supervised by Álvaro Jesús López López.

- *Diseño de estabilizadores robustos para sistemas de almacenamiento de energía en baterías*
  Montesino-Espartero Lamo de Espinosa, Francisco de Borja. Supervised by Luis Rouco Rodríguez.

- *DISEÑO DE UN PROGRAMA PARA DIMENSIONAR INSTALACIONES DE SANEAMIENTO*
  Esteban García, Rodrigo. Supervised by Jesús Ramón Jiménez Octavio.

- *Diseño y caracterización de un generador sintético de planos para el entrenamiento de un modelo de Deep Learning*
  Iglesias Aramburu, Galo. Supervised by Álvaro Jesús López López, José Portela González.

- *Diseño y puesta en marcha de un taller para formación en instalaciones fotovoltaicas*
  Villagrán Fernández-Salvador, Pablo. Supervised by Fidel Fernández Bernal.

- *Diseño, construcción y prueba de una tarjeta amplificadora de señal para una válvula oleohidráulica proporcional de un equipo de calibración de tensiómetros (medida de la tensión arterial)*
  Mochón Sáez, Joaquín. Supervised by José Daniel Muñoz Frías, Romano Giannetti .

- *Entendiendo la pobreza energética en España a partir de los datos del Censo de Población y Vivienda 2021*
  Garriga García, José María de. Supervised by José Carlos Romero Mora, Roberto Barrella .

- *Estudio de la sostenibilidad ambiental y la contaminación de la sal en la industria salinera en España y Portugal*
  Devesa Pérez, Miguel. Supervised by José Carlos Romero Mora.

- *Estudio de las alternativas para la transición hacia un transporte de mercancías cero emisiones en España*
  Borrajo González, Silvia. Supervised by Miguel Martínez Velázquez.

- *Evaluación del rendimiento de un agente entrenado mediante aprendizaje por refuerzo profundo en la transferencia de experiencia entre entornos virtuales y reales*
  García Fernández, Félix. Supervised by Álvaro Jesús López López, Lucía Güitta López.

- *Fire dynamics analysis for assessing resilience in vulnerable dwellings*
  Amo Peletier, Patricia. Supervised by Alexis Cantizano González, Pablo Ayala Santamaría.

- *Gestión óptima de una microred considerando pérdidas no lineales en la batería de ion de litio*
  García Pardo, María del Carmen. Supervised by Javier García González.

- *Implantes autosensores basados en resonadores electromagnéticos fabricados por impresión 3D*
  Pino Osborne, Gabriela del. Supervised by Francisco Javier Herraiz Martínez, Paraskevas Sofokleous .

- *Improved provision of primary frequency control by wind generators*
  Gimeno Noguera, Cristina Isabel. Supervised by Lukas Sigrist .

- *Incorporating Hydrogen into openMASTER for Decarbonizing the Spanish Energy System*
  Maté Pulido, Diego. Supervised by Antonio Francisco Rodríguez Matas, José Carlos Romero Mora.

- *La Transformación Educativa: El Poder de la Inteligencia Artificial en la Evolución de métodos de Enseñanza y Evaluación.*
  Seisdedos Rico, Alejandro Pablo. Supervised by Sara Lumbreras Sancho, Susana Ortiz Marcos.

- *Modelo Matemático para el Análisis de Cohesión Social y Tendencia a la Cooperación enla Transición Energética.*
  Romera Noriega, David Alberto. Supervised by Rosendo Daniel Castañón Naseiro.

- *Optimal black-start sequence of distributed generation*
  Lacave Díez, Alejandro. Supervised by Andrés Tomás Martín, Lukas Sigrist .

- *Predicción de demanda eléctrica*
  Otero Filgueira, Lucas. Supervised by Javier Reneses Guillén, Mercedes Vallés Rodríguez.

- *Puesta a punto de un sistema óptico de medición de deformaciones*
  Vasserot Tolmos, Federico. Supervised by Francisco José López Valdés.

- *Realidad virtual en herramientas de ingeniería*
  Bodega Palomeque, Pedro. Supervised by José Antonio Rodríguez Mondéjar.

- *Seguridad de la Inversión del Sector Eléctrico Español a 2030*
  Santos Aranda, Jesús. Supervised by Rosendo Daniel Castañón Naseiro.

- *Sistema de control para el seguimiento de pared basado en un sensor Lidar 2D*
  Vidal Sánchez, Jesús. Supervised by Juan Luis Zamora Macho.

- *Sistema de control por microprocesador de un convertidor CC-CA trifásico formador de red*
  Díaz de Rábago Pemán, Íñigo. Supervised by Andrés Tomás Martín, Aurelio García Cerrada.

- *Telemetría para fórmula student. Equipo receptor.*
  Álvarez-Gascón Lobato, Rodrigo. Supervised by José Daniel Muñoz Frías.

- *Using machine learning in input/output matrices to understand structural evolution in economies*
  Sola Lantero, Eloy Ramón de. Supervised by Pablo Dueñas Martínez.

- *Uso de la realidad aumentada para gestión y mantenimiento de activos*
  Ballesteros Ranz, Pedro José. Supervised by José Antonio Rodríguez Mondéjar.

4.1.2 Bachelor's Degree in Engineering in Telecommunications Technologies

- *Análisis de protocolos de comunicación en vehículos con sistemas Passive Keyless Entry and Start*
  Fernández García, Arturo. Supervised by Rafael Palacios Hielscher.

- *Calibrador de termómetros sin contacto*
  Díe Morales, Gonzalo. Supervised by José Daniel Muñoz Frías, Romano Giannetti .

- *Clasificación de estados de desarrollo de de AIzheimer mediante el algoritmos de machine learning*
  Ortiz de Zúñiga Faustmann, Juan. Supervised by Miguel Ángel Sanz Bobi.

- *Detección de alucinaciones en modelos del lenguaje grandes en el ámbito médico*
  Díaz de Rábago Pemán, Javier. Supervised by David Contreras Bárcena.

- *Detección y decodificación de señales ?Enhanced Wi-Fi?*
  Fernández Villar, Miguel Ángel. Supervised by Javier Matanza Domingo.

- *Diseño y creación de un LLM-ChatBot genérico-especializado*
  Vecino de Haro, Juan Carlos. Supervised by Mario Castro Ponce.

- *ESTUDIO Y EVALUACIÓN DE LAS ESTRATEGIAS DE EXTRACCIÓN DE CONOCIMIENTO EN MODELOS LLM PERSONALIZADOS*
  Valverde Gómez, Daniel. Supervised by David Contreras Bárcena.

- *Explorando los límites de ChatGPT - Una aplicación empresarial*
  Candia San Juan, Jorge. Supervised by David Contreras Bárcena.

- *OPTIMIZACIÓN DE LA POTENCIA ELÉCTRICA A CONTRATAR EN FUNCIÓN DE HISTÓRICOS PARA CONSUMIDORES CON TARIFAS 3.0 Y 6.X*
  González Lavín, Miguel. Supervised by Félix Fernández Menéndez.

- *Plataforma de Gestión de Talento, Venta y Recomendación de Cursos*
  Costa González, María. Supervised by David Contreras Bárcena.

- *POPCO, UNA APLICACIÓN PARA CINÉFILOS*
  Colino Hernández, Lorenzo. Supervised by David Contreras Bárcena.

4.2 Postgraduate teaching

4.2.1 Graduate courses

On the University website, as well as in the corresponding information brochures, you can find detailed information on the different master programs available. The master courses given by IIT staff in which they participate as lecturers are listed hereafter.

4.2.1.1 Official Master's Degree in the Electric Power Industry (MEPI)

Director: Luis Olmos Camacho
This master can also be taken in the context of the Erasmus Mundus *Master in Economics and Management of Network Industries* (EMIN). More information at https://www.comillas.edu/en/postgraduate/official-masters-degree-in-the-electric-power-industry

- *Fundamentals on electrical engineering and optimization techniques*
  Francisco Alberto Campos Fernández, Javier García González

- *Law and Legislation of the power industry*
  Tomás Gómez San Román

4.2.1.2 Master in Railway Systems

Director: Antonio Fernández Cardador
More information at
https://www.comillas.edu/en/postgraduate/official-masters-degree-in-railway-systems

- *Control, surveillance and digitization*
  José Antonio Rodríguez Mondéjar

- *Traffic operation design*
  Asunción Paloma Cucala García, Antonio Fernández Cardador, Adrián Fernández Rodríguez

- *Electrification*
  Luis Rouco Rodríguez

- *ERTMS and RAMS regulations*
  Adrián Fernández Rodríguez

4.2.1.3 Master's Degree in Smart Industry (MIC)

Director: Bernardo Villazán
More information at
https://www.comillas.edu/en/masters/master-degree-in-smart-industry

- *IIoT-Cloud Communications*
  Gregorio López López, Néstor Rodríguez Pérez

- *Machine learning*
  María del Valle Varo García

- *Master Thesis*
  Álvaro Jesús López López

- *Smart Systems Applied to Industry*
  Álvaro Sánchez Miralles

4.2.1.4 Master's Degree in Big Data Technologies and Advanced Analytics (MBD)

Director: Carlos Morrás Ruiz-Falcó
More information at
https://www.comillas.edu/en/postgraduate/master-universitario-en-big-data/

- *Machine Learning II*
  Eugenio Francisco Sánchez Úbeda, Miguel Ángel Sanz Bobi

- *Master Thesis*
  Jaime Pizarroso Gonzalo, José Portela González

4.2.1.5 Master's Degree in Smart Grids (MSG)

Director: Miguel Ángel Sánchez Fornié
More information at
https://www.comillas.edu/en/masters/master-degree-in-smart-grids

- *Master Thesis*
  Ignacio Egido Cortés, Javier Matanza Domingo, Matteo Troncia

- *Operation and Planning of Future Distribution Networks*
  José Pablo Chaves Ávila, Rafael Cossent Arín, Carlos Mateo Domingo, Álvaro Ortega Manjavacas, Matteo Troncia

- *Operation and Planning of Future Distribution Networks*
  José Pablo Chaves Ávila, Rafael Cossent Arín, Carlos Mateo Domingo, Matteo Troncia

- *Operation and Planning of Future Distribution Networks Laboratory*
  Álvaro Ortega Manjavacas, Matteo Troncia

- *Regulation and New Business Models*
  Carlos Batlle López, Pablo Rodilla Rodríguez

- *Regulation and New Business Models*
  Carlos Batlle López, Pablo Rodilla Rodríguez

- *Telecommunications for Smart Grids*
  Javier Matanza Domingo

4.2.2 Graduate theses supervised at IIT

4.2.2.1 Official Master's Degree in Industrial Engineering (MII)

- *A Decision-Making Tool for Investment, Procurement and Operation for Retailers in Electricity Markets*
  Sanz de la Escalera, Alicia. Supervised by Jose Pablo Chaves Ávila.

- *Adopción de servicios de flexibilidad*
  Vivas Roca de Togores, Eduardo. Supervised by María del Carmen Valor Martínez.

- *Adopción de servicios de flexibilidad2*
  San Millán Montero, Javier Arturo. Supervised by María del Carmen Valor Martínez.

- *Algorithmic Approaches for Optimal Placement of Flexible Resources in Distribution Networks*
  Martínez-Cattáneo Amich, Fernando María. Supervised by Carlos Mateo Domingo.

- *An investment model for renewable power resources in the context of a fully decarbonized system*
  Masjuan Ginel, Jaime. Supervised by Tomás Gómez San Román.

- *Análisis de ciclo de vida de sistemas que usan energía en un entorno doméstico e impacto enen el mismo de un sistema de gestión de energía.*
  Mejía Guinea, Alberto. Supervised by Miguel Ángel Sanz Bobi.

- *Análisis de Generalización de LayoutXLM para Token Classification con Muestras Sintéticas*
  Sánchez Cuadrado, Alberto. Supervised by Álvaro Jesús López López, Ignacio de Rodrigo Tobías.

- *Análisis de los Determinantes de Compra de Vehículos Eléctricos a partir de los Microdatos de Matriculaciones*
  Gómez Corbatón, Arturo. Supervised by Manuel Pérez Bravo.

- *Análisis económico del calor solar para la industria*
  Bernárdez Álvarez, Arturo. Supervised by Pedro Linares Llamas.

- *Análisis sobre la implementación y madurez de adopción de la IA en el sector asegurador en España, desde el punto de vista técnico y humano.*
  García-Puente Navarro, Paloma. Supervised by Susana Ortiz Marcos.

- *Analysis of Business Models for emerging power system actors: Energy Communities*
  Plaza Ramos, Marta. Supervised by Jose Pablo Chaves Ávila, Matteo Troncia .

- *Analysis of existing local markets for system services, product pricing and agent?s participation*
  Elechiguerra Batlle, Javier. Supervised by Jose Pablo Chaves Ávila, Matteo Troncia .

- *AP1 ANNEALING FURNACE CONTROL DIGITAL TWIN*
  Soroa Díaz, Jorge. Supervised by Bernardo Villazán Gil.

- *Aplicación de técnicas de aprendizaje automático a la predicción de la producción de parques eólicos.*
  Gómez Limia, Celia. Supervised by Antonio Muñoz San Roque.

- *Aplicación de técnicas de Inteligencia Artificial al diagnóstico y mantenimiento de centrales eléctricas*
  Pino Osborne, Fernando del. Supervised by Antonio Muñoz San Roque.

- *Aplicaciones de generación termoeléctrica en entornos domésticos aislados*
  Nevado Castuera, Alejandro. Supervised by Aurelio García Cerrada.

- *Assessment of dynamic load-altering attacks on power system small signal stability*
  López de Hierro Puértolas, Pablo. Supervised by Lukas Sigrist .

- *Broadband PLC over Low Voltage grid pilot roll-out results assessment and full roll-out*
  Carballo Palacio, Minerva. Supervised by Javier Matanza Domingo.

- *Caracterización mecánica de estructuras celulares TPMS fabricadas por impresión 3D*
  Guinarte Redondo, Laura. Supervised by Eva Paz Jiménez.

- *Characterisation of energy poverty in Europe through the implementation of a monitoring tool*
  Baumann, Clément Eric. Supervised by José Carlos Romero Mora, Roberto Barrella .

- *COMPARATIVA DEL IMPACTO MEDIOAMBIENTAL DEL CICLO DE VIDA DE LOS VEHÍCULOS ELÉCTRICOS Y LOS MOTOR DE COMBUSTIÓN INTERNA*
  Vacas Omatos, Enrique. Supervised by Miguel Ángel Sanz Bobi.

- *Definition of a Functional Architecture for DERMS*
  Martínez Rivera, Ginés. Supervised by Jose Pablo Chaves Ávila.

- *Desarrollo de un módulo de navegación en entornos dinámicos para una plataforma robótica con cinemática diferencial*
  Rodríguez Pérez, Lorenzo. Supervised by Jaime Boal Martín-Larrauri, Juan Luis Zamora Macho.

- *Desarrollo de una herramienta de visualización de resultados para aplicaciones de aprendizaje por refuerzo*
  Barril Rodríguez-Arana, Manuel. Supervised by Jaime Boal Martín-Larrauri, Lucía Güitta López.

- *Design and Implementation of Test Cases for IDIS Compliance in UMEME?s OneSait Smart Metering Project*
  Varas Yuste, Guillermo. Supervised by Néstor Rodríguez Pérez.

- *Estrategia de inversión y de gestión de cartera basada en un control predictivo*
  Andersen Muñoz, Javier. Supervised by Juan Luis Zamora Macho.

- *Estudio del impacto de la electrificación de flotas de taxis y VTC*
  Durán Arellano, Ángela. Supervised by Pablo Frías Marín.

- *Estudio del rendimiento económico de un software de optimización de movimiento de tierras para la construcción de plantas fotovoltaicas.*
  Torre Eguilior, Diego Manuel de la. Supervised by José Carlos Romero Mora.

- *Exploring Leadership Styles and the Impostor Phenomenon among Mid-Level Female Managers in the Industrial Sector*
  Blanco Ramos, Beatriz. Supervised by Susana Ortiz Marcos.

- *Gemelo digital de un centro de mecanizado*
  Jimeno Presas, Javier. Supervised by José Antonio Rodríguez Mondéjar.

- *Gestión óptima de una batería de ion de litio mediante la formulación Zig-Zag para aproximar las funciones de pérdidas no lineales*
  Guerrero García, Salvador. Supervised by Javier García González.

- *Hot Rolling Mill Setup Model*
  Ariznavarreta Mayado, Álvaro. Supervised by Bernardo Villazán Gil.

- *ICAI factory digital twinning*
  Martínez Liñera, Alberto. Supervised by José Antonio Rodríguez Mondéjar.

- *Impresión 3D con polímeros biocompatibles para el desarrollo de cartílago artificial*
  Presa Cárdenas, Irene. Supervised by Eva Paz Jiménez.

- *Inclusión de hábitos de consumo y eficiencia energética en una herramienta de cálculo del gasto eléctrico teórico en los hogares*
  Soutelo Rivera, Carlos. Supervised by Roberto Barrella .

- *Influencia de la simplificación de modelos computacionales dentales en la predicción del riesgo de fractura.*
  Martín de la Hoz, Naiara. Supervised by Jesús Ramón Jiménez Octavio.

- *Integración de equipo Detector de Falta a Tierra (DFT) en la Red de UFD*
  Sampol Arcas, Pedro Miguel. Supervised by Néstor Rodríguez Pérez.

- *Interfaz para la evaluación de los modelos LLM*
  González Rodríguez, Daniel. Supervised by David Contreras Bárcena.

- *La revolución de la Inteligencia Artificial en la educación. El impacto de la InteligenciaArtificial en los métodos de aprendizaje y evaluación*
  Fernández Aguirre, Jorge. Supervised by Sara Lumbreras Sancho, Susana Ortiz Marcos.

- *Low Earth Orbit (LEO) satellite telecommunications platforms: feasibility and applicationin the electric utility*
  Rodríguez Silva, Javier. Supervised by Francisco Javier Herraiz Martínez.

- *Markets designs for integrating energy communities*
  Alcañiz Pérez, José Luis. Supervised by Jose Pablo Chaves Ávila, Matteo Troncia .

- *Modelado Predictivo de Precios de Electricidad y Estrategias de Hedging para Contratos de PPA a Corto Plazo mediante IA*
  Almela Ramos, Román. Supervised by Bernardo Villazán Gil.

- *Modelling electric vehicles for emerging markets and demand response mechanisms*
  Paniagua Gutiérrez, Alejandro. Supervised by Jose Pablo Chaves Ávila, Matteo Troncia .

- *MODELO PREDICTIVO DE REGULACIÓN DEL TRÁFICO PARA LÍNEAS DE METRO EQUIPADAS CON SISTEMAS DE COMUNICACIÓN CONTINUA*
  Cidoncha González, Álvaro. Supervised by Adrián Fernández Rodríguez, Antonio Fernández Cardador.

- *Modelos de Detección en Tiempo Real de Modos de Conducción y Estrategias de Pitstop eCarreras de Fórmula 1*
  Urquidi Castro, Ana. Supervised by Rafael Palacios Hielscher.

- *Oportunidad del uso de hidrógeno como combustible en la náutica de recreo*
  Aranguren Alonso, Alejandra. Supervised by Rafael Cossent Arín.

- *Optical Fiber Sensing Applications for the Electric Utility*
  Blázquez Cabezas, Marta. Supervised by Javier Matanza Domingo.

- *Optimización de la asignación de recursos con IA generativa: Una herramienta de lenguaje natural para identificar regiones rentables y transportistas*
  Sánchez Albertí, Carlos. Supervised by Bernardo Villazán Gil.

- *Optimización del consumo energético residencial mediante modelos de deep learning*
  Montijano del Diego, Francisco. Supervised by Bernardo Villazán Gil.

- *Optimización del Diseño de Capots de Protección de Anclajes para Sistemas de Pretensado y Postensado*
  Gordillo Abengózar, Juan. Supervised by Jesús Ramón Jiménez Octavio.

- *Optimizing district heating: A model for enhancing heat supply and mass flow*
  Bustos Acitores, Juan Diego. Supervised by Carlos Mateo Domingo, Pablo Dueñas Martínez.

- *Pattern Recognition in Myoelectric Signals*
  Quintana Criado, Alberto. Supervised by José Daniel Muñoz Frías, Romano Giannetti .

- *Peer-to-Peer energy trading opportunities analysis*
  Casas Avery, María. Supervised by Morsy Abdelkader Morsy Mohammed Nour , Tomás Gómez San Román.

- *Platform Development for Automated HR Management in Healthcare Company*
  Moncho Pérez, Pablo. Supervised by Pablo Sánchez Pérez.

- *Proyecto de instalaciones eléctricas para ampliación de centro educativo y aplicación de la eficiencia energética en la instalación*
  Domingo Rivas, Alberto. Supervised by Álvaro Ortega Manjavacas.

- *Quantification of Costs and Benefits of Power System Flexibility Provision from Distributed Energ Resources (DER) for Balancing and Congestion Management in Europe*
  Marcos López-Baissón, José María de. Supervised by Jose Pablo Chaves Ávila, Luis Olmos Camacho.

- *Realidad virtual aplicada al diseño de escenarios para automatización*
  Márquez Altemir, Francisco de Asís. Supervised by José Antonio Rodríguez Mondéjar.

- *REQUIREMENTS FOR POWER SYSTEM STABILIZER TUNING*
  Córdoba Ocaña, Miguel. Supervised by Luis Rouco Rodríguez.

- *Resistencia a compresión y a fatiga de geometrías Lattice fabricadas por impresión 3D*
  Aja Albero, Jaime. Supervised by Eva Paz Jiménez.

- *SELF-SUPERVISED LEARNING FOR ACUTE STRESS DETECTION IN ELECTROCARDIOGRAMS*
  Barragán Castro, Francisco. Supervised by Álvaro Jesús López López, Berta Ruíz González.

- *Sistema IOT para control de aulas. Equipo cliente.*
  Navaridas Alejano, Daniel. Supervised by José Daniel Muñoz Frías.

- *Software development for comprehensive energy planning tools in developing countries*
  García-Amorena Palomino, Fernando. Supervised by Carlos Mateo Domingo, Fernando de Cuadra García.

- *Towards a Socially Responsible Hydrogen Economy: exploring site selection criteria in Spain*
  García Rosado, Inés Amparo. Supervised by José Carlos Romero Mora, Santiago Serna Zuluaga.

4.2.2.2 Official Master's Degree in Telecommunications Engineering (MIT)

- *Detección de Protocolos de Comunicación en Drones Comerciales.*
  González Gómez, Raúl. Supervised by Javier Matanza Domingo.

- *Aplicación de técnicas de Inteligencia Artificial al análisis de datos de parques eólicos marinos*
  Santos Jiménez, Carlos de los. Supervised by Antonio Muñoz San Roque.

- *Business Cycle and the Gold Market*
  García Revillas, Jorge. Supervised by Elena María Díaz Aguiluz.

- *Caracterización del comportamiento de bombas de agua de circulación mediante técnicas de Machine Learning*
  Casero Martín, Marta. Supervised by Miguel Ángel Sanz Bobi.

- *Desarrollo de una plataforma de orquestación de servicios dentro de una red privada 5G*
  López Requena, Paula. Supervised by David Contreras Bárcena.

- *Digitalización de máquinas mediante OPC UA para ser integrables en sistemas bajo filosofía industria 4.0*
  Díaz Romero, María Angustias. Supervised by José Antonio Rodríguez Mondéjar.

- *Diseño y Desarrollo de Infraestructura Cliente-Servidor para BattleCode en CSC 411?Artificial Intelligence*
  Martínez Luna, Lucas Alberto. Supervised by Javier Matanza Domingo.

- *Estudio y comparación de algoritmos de Aprendizaje Reforzado en Espacios Continuos*
  Cocero Quintanilla, David. Supervised by Miguel Ángel Sanz Bobi.

- *Generación de un modelo 3D de la válvula Mitral para pacientes con Síndrome de Down*
  Sánchez Bonastre, Alberto. Supervised by Alberto Carnicero López.

- *Human or AI? Plataforma web gamificada para estudiar el problema de distinguir entre voces reales y sintéticas en base a datos*
  Chávez Macías, Alejandro. Supervised by Gregorio Ignacio López López, Rafael Palacios Hielscher.

- *Nuevos enfoques en la gestión básica de carteras de valores basados en el ranking y riesgo. El uso de datos de intervalo.*
  Domingo Górriz, Teresa. Supervised by Carlos Maté Jiménez.

- *Redes neuronales adversarias en el mundo IoT*
  Álvarez Martínez, Javier. Supervised by Miguel Ángel Sanz Bobi.

4.2.2.3 Official Master's Degree in the Electric Power Industry (MEPI)

- *Analysis of impacts of different energy sharing communities*
  Plaza Ramos, Marta. Supervised by Jose Pablo Chaves Ávila, Matteo Troncia .

- *ANALYSIS OF THE FACTORS THAT AFFECT PUBLIC Charge PRICES IN SPAIN*
  Gastelum Fernández, Gabriela Orisell. Supervised by Jose Pablo Chaves Ávila, Manuel Pérez Bravo.

- *Assessment of Photovoltaic Solar Energy: A Comprehensive Study in the Spanish Context*
  Méndez Delgado, Erica. Supervised by Jose Pablo Chaves Ávila.

- *Cost-benefit analysis of solar energy models for large consumers in Mexico: ppa, epc, and leasing*
  Tomé Caparrós, Pablo. Supervised by Jose Pablo Chaves Ávila.

- *Integrated modeling of electricity and hydrogen markets: analysis of modeling different conceptions of green hydrogen*
  Ferrero Baz, Álvaro. Supervised by Francisco Alberto Campos Fernández, José Villar Collado, Luis Alberto Herrero Rozas.

4.2.2.4 Master's Degree in Smart Industry (MIC)

- *A Decision-Making Tool for Investment, Procurement and Operation ofAggregators in Electricity Markets*
  Sanz de la Escalera, Alicia. Supervised by Jose Pablo Chaves Ávila.

- *AP1 Furnace Control Digital Twin*
  Soroa Díaz, Jorge. Supervised by Bernardo Villazán Gil.

- *Aplicación de técnicas de Inteligencia Artificial al diagnóstico de centrales eléctricas*
  Pino Osborne, Fernando del. Supervised by Antonio Muñoz San Roque.

- *Control de prótesis robotizada por medio de señales mioeléctricas*
  Quintana Criado, Alberto. Supervised by José Daniel Muñoz Frías, Romano Giannetti .

- *Desarrollo de una herramienta de visualización de resultados para aplicaciones de aprendizaje por refuerzo*
  Barril Rodríguez-Arana, Manuel. Supervised by Jaime Boal Martín-Larrauri, Lucía Güitta López.

- *Gemelo Digital de un centro de mecanizado*
  Jimeno Presas, Javier. Supervised by José Antonio Rodríguez Mondéjar.

- *Hot Rolling Mill Setup Model*
  Ariznavarreta Mayado, Álvaro. Supervised by Bernardo Villazán Gil.

- *La revolución de la Inteligencia Artificial en la educación. El impacto de la Inteligencia Artificial en los métodos de aprendizaje y evaluación*
  Fernández Aguirre, Jorge. Supervised by Sara Lumbreras Sancho, Susana Ortiz Marcos.

- *Modelado Predictivo de Precios de Electricidad y Estrategias de Hedging para Contratos de PPA a Corto Plazo mediante IA*
  Almela Ramos, Román. Supervised by Bernardo Villazán Gil.

- *Optimización de la asignación de recursos con IA generativa: Una herramienta de lenguajenatural para identificar regiones rentables y transportistas*
  Sánchez Albertí, Carlos. Supervised by Bernardo Villazán Gil.

- *Optimización del consumo energético residencial mediante modelos de deep learning*
  Montijano del Diego, Francisco. Supervised by Bernardo Villazán Gil.

- *Optimizing district heating: A model for enhancing heat supply and mass flow*
  Bustos Acitores, Juan Diego. Supervised by Carlos Mateo Domingo, Pablo Dueñas Martínez.

- *Realidad virtual aplicada al diseño de escenarios para automatización*
  Márquez Altemir, Francisco de Asís. Supervised by José Antonio Rodríguez Mondéjar.

4.2.2.5 Master's Degree in Smart Grids (MSG)

- *Integración de equipo Detector de Falta a Tierra (DFT) en la Red de UFD*
  Sampol Arcas, Pedro Miguel. Supervised by Néstor Rodríguez Pérez.

- *Optical Fiber Sensing Applications for the Electric Utility*
  Blázquez Cabezas, Marta. Supervised by Javier Matanza Domingo.

- *Algorithmic Approaches for Optimal Placement of Flexible Resources in Distribution Networks*
  Martínez-Cattáneo Amich, Fernando María. Supervised by Carlos Mateo Domingo.

- *Assessment of increasing number of operations of On-Load Tap Changers (OLTC) in HV/HV distributions transformers*
  Irazabal Espinosa, Julen. Supervised by Ignacio Egido Cortés.

- *Broadband PLC over Low Voltage grid pilot roll-out results assessment and full roll-out*
  Carballo Palacio, Minerva. Supervised by Javier Matanza Domingo.

- *Definition of a Functional Architecture for DERMS*
  Martínez Rivera, Ginés. Supervised by Jose Pablo Chaves Ávila.

- *Design and Implementation of Test Cases for IDIS Compliance in UMEME?s OneSait Smart Metering Project*
  Varas Yuste, Guillermo. Supervised by Néstor Rodríguez Pérez.

- *Dynamic Line Rating (DLR) system without DLR devices*
  Carnicero Príncipe, David. Supervised by Matteo Troncia .

4.3 Other academic activities

4.3.1 Master courses

- Aurelio García Cerrada, *"Fundamentals of Electronic Power Converters",* Máster «Integración de energías renovables en la red eléctrica». Organized by Universidad Carlos III de Madrid - UC3M. Madrid (Spain).

5. Doctorate

5.1 ICAI Engineers' Association

The IIT maintains a close relationship with the ICAI Engineers' Association in several aspects. On the one hand, the Association partially funds one of the IIT doctoral theses. During this academic year, the thesis developed by Javier García Aguilar has benefited from such financial support. On the other hand, the IIT collaborates with the Association sending some of its research for publication to its official journal *Anales de Mecánica y Electricidad.*

5.2 Training complements

Training complements typically correspond to Master courses that complement the training of the student in those aspects relevant for the doctoral thesis and that have not been tackled in the academic or professional career.

- *Research Methods I: Introduction, Information Sources and Quantitative Research Methods*
  Carmen Valor Martínez

- *Optimization Techniques*
  Francisco Alberto Campos Fernández

- *Publishing Research Results*
  Aurelio García Cerrada

5.3 Training activities

Training activities have to be carried out by all students. These activities provide the students with basic information about various research techniques.

- *Applications of Artificial Intelligence to Research: Applications of Artificial Intelligence to Research*
  Mario Castro Ponce, Sara Lumbreras Sancho, Daniel Lewis Wuebben

- *DBA in Management and Technology: Analytics for Strategic Thinking*
  José Portela González

- *Developing Social and Communication Skills Using Improvisational Theatre*
  Efraim Centeno Hernáez

- *Doctorado e Investigación Científica en Comillas (20h): El proceso de investigación*
  Carmen Valor Martínez

- *Doctorado e Investigación Científica en Comillas (20h): La investigación en una universidad de la Compañía de Jesús*
  Pedro Linares Llamas

- *Doctorado ICAI: Advanced Excel for applied research*
  Javier García González

- *Doctorado ICAI: Advanced optimization modelling for applied research*
  Pedro de Otaola Arca, Andrés Ramos Galán

- *Doctorado ICAI: Current research topics*
  Ana Baringo Morales, Roberto Barrella, Pablo Dueñas Martínez, Simón Rodríguez Santana, Pablo Sánchez Pérez, Matteo Troncia

- *Doctorado ICAI: Data analysis (10h)*
  Sara Lumbreras Sancho

- *Doctorado ICAI: Forecasting techniques (10h)*
  José Portela González

- *Doctorado ICAI: Introduction to Biomechanics*
  Francisco José López Valdés

- *Doctorado ICAI: Introduction to Python (10 h)*
  David Domínguez Barbero

- *Doctorado ICAI: Reinforcement learning*
  Álvaro Jesús López López

- *Programa oficial de doctorado CETIS 99/2011: Doctorado e Investigación Científica en Comillas (8h)*
  Carmen Valor Martínez

5.4 Doctoral theses

The following doctoral theses defended in this academic year or currently in development are or have been conducted and led by researchers at the IIT. Usually, these theses are developed in conjunction or in close relationship with some of the research projects mentioned above.

5.4.1 Comillas submitted theses

- Title: *Multi-region probabilistic electric load forecasting using coherent temperature scenarios*
  Author: Santiago Moreno Carbonell
  Supervisors: Eugenio Francisco Sánchez Úbeda and Antonio Muñoz San Roque
  Date: Octubre 27 , 2023

- Title: *Long-term active distribution network planning with high shares of distributed energy resources*
  Author: David Ulrich Ziegler
  Supervisors: Tomás Gómez San Román, Carlos Mateo Domingo and Gianluca Fulli
  Date: Noviembre 16 , 2023

- Title: *Multi-area electricity market modeling using intelligent data techniques and an advanced temporal framework*
  Author: Alberto Orgaz Gil
  Supervisors: Javier Reneses Guillén and Antonio Bello Morales
  Date: Noviembre 23 , 2023

- Title: *Distribution network tariff design under decarbonization, decentralization and digitalization*
  Author: Nicolás Mariano Morell Dameto
  Supervisors: José Pablo Chaves Ávila and Tomás Gómez San Román
  Date: Noviembre 28 , 2023

- Title: *Explainable Artificial Intelligence (XAI) techniques based on partial derivatives with applications to neural networks*
  Author: Jaime Pizarroso Gonzalo
  Supervisors: Antonio Muñoz San Roque and José Portela González
  Date: Diciembre 15 , 2023

- Title: *A comprehensive decision support framework for the provision of universal access to modern power services in developing countries*
  Author: Andrés González García
  Supervisors: José Ignacio Pérez Arriaga and Ana Moreno Romero
  Date: Marzo 05 , 2024

- Title: *Desarrollo de la metodología "DSRM-MML", de seguimiento continuo de la degradación de un BESS operando en regulación*
  Author: Jose Ignacio Álvarez Monteserín García
  Supervisor: Miguel Ángel Sanz Bobi
  Date: Marzo 18 , 2024

- Title: *Control of grid-forming vsc-based generators to improve transient stability in power systems with100% non-synchronous generation*
  Author: Régulo Enrique Ávila Martínez
  Supervisors: Francisco Javier Renedo Anglada and Luis Rouco Rodríguez
  Date: Abril 08 , 2024

- Title: *Nuevos enfoques para la monitorización y el dimensionamiento de aisladores de alta tensión*
  Author: Héctor de Santos Yubero
  Supervisor: Miguel Ángel Sanz Bobi
  Date: Abril 18 , 2024

- Title: *Power oscillation damping with converter interfaced generation*
  Author: Njegos Jankovic
  Supervisors: Luis Rouco Rodríguez, Javier Roldán Pérez and Milan Prodanovic
  Date: Abril 22 , 2024

- Title: *Contributions to the analysis and design of primary and secondary controllers of electronic power converters in power systems*
  Author: Diana Patricia Morán Río
  Supervisors: Milan Prodanovic, Javier Roldán Pérez and Aurelio García Cerrada
  Date: Mayo 14 , 2024

- Title: *Impact of Serious Games and causal Artificial Intelligence on social science research: a case study on cyberbullying*
  Author: Jaime Pérez Sánchez
  Supervisors: Gregorio López López and Mario Castro Ponce
  Date: Junio 14 , 2024

- Title: *Contribution to the analysis and evaluation of the digitalisation of smart grids*
  Author: Néstor Rodríguez Pérez
  Supervisors: Javier Matanza Domingo and Gregorio López López
  Date: Junio 17 , 2024

5.4.2 Submitted theses in other universities

- Title: *Evaluación de los efectos de los precios de la energía eléctrica sobre una región industrial: una aproximación empírica a la economía del Valle del Cauca*
  Author: Andrés Felipe Oviedo Gómez
  Supervisors: Sandra Milena Londoño Hernández and Diego Fernando Manotas Duque
  Universidad del Valle. Cali (Colombia).
  Date: Octubre 05 , 2023

- Title: *Local market mechanisms: how local markets can shape the energy transition*
  Author: Marco Galici
  Supervisor: Fabrizio Pilo
  Università degli Studi di Cagliari. Cagliari (Italy).
  Date: Febrero 09 , 2024

- Title: *Stability analysis of unbalanced microgrids with grid-forming and grid-following electronic power converters*
  Author: Sauro José Yagüe Yagüe
  Supervisors: Pere Palacín Farré and Aurelio García Cerrada
  Universitat Ramón Llull. Barcelona (Spain).
  Date: Abril 12 , 2024

- Title: *Comparative analysis of Human Body Model and post mortem human subjects in oblique impact: evaluating chest deformation and personalization techniques*
  Author: Ana Piqueras Lorente
  Supervisor: Francisco José López Valdés
  Universidad de Zaragoza. Zaragoza (Spain).
  Date: Mayo 18 , 2024

5.4.3 Comillas ongoing theses

- Title: *Contribuciones al análisis y la previsión de los precios del petróleo*
  Author: Pedro Moreno Alonso
  Supervisor: Antonio Muñoz San Roque

- Title: *Alternative accounting and bank perfomance. The relevance of bank misconduct and other non-GAAP variables*
  Author: José Miguel Fernández de Bilbao Ortega
  Supervisor: Isabel Catalina Figuerola-Ferreti Garrigues

- Title: *ESG Investing, corporate performance and idiosyncratic risk*
  Author: Paraskevas Paraskevas
  Supervisors: Isabel Catalina Figuerola-Ferretti Garrigues and Sara Lumbreras Sancho

- Title: *DSO-TSO Coordination in the European context*
  Author: Leandro Lind
  Supervisors: Rafael Cossent Arín and Pablo Frías Marín

- Title: *Analysis of policy strategies for renewable energy integration in multi-area electricity markets*
  Author: Geovanny Alberto Marulanda García
  Supervisors: Antonio Bello Morales and Javier Reneses Guillén

- Title: *Modeling and Optimizing the behavior of distributed agents in decentralized power systems by Reinforcement Learming techniques*
  Author: David Domínguez Barbero
  Supervisors: Javier García González and Miguel Ángel Sanz Bobi

- Title: *IMPROVING MODELLING FOR OPTIMAL EXPANSION PLANNING OF POWER TRANSMISSION SYSTEMS*
  Author: Erik Francisco Alvarez Quispe
  Supervisors: Andrés Ramos Galán and Luis Olmos Camacho

- Title: *Assessment of electricity network requierements for the energy transition*
  Author: Leslie Lara Herding
  Supervisors: Michel Rivier Abbad and Rafael Cossent Arín

- Title: *Medium-term hydrothermal scheduling considering short-term uncertainty*
  Author: Jesús David Gómez Pérez
  Supervisors: Andrés Ramos Galán and Jesús María Latorre Canteli

- Title: *Selecting flexibility mechanisms for DSOs in the energy transition*
  Author: Fernando David Martín Utrilla
  Supervisors: Rafael Cossent Arín and José Pablo Cháves Avila

- Title: *Dealing with Uncertainty in Energy Planning: Robust Optimization for Energy Models.*
  Author: Antonio Francisco Rodríguez Matas
  Supervisors: Pedro Linares Llamas and José Carlos Romero Mora

- Title: *A bilevel model for the long-term evolution of tariffs in the power sector considering behind-the-meter distributed generation*
  Author: Salvador Doménech Martínez
  Supervisors: Francisco Alberto Campos Fernández and José Villar Collado

- Title: *Beyond Teaching: The extended role of informal entrepreneurship education and training in challenging contex*
  Author: Grace Akullo
  Supervisors: Elisa María Aracil Fernández and Samuel Mbugua Mwaura

- Title: *Customer misbehaviour in Access based-services*
  Author: Andres Camacho Donézar
  Supervisors: Carmen Valor Martínez and José Portela González

- Title: *EVALUATING THE INTERACTION BETWEEN DSO AND THIRD-PARTY FLEXIBILITY RESOURCES IN THE OPERATION AND PLANNING OF DISTRIBUTION GRIDS*
  Author: Orlando Mauricio Valarezo Rivera
  Supervisors: Tomás Gómez San Román and José Pablo Cháves Avila

- Title: *Robust control of electric power systems with important share of electronic generation*
  Author: Javier García Aguilar
  Supervisors: Juan Luis Zamora Macho and Aurelio García Cerrada

- Title: *IMPROVING MEDIUM-TERM MODELS TO DEAL WITH THE LOW-CARBON REALITY OF MODERN POWER SYSTEMS*
  Author: Luis Manuel Montero Guirao
  Supervisors: Javier Reneses Guillén and Antonio Bello Morales

- Title: *Detección de Ciberataques mediante algoritmos de aprendizaje y clasificación en la matriz de MITRE ATT&CK*
  Author: Antonio Pérez Sánchez
  Supervisors: Rafael Palacios Hielscher and Gregorio López López

- Title: *Cryogenic Supply System with Magnetic Refrigeration Stage*
  Author: Carlos José Hernando López de Toledo
  Supervisors: Juan Carlos del Real Romero, Javier Munilla López and Luis García-Tabares Rodríguez

- Title: *Improving the representation of the transport sector within energy models*
  Author: Manuel Pérez Bravo
  Supervisors: Pedro Linares Llamas and Pablo Frías Marín

- Title: *Coordination between Generation and Transission expasion planning in a liberalized electricity context, and the use of the FTRs as a coordination tool*
  Author: Stefania Gómez Sánchez
  Supervisor: Luis Olmos Camacho

- Title: *DC segmentation of power system*
  Author: Mathieu Guillaume Robin
  Supervisors: Jaime Renedo Anglada, Aurelio García Cerrada and Juan Carlos González Torres

- Title: *MULTI-AGENT CONTROL STRATEGIES FOR THE ISLANDED AND GRID-CONNECTED OPERATION OF MICROGRIDS WITH 100% ELECTRONIC GENERATION*
  Author: Andrés Tomás Martín
  Supervisors: Aurelio García Cerrada and Lukas Sigrist

- Title: *The impact of bike-sharing systems in urban mobility : the BiciMad case*
  Author: Carlos Miguel Vallez Fernández
  Supervisors: Mario Castro Ponce and David Contreras Bárcena

- Title: *IMPACT OF VEHICLE RESTRAINT SYSTEMS ON INJURY OUTCOMES: A COMBINED APPROACH USING REAL-WORD CRASH DATA AND COMPUTATIONAL MODELLING*
  Author: Manuel Valdano
  Supervisors: Francisco José López Valdés and Bengt Pipkorn

- Title: *Development of smart environment for asset management based on Machine Learning Models in power grids*
  Author: GopaL Lal Rajora
  Supervisor: Miguel Ángel Sanz Bobi

- Title: *Optimal Operation and Configuration of RVPP under Uncertainty of Non-Dispatchable RES in the Energy and Ancillary Markets*
  Author: Hadi Nemati
  Supervisors: Álvaro Ortega Manjavacas and Pedro Sánchez Martín

- Title: *Real-Time Operation of RES-based Virtual Power Plants*
  Author: Oluwaseun Enoch Oladimeji
  Supervisors: Lukas Sigrist and Álvaro Ortega Manjavacas

- Title: *Rigid Body Simulation with Implicit Shape Descriptions*
  Author: Pedro López-Adeva Fernández-Layos
  Supervisors: Luis Francisco Sánchez Merchante and Carlos Segura Perales

- Title: *Actitudes hacia la tecnología y el pensamiento computacional en la Educación STEM del profesorado de Primaria, Secundaria y en formación*
  Author: Ana María González Cervera
  Supervisors: Olga Martín Carrasquilla and Yolanda González Arechavala

- Title: *AN INTEGRATED FINANCIAL AND REGULATORY FRAMEWORK FOR ELECTRIFICATION*
  Author: Santos-José Díaz Pastor
  Supervisor: José Ignacio Pérez Arriaga

- Title: *Un modelo ético para la inteligencia artificial: el caso de la toma de decisiones automatizadas (ADM)*
  Author: Sonia Liliana Acosta Arias
  Supervisors: Sara Lumbreras Sancho and Gonzalo Génova

- Title: *Navigating Employee Resistance*
  Author: Veronika María Cieslak
  Supervisor: Carmen Valor Martínez

- Title: *Development of Operational Wildfire Models and applications at the Wildland Indutrial-Urban Interface*
  Author: Juan Luis Gómez González
  Supervisors: Mario Castro Ponce and Alexis Cantizano González

- Title: *Techno-economic Analysis of Green Hydrogen Supply Chain in Spain*
  Author: Santiago Serna Zuluaga
  Supervisors: Rafael Cossent Arín and Timo Gerres

- Title: *The impact of CSR on firm risk and valuation*
  Author: Jorge Abdon Merladet Artiach
  Supervisors: Sara Lumbreras Sancho and Andrés Ramos Galán

- Title: *From stand-alone to combined mechanisms for acquiring distribution system operator services*
  Author: Eliana Carolina Ormeño Mejía
  Supervisors: José Pablo Cháves Avila and Matteo Troncia

- Title: *Alternate Models for European Short-Term Electricity Markets*
  Author: Shilpa Bindu
  Supervisors: José Pablo Cháves Avila and Luis Olmos Camacho

- Title: *STUDY OF THE PERFORMANCE OF MULTI-STAGE HOLOMORPHIC EMBEDDING METHOD (MSHELM)*
  Author: Álvaro Benítez Domínguez
  Supervisors: Luis Rouco Rodríguez and Francisco Miguel Echavarren Cerezo

- Title: *Future-Proof Design of Capacity Mechanisms During the Energy Transition: Firm Supply Calculation, Demand Participation and Cost Allocation*
  Author: Paulo Brito Pereira
  Supervisors: Pablo Rodilla Rodríguez and Paolo Mastropietro

- Title: *African Power Pools and Regional Trade: Adoption of international best practices in the African context*
  Author: Mohamed Abbas Eltahir Elabbas
  Supervisors: Luis Olmos Camacho and José Ignacio Pérez Arriaga

- Title: *The role of demand-response independent aggregator in the power system. How does it change the balance between the actors?*
  Author: Jesús José Fernández García
  Supervisors: Matteo Troncia and José Pablo Cháves Avila

- Title: *Bi-level programming applied to the hydrogen economy in energy markets*
  Author: Luis Jesús Fernández Palomino
  Supervisor: Efraim Centeno Hernáez

- Title: *Assessing the impact of electrolyzer operational characteristics on integration in the electricity markets.*
  Author: Juan Francisco Gutiérrez Guerra
  Supervisors: José Pablo Cháves Avila and Andrés Ramos Galán

- Title: *A long-term joint equilibrium model for the wholesale electricity and hydrogen markets*
  Author: Luis Alberto Herrero Rozas
  Supervisors: Francisco Alberto Campos Fernández and José Villar Collado

- Title: *Integrating flexibility from Electric Vehicles and other Distributed Energy Resources in Distribution Network Planning*
  Author: Miguel Martínez Velázquez
  Supervisors: Pablo Frías Marín and Carlos Mateo Domingo

- Title: *Value-Creation Strategies for Engaging Small-Load Flexibility-Service-Providers (SL-FSP) in Electricity Markets*
  Author: Valeria Karina Moreno
  Supervisors: Carmen Valor Martínez and José Pablo Cháves Avila

- Title: *Research Plan Proposal - Year 1 Frequency Behavior in Electric Power Systems in the Power Electronics Age.*
  Author: Carlo de Paolis Robles
  Supervisors: Ignacio Egido Cortés and Aurelio García Cerrada

- Title: *A Comprehensive Energy Poverty Analysis in Just Energy Transitions: From Conceptualization to Decision-Making*
  Author: Miguel Angel Rios Ocampo
  Supervisors: José Carlos Romero Mora and Efraim Centeno Hernáez

- Title: *Distribution system operator remuneration for fostering flexibility procurement. Valuing flexibility solutions in planning distribution networks*
  Author: Miguel Ángel Ruiz Hernández
  Supervisors: José Pablo Cháves Avila and Tomás Gómez San Román

- Title: *How to improve the coordinated use of models for energy planning towards to a zero-carbon system*
  Author: Dilayne Santos Oliveira
  Supervisors: Sara Lumbreras Sancho and Andrés Ramos Galán

- Title: *A Multi-faceted approach to water management and hydropower generation under climate change and power markets regulation*
  Author: Ignacio Segarra Tamarit
  Supervisors: Isabel Catalina Figuerola-Ferretti Garrigues and Eduardo Schwartz

- Title: *Increasing the penetration of inverter-based resources to weak grids with synchronous compensators*
  Author: Jorge Suárez Porras
  Supervisors: Fidel Fernández Bernal and Luis Rouco Rodríguez

- Title: *UNDERSTANDING INJURY MECHANISMS IN E-SCOOTER RIDERS*
  Author: Juan Manuel Asensio Gil
  Supervisors: Jesús Jiménez Octavio and Alberto Carnicero López

- Title: *Operación eficiente de tráfico ferroviario*
  Author: Manuel Blanco Castillo
  Supervisors: Asunción Paloma Cucala García and Antonio Fernández Cardador

- Title: *INFLUENCE OF REALISTIC DENTAL BIOMECHANICAL MODELS ON DENTAL STRUCTURE*
  Author: Saúl Manuel Dorado Nuño
  Supervisors: Jesús Jiménez Octavio and Ana Arias Paniagua

- Title: *Analysis of cybersecurity systems in the automotive sector*
  Author: Roberto Gesteira Miñarro
  Supervisors: Gregorio López López and Rafael Palacios Hielscher

- Title: *Efficiently transferring deep reinforcement learning experience to industrial assets*
  Author: Lucía Güitta López
  Supervisors: Álvaro Jesús López López and Jaime Boal Martín-Larrauri

- Title: *Guiding the Decarbonisation of the Energy- and Emission-Intensive EU Industries*
  Author: Léonard Lefranc
  Supervisors: Timo Gerres and Pedro Linares Llamas

- Title: *Sim-to-real hybrid reinforcement learning and optimal control strategies for automous mobile robot coordination*
  Author: Diego Cubillo Llanes
  Supervisors: Jaime Boal Martín-Larrauri and Juan Luis Zamora Macho

- Title: *Enhancing keyphrase extraction from long documents*
  Author: Roberto Martínez Cruz
  Supervisors: Álvaro Jesús López López and José Portela González

- Title: *MACHINE LEARNING TECHNIQUES TO ENHANCE THE CAPACITIVE SENSING OF MICROWAVE RESONANT STRUCTURES*
  Author: Miguel Monteagudo Honrubia
  Supervisors: Javier Matanza Domingo and Francisco Javier Herraiz Martínez

- Title: *Generating Synthetic Datasets: Towards Bridging the Gap Between Deep Learning and Applications with Limited Data*
  Author: Ignacio de Rodrigo Tobías
  Supervisors: Álvaro Jesús López López and Jaime Boal Martín-Larrauri

- Title: *Prognosis methods of Industrial Systems Based on Generative Adversarial Networks*
  Author: María del Carmen Rubiales Mena
  Supervisors: Antonio Muñoz San Roque and Miguel Ángel Sanz Bobi

- Title: *3D-printed Self-sensing Scaffolds for Monitoring Bone Regeneration*
  Author: Paraskevas Sofokleous
  Supervisors: Eva Paz Jiménez and Francisco Javier Herraiz Martínez

- Title: *Bio-hydrogen with CCUS (golden hydrogen) as decarbonisation tool in hard-to-abate industrial sectors*
  Author: Luis Yagüe Muñoz
  Supervisors: José Ignacio Linares Hurtado and Eva María Arenas Pinilla

- Title: *Cultivating spirituality in organizations. The role of spiritual discernment*
  Author: Norma Carolina Verdugo Rojas
  Supervisors: David Roch Dupré and Elisa María Aracil Fernández

- Title: *Anaerobic co-digestion of different residues enhanced with Fe-C nanoparticles*
  Author: Javier Victoria Rodríguez
  Supervisors: Mª del Mar Cledera Castro and Carlos Morales Polo

- Title: *Forecasting the price of crude oil under the energy transition.*
  Author: Carlos Casarrubio Feijoo
  Supervisor: Isabel Catalina Figuerola-Ferreti Garrigues

- Title: *CLIMATE-RELATED CREDIT RISK: RETHINKING THE CREDIT RISK FRAMEWORK*
  Author: María Helena Redondo García
  Supervisor: Elisa María Aracil Fernández

- Title: *Can TV series change our futures ? Studying the mechanisms and ethical limits of edutainment through TV series*
  Author: Sophie Sandrine Joséphа Raynaud
  Supervisors: Carmen Valor Martínez, Paolo Antonetti and María Carolina Zanette

- Title: *Análisis de Factores de Éxito y Fracaso AcadémicoUniversitario en Ingeniería: Un enfoque centrado en la Autorregulación y los Patrones de Aprendizaje*
  Author: Luis Alarcón Massó
  Supervisors: Isabel Muñoz San Roque and Jesús Jiménez Octavio

- Title: *Maximizing Performance in the Continuous Intraday Market: A Reinforcement Learning Approach to Strategy Optimization*
  Author: Francisco Rodríguez Cuenca
  Supervisor: Eugenio Francisco Sánchez Úbeda

- Title: *Advancing Neural Network Comprehension with Geometric and Topological approaches*
  Author: Alejandro Polo Molina
  Supervisors: José Portela González and David Alfaya Sánchez

- Title: *TOOLS TO OPTIMIZE THE PARTICIPATION OD AGGREGATORS IN ELECTRICITY MARKETS*
  Author: Diana María Navarrete Cruz
  Supervisors: Antonio Bello Morales and Pablo Rodilla Rodríguez

- Title: *PROSUMERS IN ELECTRICITY MARKETS: APPROACHES, TOOLS AND VIABILITY ASSESSMENT*
  Author: Rubén Rodríguez Vilches
  Supervisors: Álvaro Sánchez Miralles and Francisco Martín Martínez

- Title: *OPTIMAL BIDDING OF BATTERIES IN ENERGY AND ANCILLARY SERVICES MARKETS*
  Author: Mohammad Zain Ul Abideen
  Supervisors: Pedro Sánchez Martín, Abdulrahman Samir Ali Alassi and Andrés Ramos Galán

- Title: *ELECTRIC VEHICLES AND HVAC SYSTEMS AS DEMAND-SIDE FLEXIBILITY PROVIDERS*
  Author: Jordi Guasch Albareda
  Supervisors: Pablo Rodilla Rodríguez, José Pablo Cháves Avila and Andrés Ramos Galán

- Title: *BREAKTHROUGH IN OFF-GRID ENERGY SYSTEMS: CROSSING THE CHASM TOWARDS SUSTAINABLE ENERGY ACCESS IN AFRICA*
  Author: Hagos Meresa Weldu
  Supervisors: Pablo Dueñas Martínez and Andrés González García

- Title: *OPERATIONAL TECHNOLOGY SYSTEM ARCHITECTURES FOR NEW GREEN MOLECULE ENERGY COMPANIES IN THE ERA OF INDUSTRY 4.0*
  Author: Juan Manuel Tomé Lara
  Supervisor: José Antonio Rodríguez Mondéjar

- Title: *DESIGNING AN INTEGRATED PLANNING TOOL FOR GLOBAL CLEAN COOKING INITIATIVES: ADRESSING GAPS AND ENHANCING CAPABILITIES*
  Author: Olga Rico Díez
  Supervisors: Fernando de Cuadra García and Pablo Dueñas Martínez

- Title: *MAINTENANCE OPTIMISATION THROUGH DIGITAL TWINS: INTEGRATION OF PHM AND MAINTENANCE MANAGEMENT*
  Author: Francisco Javier Bellido López
  Supervisors: Antonio Muñoz San Roque and Miguel Ángel Sanz Bobi

- Title: *WEATHER TO POWER: MULTIVARIATE MEDIUM-TERM PROBABILISTIC FORECASTING*
  Author: Anne Maren Coll Franck
  Supervisor: Eugenio Francisco Sánchez Úbeda

- Title: *Natural gas tariff design: a comprehensive framework for analyzing economic efficiency.*
  Author: Celia Mosácula Atienza
  Supervisors: Javier Reneses Guillén and José Pablo Cháves Avila

- Title: *Research status report: The intentionality in impact funds: how to measure it and effects on impact perfomance*
  Author: Olga de Bergé Pineo
  Supervisors: José Luis Fernández Fernández and Elisa María Aracil Fernández

- Title: *Effective Use of Virtual Coupling for Trains System.*
  Author: Rohit Raj Goswami
  Supervisors: Asunción Paloma Cucala García and Adrián Fernández Rodríguez

- Title: *Abdominal Injuries in Occupants Seated in Reclined Configurations in Autonomous Vehicles*
  Author: Carmen María Vives Torres
  Supervisor: Francisco José López Valdés

6. Other activities

6.1 EES-UETP

The Electric Energy Systems - University Enterprise Training Partnership (EES-UETP) is a consortium of 3 companies and 22 universities and research centers in 15 European countries. They started operations in July 1992 under the program COMETT (COMmunity program for Education and Training in Technology). Since its origin, the IIT has participated very actively in the management and maintenance of this Association.

The main objective of the EES-UETP is to increase the competitiveness of the electric power industry sector through technology training. In this sense, the main activities of the EES-UETP are the organization of advanced courses in electric power systems and exchanges of students and researchers.

More information at https://www.comillas.edu/ees-uetp/

6.1.1 EES-UETP partners

Currently, the partners of the ESS-UETP are as detailed below, classified by country:

- **Austria**
  - Graz University of Technology
- **Belgium**
  - Katholieke Universiteit Leuven (KU Leuven)
- **Croatia**
  - Energy Institute Hrvoje Požar
  - University of Osijek
- **Cyprus**
  - University of Cyprus
- **Denmark**
  - Danmarks Tekniske Universitet
- **Finland**
  - Graduate School in Electrical Energy Engineering (GSEEE)

- **France**
  - École Centrale de Nantes
  - École Supérieure d´Electricité (SUPELEC)
  - Gestionnaire du Réseau de Transport d'Electricité (RTE)
- **Germany**
  - Technische Universität Dortmund
- **Greece**
  - National Technical University of Athens
- **Ireland**
  - University College Dublin
- **Italy**
  - Universitá degli Studi di Bologna
  - Universitá degli Studi di Cagliari
  - Universitá degli Studi di Genova
- **Latvia**
  - Riga Technical University
- **Portugal**
  - Institute for Systems and Computer Engineering of Porto (INESC Porto)
- **Spain**
  - Catalonia Institute for Research in Technology (IREC)
  - Iberdrola, S.A.
  - Universidad de Sevilla
  - Universidad Politécnica Valencia
  - Universidad Pontificia Comillas
- **Sweden**
  - KTH Royal Institute of Technology
- **Switzerland**
  - École Polytechnique Fédérale de Lausanne (EPFL)
  - ETH Zürich
- **United Kingdom**
  - University of Manchester
  - University of Strathclyde

Besides being an active member of the network, the Comillas Pontifical University covers the following positions in the EES-UETP:
- Chairman of the Executive Board: Mr. Luis Rouco Rodríguez
- Coordinating Secretary: Mr. Luis Olmos Camacho

6.1.2 Teached courses

- *HVDC technology and HVDC grids*
  CITCEA-UPC, Technical University of Catalonia
  Technical University of Denmark
  University of Leuven

- *Synchronous compensators*
  Universidad Pontificia Comillas

6.2 International exchanges

It is an IIT policy to encourage and finance, to the extent possible, that its members expand their education and research experience abroad. Some members of IIT have spent some time at foreign universities and agencies, as visiting scientists or engineers, working on specific projects and expand its expertise in research problems. During this academic year, the stays are:

- Shilpa Bindu, in Robert Schuman Centre, European University Institute. Florence School of Regulation, Florence (Italy). November-December 2023.

- Shilpa Bindu, in Whiting School of Engineering, Johns Hopkins University (JHU), Baltimore (United States of America). May-August 2024.

- Pablo Calvo Báscones, in Faculty of Electrical Engineering, Mathematics and Computer Science, Technische Universiteit Delft (TU Delft), Delft (Netherlands). December 2023.

- Efraim Centeno Hernáez, in Energy and Materials Transtion Unit, Nederlandse Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek (TNO), Amsterdam (Netherlands). August-December 2024.

- Santos José Díaz Pastor, in Visiting PhD Student at MIT Energy Initiative, Massachusetts Institute of Technology (MIT), Cambridge (United States of America). September 2023-May 2024.

- Pablo Frías Marín, in Energy Technologies Area. Grid Integration Group., Lawrence Berkeley National Laboratory (LBNL), Berkeley (United States of America). July 2024.

- Juan Luis Gómez González, in Systems Reliability and Industrial Safety Laboratory, Institute of Nuclear and Radiological Sicneces and Technology, Energy and Safety (INRASTES), Agia Paraskevi (Greece). September-December 2023.

- Lucía Güitta López, in Department of Computer, Control and Management Engineering, Sapienza Università di Roma, Rome (Italy). August-December 2023.

- Lucía Güitta López, in Electrical and Computer Engineering Department, University of California San Diego (UCSD), San Diego (United States of America). January-May 2024.

- Leslie Herding, in Grid Planning and Analysis Center, National Renewable Energy Laboratory (NREL), Golden (United States of America). April-July 2024.

- Gregorio López López, in Oxford Uehiro Centre for Practical Ethics, University of Oxford, Oxford (United Kingdom). July 2024.

- Miguel Martínez Velázquez, in Distribution Operations and Planning Department, EPRI Europe, Dublin (Ireland). June-September 2023.

- Geovanny Alberto Marulanda García, in Department of Engineering Systems and Services. Faculty of Technology, Policy, & Management (TPM), Technische Universiteit Delft (TU Delft), Delft (Netherlands). September-December 2023.

- Rafael Palacios Hielscher, in CAMS - Cybersecurity at MIT Sloan, Massachusetts Institute of Technology (MIT), Cambridge (United States of America). August 2024-July 2025.

- Manuel Pérez Bravo, in Department of Space, Earth and Environment, Chalmers tekniska högskola (CTH), Gothenburg (Sweden). April-July 2024.

- Gopal Lal Rajora, in Division of Electric Power and Energy Systems, Royal Institute of Technology (KTH), Stockholm (Sweden). November 2023-March 2024.

- Antonio Francisco Rodríguez Matas, in Joint Global Change Research Institute, Pacific Northwest National Laboratory (PNNL), College Park (United States of America). May-July 2024.

- Antonio Francisco Rodríguez Matas, in Department of Civil and Environmental Engineering, Tufts University, Somerville (United States of America). July 2024.

- Ignacio Segarra Tamarit, in Beedie School of Business, Simon Fraser University (SFU), Vancouver (Canada). September-December 2023.

- Andrés Tomás Martín, in Department of Engineering, University of Durham, Durham (United Kingdom). January-April 2024.

- Manuel Valdano, in Simulation and Active Structures, Autoliv Development AB, Gothenburg (Sweden). August-November 2023.

6.3 Visiting professors

- Tarek Elgindy, from National Renewable Energy Lab, Carnegie Mellon University, Denver (USA). April-October 2023.

- Corina Klug, from Vehicle Safety Institute, Graz University of Technology, Graz (Austria). June-July 2024.

- Duilio Calcagno, from Consejo Nacional de Investigaciones Científicas y Técnicas, Universidad Tecnológica Nacional, Mendoza (Argentine). November-December 2023.

6.4 Visiting students

- David Cardona Vásquez, from Institute of Electricity Economics and Energy Innovation., Graz University of Technology, Graz (Austria). May-July 2024.

- David Cardona Vásquez, from Institute of Electricity Economics and Energy Innovation., Graz University of Technology, Graz (Austria). May 2024.

- Luke Heeney, from Center for Energy and Environmental Policy Research, Massachusetts Institute of Technology, Cambridge (MA) (USA). June 2024.

- Kristof Phillips, from Mechanical Engineering, KU Leuven, Leuven (Belgium). October 2023-December 2024.

- Jair Ramos Guzmán, from Facultad de ingeniería Electrica., Universidad Michoacana de San Nicolas de Hidalgo, Morelia (Mexico). September 2023.

- Jair Ramos Guzmán, from Facultad de ingeniería Electrica., Universidad Michoacana de San Nicolas de Hidalgo, Morelia (Mexico). September 2023-September 2024.

- Alessandro Spalletta, from Department of Energy, System, Territory, and Construction Engineering, University of Pisa, Pisa (Italy). February 2024.

- Alessandro Spalletta, from Department of Energy, System, Territory, and Construction Engineering, University of Pisa, Pisa (Italy). February-July 2024.

6.5 Courses offered and coordinated to external companies and institutions

The courses offered to companies and consultancy activities are frequently related to research projects. There have been as follows:

- Pablo Rodilla Rodríguez, *"FSR e-learning course on regulation of energy utilities"*. European University Institute (EUI), Florence School of Regulation. Italy. Online.

- Luis Olmos Camacho, Luis Rouco Rodríguez, Rafael Palacios Hielscher, *"Coordination of the course committee of the EES-UETP network during the year 2023".* Electric Energy Systems - University Enterprise Training Partnership Association (EES-UETP). Italy. Madrid, Madrid.

- José Portela González, *"Training course: Using the NeuralSens package for interpretable machine learning on Neural Networks".* Universidad Complutense de Madrid. Italy. Madrid, Madrid.

- Juan Carlos del Real Romero, Eva Paz Jiménez, Yolanda Ballesteros Iglesias, *"Adhesive joints course for European Adhesive Specialist (EAS)".* Asociación Española de Soldadura y Tecnologías de Unión (CESOL). Italy. Madrid, Madrid.

- Juan Carlos del Real Romero, Yolanda Ballesteros Iglesias, Eva Paz Jiménez, *"Lab course of adhesive joints for the European Adhesive Engineer (EAE)".* Asociación Española de Soldadura y Tecnologías de Unión (CESOL). Italy. Madrid, Madrid.

- Francisco José López Valdés, *"Child restraint system expert course".* Inscripciones asistentes. Italy. Madrid, Madrid.

- José Portela González, Jaime Pizarroso Gonzalo, *"Advanced Machine Learning techniques course".* Xfera Móviles, S.A.U. Italy. Alcobendas, Madrid.

- Francisco José López Valdés, Juan Manuel Asensio Gil, Carmen María Vives Torres, *"Injury Biomechanics course".* Applus IDIADA. Italy. Madrid, Madrid.

- José Portela González, *"AI Training Seminar Focused on Legal Sector Applications".* BLT LAW & TAX, S.L. Italy. Madrid, Madrid.

- José Pablo Chaves Ávila, *"Modern electricity system course".* Autoridad Reguladora de los Sevicios Públicos (ARESEP). Italy. Online.

- Luis Olmos Camacho, Luis Rouco Rodríguez, Rafael Palacios Hielscher, *"Coordination of the course committee of the EES-UETP network during the year 2024".* Electric Energy Systems - University Enterprise Training Partnership Association (EES-UETP). Italy. Madrid, Madrid.

- Michel Rivier Abbad, *"Training course on the Integrated Distribution Framework for staff of the Madagascar Electricity Regulation Office (ORE)".* GFA Consulting Group GmbH. Italy. Online.

- Andrés Ramos Galán, Javier García González, Pablo Dueñas Martínez, *"Computational modeling for clean, reliable, and affordable electricity".* Massachusetts Institute of Technology (MIT). Italy. Cambridge, MA (United States of America).

- Jesús Jiménez Octavio, Francisco José López Valdés, *"Training and Advice Norvento - Finite Element Modeling".* Norvento Tecnología S.L. Italy. Madrid, Madrid.

- Pedro Linares Llamas, Pablo Rodilla Rodríguez, Tomás Gómez San Román, José Pablo Chaves Ávila, José Carlos Romero Mora, Carmen Valor Martínez, Rafael Cossent Arín, *"Course on the ecological transition for CEPSA Technical Direction".* CEPSA Comercial Petróleo S.A.U. Italy. Online.

- Jesús Jiménez Octavio, Francisco José López Valdés, *"Training and advice AMASI SL - Finite Element Modeling".* AMASI S.L. Italy. Madrid, Madrid.

- Luis Rouco Rodríguez, *"Course on voltage control".* Engie Cartagena S.L. Italy. Online.

- Juan Carlos del Real Romero, Yolanda Ballesteros Iglesias, Eva Paz Jiménez, Sara López de Armentia Hernández, *"Adhesive bonding technology course for European Adhesive Engineer (EAE)".* Asociación Española de Soldadura y Tecnologías de Unión (CESOL). Italy. Online.

- Pablo Rodilla Rodríguez, Paolo Mastropietro, Carlos Batlle López, Andrés Ramos Galán, Luis Rouco Rodríguez, Enrique Lobato Miguélez, Miguel Angel Barruso Recuero, *"Advanced course on low-carbon generation".* Repsol Renovables. Italy. Madrid, Madrid.

- Luis Rouco Rodríguez, *"Course on generator protection".* Engie Castelnou S.L.U. Italy. Online.

- Luis Rouco Rodríguez, Lukas Sigrist, Jorge Suárez Porras, *"EES-UETP Course on synchronous compensators".* EES-UETP. Italy. Madrid, Madrid.

- Juan Carlos del Real Romero, Yolanda Ballesteros Iglesias, Sara López de Armentia Hernández, Eva Paz Jiménez, *"Lab course of adhesive joints for the European Adhesive Engineer (EAE)".* Asociación Española de Soldadura y Tecnologías de Unión (CESOL). Italy. Madrid, Madrid.

- Juan Carlos del Real Romero, Sara López de Armentia Hernández, *"Adhesive bonding technology course for European Adhesive Engineer (EAE)".* Asociación Española de Soldadura y Tecnologías de Unión (CESOL). Italy. Online.

6.6 Seminars

Dissemination seminars are organized throughout the year at IIT facilities to present final or preliminary results of the ongoing research lines, as well as to

discuss hot topics of general interest. The speakers of these seminars are either IIT member or guest speakers coming from other institutions. The seminars that have taken place in this course are the following ones.

- David Alfaya Sánchez, *"Classifying isomorphisms between moduli of bundles".* Mathematical Physics and Algebraic Geometry (MAPHYAG) Seminar. Universidad Complutense de Madrid (UCM).

- David Alfaya Sánchez, *"LED Meeting: Teaching experiences with ChatGPT and other Ais".* Universidad Pontificia Comillas.

- Erik Francisco Alvarez Quispe, *"SADSE seminar: Introducing learning algorithms within an operational state aggregation method for transmission system planning".* Instituto de Investigación Tecnológica. Universidad Pontificia Comillas.

- Erik Francisco Alvarez Quispe, *"Self-scheduling for a hydrogen-based virtual power plant in day-ahead energy and reserve electricity markets".* 19th Workshop on Industrial Systems and Energy Technologies - JOSITE'2024. Instituto de Investigación Tecnológica. Universidad Pontificia Comillas.

- Eva María Arenas Pinilla, Mª del Mar Cledera Castro, Carlos Morales Polo, *"Bioenergy in action: producing biomethane from waste".* Semana de la Ciencia y la Innovación 2023. Fundación para el conocimiento madri+d. Comunidad de Madrid.

- Juan Manuel Asensio Gil, *"Characterization of head injury risk for e-scooter riders in curb collisions".* 19th Workshop on Industrial Systems and Energy Technologies - JOSITE'2024. Instituto de Investigación Tecnológica. Universidad Pontificia Comillas.

- Ana Baringo Morales, *"Pricing and settlement of the secondary regulation service in Spain".* Instituto de Investigación Tecnológica. Universidad Pontificia Comillas.

- Roberto Barrella, *"Energy Poverty Indicators in Spain. Datasets, methods and results".* EU Energy Poverty Advisory Hub (EPAH) - Course platform. Energy Poverty Advisory Hub.

- Roberto Barrella, *"Addicted to energy".* I Congreso de Educación hacia la Sostenibilidad - ICES. Comunidad de Madrid.

- Roberto Barrella, *"Chair of Energy and Poverty: Research and action against energy poverty".* Jornadas de Capacitación en Pobreza Energética: Panorama internacional, casos de análisis y lecciones aprendidas. Proyecto I-COOP VEnUS.

- Roberto Barrella, *"Energy poverty in a global crisis. Who is left behind by the energy transition?".* Instituto de Investigación Tecnológica. Universidad Pontificia Comillas.

- Roberto Barrella, *"Evaluating the impact of energy efficiency strategies on households' energy affordability: A Spanish case study".* IEA Workshop «Measuring Affordability and the Social Impacts of Clean Energy Transitions». International Energy Agency (IEA).

- Roberto Barrella, *"Introduction to the bulletin, purpose and research methodology used".* Presentación del Boletín sobre Vulnerabilidad Social | Pobreza Energética. Cruz Roja Española.

- Roberto Barrella, *"Measuring affordability and the social impacts of clean energy policies on marginalized groups: Toward better policy design".* IEA Workshop «Measuring Affordability and the Social Impacts of Clean Energy Transitions». International Energy Agency (IEA).

- Roberto Barrella, *"Energy poverty".* I Congreso de Educación hacia la Sostenibilidad - ICES. Comunidad de Madrid.

- Roberto Barrella, Eva María Arenas Pinilla, *"Energy poverty vision and challenges to be tackled".* Webinar «10 Años de "Ni Un Hogar Sin Energía": Acción e innovación en la lucha contra la pobreza energética.». Fundación Ecológica y Desarrollo - ECODES.

- Álvaro Benítez Domínguez, *"A convergence control scheme for multi-stage holomorphic embedding load-flow method".* 19th Workshop on Industrial Systems and Energy Technologies - JOSITE'2024. Instituto de Investigación Tecnológica. Universidad Pontificia Comillas.

- Paulo Brito Pereira, *"SADSE seminar: Assessing resource adequacy in the energy transition: the need for future-proofed reliability metrics".* Instituto de Investigación Tecnológica. Universidad Pontificia Comillas.

- Mario Castro Ponce, *"Identifiability matters: a closer look at the art of simple mathematical models for complex systems".* 2nd Meeting of the Spanish Chapter of the Complex Systems Society. Centre de Recerca Matemática (CRM).

- Mario Castro Ponce, Álvaro Jesús López López, *"What are the limits of AI?".* VII Seminario Interdisciplinar Cátedra Hana y Francisco José Ayala de Ciencia, Tecnología y Religión. Cátedra Hana y Francisco José Ayala de Ciencia, Tecnología y Religión. Universidad Pontificia Comillas.

- Efraim Centeno Hernáez, *"Energy and climate dialogues: energy and poverty".* Fundación Reformismo 21.

- José Pablo Chaves Ávila, *"Flexibility for distribution networks".* Jornada «Smart Grids Innova Madrid 2024». Iberdrola S.A..

- José Pablo Chaves Ávila, *"BEFLEXIBLE project: developing the following steps to unlock flexibility in the electricity system".* II Congreso de Redes Inteligentes. Instituto Tecnológico de la Energía (ITE); y FutuRed.

- José Pablo Chaves Ávila, *"Regulatory sandboxes in the Spanish energy sector".* Jornada «Nuevas formas de regular el sector energético». Club Español de la Energía.

- Rafael Cossent Arín, *"Digitalisation of electricity distribution networks: indicators and investments".* Presentación de informe.. Fundación Naturgy.

- Rafael Cossent Arín, *"Presentation".* Presentación del Informe Anual de la Cátedra de Estudios sobre el Hidrógeno 2023. Cátedra de Estudios sobre el Hidrógeno. Universidad Pontificia Comillas.

- Rafael Cossent Arín, *"Regulatory treatment of new transport fuels. Guide on new renewable and synthetic fuels".* Programa Green Gas Mobility Summit 2024. Gasnam Neutral Transport.

- Rafael Cossent Arín, *"An orderly transition to the decarbonisation of transport".* 23º Foro Nacional del Transporte. AECOC.

- Asunción Paloma Cucala García, *"Opening session".* Jornada Homenaje al Profesor Ignacio Pérez Arriaga. 40 Aniversario del IIT.. Instituto de Investigación Tecnológica. Universidad Pontificia Comillas.

- Santos José Díaz Pastor, *"Accelerating global energy access".* Misión al ecosistema de emprendimiento innovador de Massachusetts. MIDE | Madrid Innovation Driven Ecosystem.

- Santos José Díaz Pastor, *"Business and financial models for electrification. The case of Madagascar".* Regulation for Sustainable Development Goal 7 Course. Florence School of Regulation (FSR).

- Santos José Díaz Pastor, *"Implementing an integrated distribution framework to achieve universal electricity access. The critical financial step".* 19th Workshop on Industrial Systems and Energy Technologies - JOSITE'2024. Instituto de Investigación Tecnológica. Universidad Pontificia Comillas.

- Santos José Díaz Pastor, *"Powering Northern Madagascar: An integrated approach".* MITEI Research Seminar. MIT Energy Initiative.

- Santos José Díaz Pastor, *"Regulatory support to accelerate electrification. On- and off-grid distribution".* Presential week: Power Sector Regulation in Africa. African School of Regulation (ASR).

- Santos José Díaz Pastor, *"Universal energy access. An integrated approach".* The Dirt Road - Speaker Portion. Martin Trust Center for MIT Entrepreneurship.

- Pablo Dueñas Martínez, *"Mathematical models for distribution impact analysis from decarbonization, decentralization and digitalization".* Instituto de Investigación Tecnológica. Universidad Pontificia Comillas.

- Mohamed Abbas Eltahir Elabbas, *"Renewable energy integration and cross-border trading. Session 1 - Energy Connectivity in Central Asia".* 3rd Almaty Energy Forum. United Nations Economic Commission for Europe (UNECE).

- Mohamed Abbas Eltahir Elabbas, *"Transmission regulation, regional power trade and integration of renewables".* Presential week: Power Sector Regulation in Africa. African School of Regulation (ASR).

- Teresa Freire Barceló, *"SADSE seminar: System planning with demand assets in balancing markets".* Instituto de Investigación Tecnológica. Universidad Pontificia Comillas.

- Roberto Gesteira Miñarro, *"Reverse-engineering radiofrequency protocols for Remote Keyless Entry systems".* 19th Workshop on Industrial Systems and Energy Technologies - JOSITE'2024. Instituto de Investigación Tecnológica. Universidad Pontificia Comillas.

- Tomás Gómez San Román, *"Flexibility in electricity distribution networks".* XXVII Congreso ASEME. Asociación de Empresas Eléctricas -ASEME.

- Tomás Gómez San Román, *"Utility of the future".* Máster en Negocio Energético. Club Español de la Energía.

- Tomás Gómez San Román, Pedro Linares Llamas, *"An assessment of the Iberian Exception to control electricity prices".* 2º Webinar «The energy transition: towards a decarbonized energy». IEEE PES España.

- Yolanda González Arechavala, *"Bringing the STEM world into the classroom".* Semana de la Ciencia y la Innovación 2023. Fundación para el conocimiento madri+d. Comunidad de Madrid.

- Yolanda González Arechavala, *"STEM careers participation and gender: the impossible gap?".* I Jornadas PartyGen «Miradas a la participación y al género en las aulas universitarias: experiencias desde STEM-H». Universidad Complutense de Madrid.

- Yolanda González Arechavala, *"Discovering Artificial Intelligence".* Semana de la Ciencia y la Innovación 2023. Fundación para el conocimiento madri+d. Comunidad de Madrid.

- Yolanda González Arechavala, *"STEM Studies".* Jornada sobre estudios STEM en en el Colegio Santa Joaquina de Vedruna en Madrid. Cátedra para la Promoción de la mujer en Vocaciones STEM en la Formación Profesional para la Movilidad Sostenible. Universidad Pontificia Comillas.

- Yolanda González Arechavala, *"STEM Studies and STEM Women's Professional Careers".* Jornada sobre estudios STEM en el Colegio Santísima Trinidad de Collado Villalba. Cátedra para la Promoción de la mujer en Vocaciones STEM en la Formación Profesional para la Movilidad Sostenible. Universidad Pontificia Comillas.

- Yolanda González Arechavala, *"Labour market developments: present and future".* III Jornada STEM para orientadores. Cátedra para la Promoción de la mujer en Vocaciones STEM en la Formación Profesional para la Movilidad Sostenible. Universidad Pontificia Comillas.

- Yolanda González Arechavala, *"Traffic Light Synchronisation Workshop".* Jornada sobre estudios STEM en en el Colegio Santa Joaquina de Vedruna en Madrid. Cátedra para la Promoción de la mujer en Vocaciones STEM en la Formación Profesional para la Movilidad Sostenible. Universidad Pontificia Comillas.

- Andrés González García, *"Electrifying the last mile, the case of Latin America".* Jornada «Avanzando en la colaboración por el acceso universal a la energía y contra la pobreza energética. MAUE 10º Aniversario». Mesa de Acceso Universal a la Energía (MAUE).

- Lucía Güitta López, *"Efficiently transferring deep reinforcement learning experience to industrial assets".* Instituto de Investigación Tecnológica. Universidad Pontificia Comillas.

- Juan Francisco Gutiérrez Guerra, *"Bio-FlexGen: Making the Green Deal real through the efficient and flexible integration of biomass and hydrogen for CHP generation".* PyroCO2 Exploitation Workshop - ECOMONDO 2023. IEG -Italian Exhibition Group S.p.A..

- Leslie Herding, *"SADSE seminar: A security-aware dynamic hosting capacity approach to enhance the integration of renewable generation in distribution networks".* Instituto de Investigación Tecnológica. Universidad Pontificia Comillas.

- Luis Alberto Herrero Rozas, Léonard Lefranc, *"SADSE seminar: A comparative analysis of Cournot equilibrium and perfect competition models for electricity and hydrogen markets integration".* Instituto de Investigación Tecnológica. Universidad Pontificia Comillas.

- Pedro Linares Llamas, *"Academic views on long-term ppas in the eu and their impact on the power markets".* REKK Regional Energy Policy Forum: The New Electricity Market Design - How to design PPAs creating a healthy investment environment in the EU?. Corvinus University of Budapest.

- Pedro Linares Llamas, Tomás Gómez San Román, *"SADSE seminar: An assessment of the Iberian Exception to control electricity prices".* Instituto de Investigación Tecnológica. Universidad Pontificia Comillas.

- Sara López de Armentia Hernández, *"Use of 3D printing in bioengineering: hard tissue regeneration".* Instituto de Investigación Tecnológica. Universidad Pontificia Comillas.

- Álvaro Jesús López López, *"Generative AI in the work environment".* 1º Comillas Learning Festival. Universidad Pontificia Comillas.

- Álvaro Jesús López López, *"Innovation in AI techniques with focus on application to real projects in industry".* VI Encuentro del Foro Universidad-Empresa. Las Rozas Next.

- Francisco José López Valdés, *"Assessing the mechanical response of the cervical spine of the PIPER model".* Seminar «Child occupant protection: Latest knowledge and future opportunities». SAFER.

- Sara Lumbreras Sancho, *"God. Science. The evidences. What is changing?".* Encuentros del Máster en Cristianismo y Cultura Contemporánea. Universidad de Navarra.

- Sara Lumbreras Sancho, *"Ethics and artificial intelligence".* Jornadas sobre IA. Área transversal de Pastoral y Compromiso Social.. Grupo San Valero.

- Sara Lumbreras Sancho, *"Anthropological implications of Artificial Intelligence".* SRF Online Conference 2024 «Continuous & Cocreation: Emergence in Scientific Age». Science and Religion Forum (SRF).

- Sara Lumbreras Sancho, *"Ethical and bioethical aspects of the AI".* Jornadas IA (sociedad y periodismo). Fundación COPE.

- Sara Lumbreras Sancho, *"Can AI be trusted and when?".* AIESC 2024 «IA et Sagesse du coeur dans le monde contemporain». Association Internationale pour l'Enseignement Social Chrétien (AIESC).

- Sara Lumbreras Sancho, *"Science and Theology".* I Seminario Diálogo Ciencia Y Teología. Universidad de Murcia.

- Sara Lumbreras Sancho, *"How AI is going to change medicine".* Jornadas IA en Medicina. Consejo Estatal de Estudiantes de Mecidina (CEEM).

- Sara Lumbreras Sancho, *"How artificial intelligence will change our lives".* Jornada «El mejor tratamiento posible del asma y la EPOC. Uniendo hombre y máquina». Cátedra UAH-GSK de enfermedades inflamatorias de las vías aéreas. Universidad de Alcalá..

- Sara Lumbreras Sancho, *"From anthropology to ethics: value-based AI ethics".* XXVII Jornadas Internacionales de Filosofía «Pensar la Inteligencia Artificial». Universidad Pontificia Comillas.

- Sara Lumbreras Sancho, *"The technological challenge: the fourth Industrial Revolution".* II Jornadas Teología y Mundo Actual «Época de cambios, cambio de época».. Centro Superior de Estudios Teológicos San Pablo (CESET).

- Sara Lumbreras Sancho, *"The current state of Artificial Intelligence".* Seminario de Filosofía y Biología «Pasado, presente y futuro de la inteligencia humana». Fundación Xavier Zubiri.

- Sara Lumbreras Sancho, *"AI Ethics".* European Leadership Programme (ELP). Jesuit European Social Centre (JESC).

- Sara Lumbreras Sancho, *"Exploring the boundaries between Artificial Intelligence and Bioethics: the role of ChatGPT".* Semana de la Ciencia y la Innovación 2023. Fundación para el conocimiento madri+d. Comunidad de Madrid.

- Sara Lumbreras Sancho, *"AI in complex decision problems".* Curso «Experto Universitario en Inteligencia Artificial en Ciencias Sociales y Jurídicas». Universidad Complutense de Madrid.

- Sara Lumbreras Sancho, *"The impact of health data in real life. Actionable knowledge".* EvidencIA Summit. Del dato al impacto. Medsavana S.L..

- Sara Lumbreras Sancho, *"Artificial Intelligence and human rights".* XXIX Curso de DSI «Los desafíos de la inteligencia artificial a la Doctrina Social de la Iglesia». Fundación Pablo VI.

- Sara Lumbreras Sancho, *"Interiority in Artificial Intelligence: a reflexion from St Teresa of Jesus".* V Simposio Internacional de SOFIC "Interioridad humana, presencia, conciencia, educación". Sociedad de Filósofos Cristianos (SOFIC).

- Sara Lumbreras Sancho, *"Human identity at the sight of technology and AI".* XXVIII Encuentro de Obispos-Teólogos «Una mirada al transhumanismo desde la teología». Conferencia Episcopal Española.

- Sara Lumbreras Sancho, *"Legacy and new horizons: What lies ahead for Francisco J. Ayala's lifework and the Center for Science, Technology, and Religion".* Frontiers of the Universal: Towards a Symphony of Science, Art, Faith, and Knowledge Economy to Mobilize the Wonder of the Natural World in Benefit of Humanity. Cátedra hana y Francisco José Ayala de Ciencia, Tecnología y Religión. Universidad Pontificia Comillas.

- Sara Lumbreras Sancho, *"Transhumanism, artificial intelligence and integrative ecology".* Jornadas de Pensamiento Humanista. Un diálogo sobre valores y ética. Junta de Andalucía. Consejería de Turismo, Cultura y Deporte.

- Sara Lumbreras Sancho, *"Ethical use of AI applications in research".* Encuentro de doctorandos: salud, bienestar y bioética. Programa de doctorado de Salud, Bienestar y Bioética..

- Sara Lumbreras Sancho, Sara Lumbreras Sancho, *"Artificial Intelligence in the decision making of complex problems".* Curso «Experto Universitario en Inteligencia Artificial en Ciencias Sociales y Jurídicas». Universidad Complutense de Madrid (UCM).

- Seyedamir Mansouri, *"SADSE seminar: Useful optimization approaches for planning, operation and energy management in power systems".* Instituto de Investigación Tecnológica. Universidad Pontificia Comillas.

- Miguel Martínez Velázquez, *"Assessing grid-wide hosting capacity for residential EV adoption".* 19th Workshop on Industrial Systems and Energy Technologies - JOSITE'2024. Instituto de Investigación Tecnológica. Universidad Pontificia Comillas.

- Oibar Martínez Vílchez, *"Static charge control and earthing system of the LST1 Cherenkov telescope".* Instituto de Investigación Tecnológica. Universidad Pontificia Comillas.

- Paolo Mastropietro, *"Capacity market mechanism for energy transition: international experience".* Webinar. MAI Group.

- Paolo Mastropietro, *"Capacity market: what is it, how does it work and what has been done in other countries?".* Open Sessions. AEPIBAL.

- Ana María Megía Macías, *"Ana Megía-Macías: Pioneering cold plasma technology".* Third Collisions Panel: Entrepreneurship Unveiled. Conseil Européen pour la Recherche Nucléaire (CERN).

- Emanuel Gastón Mompó Pavesi, *"Equilibrium properties that dominate the anomalous evolution of systems out of equilibrium".* Instituto de Investigación Tecnológica. Universidad Pontificia Comillas.

- Antonio Muñoz San Roque, *"Closure".* Jornada Homenaje al Profesor Ignacio Pérez Arriaga. 40 Aniversario del IIT.. Instituto de Investigación Tecnológica. Universidad Pontificia Comillas.

- José Ignacio Pérez Arriaga, *"ASR Launch. Building the capacity in energy regulation that Africa needs to meet the objectives of the Agenda 2063".* African Climate Summit 2023.. African Capacity Building Foundation (ACBF); African Union Commission (AUC); European University Institute (EUI); y Rockefeller Foundation;.

- Pablo Pintos Touriño, *"Legislative procedure of the electricity market reform".* Instituto de Investigación Tecnológica. Universidad Pontificia Comillas.

- Alejandro Polo Molina, *"A mathematical certification for positivity conditions in neural networks with applications to partial monotonicity and ethical AI".* 19th Workshop on Industrial Systems and Energy Technologies - JOSITE'2024. Instituto de Investigación Tecnológica. Universidad Pontificia Comillas.

- Mohammad Rajabdorri, *"Discussing the possibility of estimating under frequency load shedding (UFLS) with machine learning methods".* Instituto de Investigación Tecnológica. Universidad Pontificia Comillas.

- Andrés Ramos Galán, *"Relaxation and decomposition. Decomposition I: Benders decomposition".* Curso de Doctorado del IMI-DSC. Optimización Entera (Integer Optimisation). Universidad Complutense de Madrid.

- María Reneses Botija, *"The dangers of computer games and RAYUELA, or a fun way to fight cybercrime".* Tartu 2024. Tartu University.

- Saeed Rezaeian-Marjani, *"The impact of HVDC on the propagation of cascading outages".* I Jornada de jóvenes investigadores en potencia y energía España. IEEE PES España.

- Simón Rodríguez Santana, *"Uncertain predictions and probabilistic machine learning".* Instituto de Investigación Tecnológica. Universidad Pontificia Comillas.

- José Carlos Romero Mora, Antonio Francisco Rodríguez Matas, Manuel Pérez Bravo, *"SADSE seminar: Defining and assessing transport poverty".* Instituto de Investigación Tecnológica. Universidad Pontificia Comillas.

- Mª del Carmen Rubiales Mena, *"Applications of GANs to predictive maintenance".* 19th Workshop on Industrial Systems and Energy Technologies - JOSITE'2024. Instituto de Investigación Tecnológica. Universidad Pontificia Comillas.

- Miguel Ángel Ruiz Hernández, *"Anticipatory investment and flexibility in distribution network planning: a real options approach".* 19th Workshop on Industrial Systems and Energy Technologies - JOSITE'2024. Instituto de Investigación Tecnológica. Universidad Pontificia Comillas.

- Álvaro Sánchez Miralles, *"ReDream ecosystem: energy flexibility in a community".* Flexcon 2023. Flexiblepower Alliance Network (FAN); y Smart Energy Europe.

- Pablo Sánchez Pérez, *"Analyzing biases and data characteristics in Point-Of-Interest recommendation".* Instituto de Investigación Tecnológica. Universidad Pontificia Comillas.

- Miad Sarvarizadeh Kouhpaye, *"Reliability in Island Power Systems: corrective unit comitment with UFLS awareness".* 19th Workshop on Industrial Systems and Energy Technologies - JOSITE'2024. Instituto de Investigación Tecnológica. Universidad Pontificia Comillas.

- Santiago Serna Zuluaga, *"SADSE seminar: Optimising the design and operation of an electrolysis plant to account for non-linear performance while meeting demand fluctuations".* Instituto de Investigación Tecnológica. Universidad Pontificia Comillas.

- Paraskevas Sofokleous, *"Design and manufacturing of dielectric resonators via 3D printing using low-cost polymeric/ceramic filaments".* 19th Workshop on Industrial Systems and Energy Technologies - JOSITE'2024. Instituto de Investigación Tecnológica. Universidad Pontificia Comillas.

- Marcos Tostado Véliz, *"Energy management strategies for upcoming smart systems".* Instituto de Investigación Tecnológica. Universidad Pontificia Comillas.

- Matteo Troncia, *"Integrated and coordinated short-term markets for system services: implementation challenges and impact assessment".* Instituto de Investigación Tecnológica. Universidad Pontificia Comillas.

- Matteo Troncia, *"Market design towards a modernised system based on distributed resources".* Workshop «Empowering Ukraine: Policies and frameworks for a modern and resilient power system». International Energy Agency (IEA).

- Orlando Mauricio Valarezo Rivera, *"Optimizing distribution system operation and planning through the interaction between DSO-owned and third-party flexibility resources".* 19th Workshop on Industrial Systems and Energy Technologies - JOSITE'2024. Instituto de Investigación Tecnológica. Universidad Pontificia Comillas.

- Carlos David Zuluaga Ríos, *"A vector-based flexible-complexity tool for hybrid AC/DC power system analysis".* I Jornada de jóvenes investigadores en potencia y energía España. IEEE PES España.

6.7 Organization of congresses, seminars and workshops

- Matteo Troncia, *"ISGAN Virtual Learning webinars".* International Smart Grid Action Network (ISGAN). Online. July 2024.

- Asunción Paloma Cucala García, *"Jornada Técnica "Conducción Automática en Ferrocarriles. ATO sobre ERTMS N2"".* Asociación de Ingenieros del ICAI (Foro Icaitren); Escuela de Ingeniería ICAI-Comillas. Madrid (Spain). July 2024.

- Yolanda González Arechavala, *"Jornada de Tecnología".* Cátedra para la Promoción de la mujer en Vocaciones STEM en la Formación Profesional para la Movilidad Sostenible. Universidad Pontificia Comillas. Madrid (Spain). July 2024.

- Mariano Ventosa Rodríguez, *"La inteligencia artificial y la remodelación del talento".* Cátedra de Industria Conectada. Universidad Pontificia Comillas. Madrid (Spain). July 2024.

- Miguel Angel Ríos Ocampo, *"Indicadores de Pobreza Energética, España 2022".* Catedra de Energía y Pobreza. Universidad Pontificia Comillas. Madrid (Spain). July 2024.

- Sara Lumbreras Sancho, *"VII Seminario Interdisciplinar Cátedra Hana y Francisco José Ayala de Ciencia, Tecnología y Religión".* Cátedra Hana y Francisco José Ayala de Ciencia, Tecnología y Religión. Universidad Pontificia Comillas. Madrid (Spain). July 2024.

- Yolanda González Arechavala, *"1ª Jornada de Formación STEM para el profesorado".* Cátedra para la Promoción de la mujer en Vocaciones STEM en la Formación Profesional para la Movilidad Sostenible. Universidad Pontificia Comillas. Madrid (Spain). July 2024.

- Sara Lumbreras Sancho, *"Pensar la IA".* Cátedra Hana y Francisco José Ayala de Ciencia, Tecnología y Religión. Universidad Pontificia Comillas. Madrid (Spain). July 2024.

- Yolanda González Arechavala, *"Jornada sobre estudios STEM en en el Colegio Santa Joaquina de Vedruna en Madrid".* Cátedra para la Promoción de la mujer en Vocaciones STEM en la Formación Profesional para la Movilidad Sostenible. Universidad Pontificia Comillas. Madrid (Spain). July 2024.

- Sara Lumbreras Sancho, *"Frontiers of the Universal: Towards a Symphony of Science, Art, Faith, and Knowledge Economy to Mobilize the Wonder of the Natural World in Benefit of Humanity".* Cátedra hana y Francisco José Ayala de Ciencia, Tecnología y Religión. Universidad Pontificia Comillas. Madrid (Spain). July 2024.

- Eva María Arenas Pinilla, *"Presente y futuro del almacenamiento energético por bombeo hidráulico".* Cátedra Rafael Mariño de Nuevas Tecnologías Energéticas. Universidad Pontificia Comillas. Madrid (Spain). July 2024.

- Yolanda González Arechavala, *"Profesionales STEM: el empleo del futuro. Atrayendo el talento femenino como valor añadido".* Cátedra para la Promoción de la mujer en Vocaciones STEM en la Formación Profesional para la Movilidad Sostenible. Universidad Pontificia Comillas. Madrid (Spain). July 2024.

- José Pablo Chaves Ávila, *"ISGAN Lighthouse Workshop on Smart Distribution Grids in South & Central America".* International Smart Grid Action Network (ISGAN). Online. July 2024.

- Sara Lumbreras Sancho, *"Pensar la IA".* Cátedra Hana y Francisco José Ayala de Ciencia, Tecnología y Religión. Universidad Pontificia Comillas. Madrid (Spain). July 2024.

- Miguel Angel Ríos Ocampo, *"Avanzando en la colaboración por el acceso universal a la energía y contra la pobreza energética. MAUE 10º Aniversario".* Mesa de Acceso Universal a la Energía (MAUE). Madrid (Spain). July 2024.

- Roberto Barrella, *"Avanzando en la colaboración por el acceso universal a la energía y contra la pobreza energética. MAUE 10º Aniversario".* Mesa de Acceso Universal a la Energía (MAUE). Madrid (Spain). July 2024.

- Yolanda González Arechavala, *"II Jornada de Formación STEM para el profesorado".* Cátedra para la Promoción de la mujer en Vocaciones STEM en la Formación Profesional para la Movilidad Sostenible. Universidad Pontificia Comillas. Madrid (Spain). July 2024.

- Sara Lumbreras Sancho, *"19th Workshop on Industrial Systems and Energy Technologies - JOSITE'2024".* Instituto de Investigación Tecnológica. Universidad Pontificia Comillas. Madrid (Spain). July 2024.

6.8 Organization and management of other academic activities

- Roberto Barrella, *"Chairman in Round table: Eliminating energy poverty in a Europe in transition in «Jornada «Avanzando en la colaboración por el acceso universal a la energía y contra la pobreza energética. MAUE 10º Aniversario»».".* Mesa de Acceso Universal a la Energía (MAUE). Madrid (Spain). June 2024.

- Mario Castro Ponce, *"Permanent member of Congress of Statistical Physics - FISES".* RSEF / GEFENOL. April 2014- Today.

- Fernando de Cuadra García, *"Chairman in Universal access to electricity. Second Part: Scientific achievements and contributions to electrical engineering in «Jornada Homenaje al Profesor Ignacio Pérez Arriaga. 40 Aniversario del IIT.».".* Instituto de Investigación Tecnológica. Universidad Pontificia Comillas. Madrid (Spain). July 2024.

- Pablo Dueñas Martínez y Pedro Linares Llamas, *"Member of the Scientific Committee of XIX Conference Spanish Association for Energy Economics (AEEE)".* Asociación Española para la Economía Energética (AEEE). Granada (Spain). June 2024.

- Aurelio García Cerrada, *"Permanent member of Annual Seminar on Automation, Industrial Electronics and Instrumentation - SAAEI".* September 1999- Today.

- Aurelio García Cerrada, *"Chairman in XXXI Annual Workshop on Control, industrial electronics and instrumentation - SAAEI 2024. Session: Electrical Engineering Applications".* Universidad de Granada. Granada (Spain). July 2024.

- Aurelio García Cerrada, *"Editor of Journal of Modern Power Systems and Clean Energy".* State Grid Electric Power Research Inst.. Nanjing (China). January 2022- Today.

- Javier García González, *"Permanent member of Power Systems Computation Conference - PSCC".* January 2001- Today.

- Tomás Gómez San Román, *"Editor of Sustainable Energy, Grids and Networks".* Elsevier Science BV.. Amsterdam (Netherlands). June 2014- Today.

- Tomás Gómez San Román, *"Editor of Journal of Modern Power Systems and Clean Energy".* Nanjing NARI Electric Power Information Co., Ltd. ; e Institute of Electrical and Electronics Engineers Inc. - IEEE. Piscataway (United States of America). March 2020- Today.

- Tomás Gómez San Román, *"Chairman in Round table: Contributions and challenges for a more sustainable energy system in «Jornada Homenaje al Profesor Ignacio Pérez Arriaga. 40 Aniversario del IIT.»".* Instituto de Investigación Tecnológica. Universidad Pontificia Comillas. Madrid (Spain). July 2024.

- Yolanda González Arechavala, *"Chairman in Round table: STEM professionals: the job of the future. Attracting female talent as an added value in «III Jornada STEM para orientadores»".* Cátedra para la Promoción de la mujer en Vocaciones STEM en la Formación Profesional para la Movilidad Sostenible. Universidad Pontificia Comillas. Madrid (Spain). April 2024.

- Pedro Linares Llamas, *"Editor of Papeles de Energía".* FUNCAS. Madrid (Spain). June 2015- Today.

- Pedro Linares Llamas, *"Chairman in Round table: Challenges for research in mobility in «Jornada «Los retos de la investigación para una movilidad sostenible»»".* Universidad Pontificia Comillas. Madrid (Spain). March 2024.

- Pedro Linares Llamas, *"Chairman in 10th Atlantic Workshop on Energy and Environmental Economics (AWEEE). Session B: Electricity and Transition".* Economics for Energy; CEPE (ETH Zurich); y CURE (Ruhr-Universität Bochum). La Toja Island (Spain). June 2024.

- Pedro Linares Llamas, *"Chairman in Roundtable with Editors of Energy and Environmental Journals in «10th Atlantic Workshop on Energy and Environmental Economics (AWEEE)».* Economics for Energy; CEPE (ETH Zurich); y CURE (Ruhr-Universität Bochum). La Toja Island (Spain). June 2024.

- Francisco José López Valdés, *"Editor of Journal of Healthcare Engineering".* Hindawi Ltd.. London (United Kingdom). January 2016- Today.

- Francisco José López Valdés, *"Editor of Frontiers in Bioengineering and Biotechnology. Biomechanics".* Frontiers Editorial. Lausanne (Switzerland). November 2014- Today.

- Francisco José López Valdés, *"Editor of Injury Epidemiology".* Springer. London (United Kingdom). January 2022- Today.

- Sara Lumbreras Sancho, *"Editor of Micro espacios de investigación. Revista científica e interdisciplinar".* Asociación UBUNTU. Madrid (Spain). January 2016- Today.

- Antonio Muñoz San Roque, *"Chairman in Presentation of the Kapsch Chair for Sustainable and Intelligent Mobility in «Jornada «Los retos de la investigación para una movilidad sostenible»»".* Universidad Pontificia Comillas. Madrid (Spain). March 2024.

- Luiz Augusto Nobrega Barroso, *"Editor of IEEE Power & Energy Magazine".* IEEE Power & Energy Society (IEEE PES). Piscataway (United States of America). January 2017- Today.

- Luiz Augusto Nobrega Barroso, *"Editor of IEEE Open Access Journal of Power and Energy".* IEEE Power & Energy Society (IEEE PES). Piscataway (United States of America). January 2020- Today.

- Luis Olmos Camacho y Luis Rouco Rodríguez, *"Permanent member of Power Systems Computation Conference - PSCC".* June 2017- Today.

- Luis Olmos Camacho y Luis Rouco Rodríguez, *"Member of the Scientific Committee of Technical Program Committee «XXIII Power Systems Computation Conference- PSCC 2024»".* Réseau de Transport d'Electricité (RTE). Paris (France). June 2024.

- José Ignacio Pérez Arriaga, *"Editor of European Review of Energy Markets".* European Energy Institute. June 2015- Today.

- José Ignacio Pérez Arriaga, *"Organization/Direction of the course «Regulation for Sustainable Development Goal 7 (SDG7) Course»".* European University Institute. Florence School of Regulation. Florence (Italy) Online. May-October 2023.

- José Ignacio Pérez Arriaga, *"Chairman in Round table: Mass access to energy, the case of Africa in «Jornada «Avanzando en la colaboración por el acceso universal a la energía y contra la pobreza energética. MAUE 10º Aniversario»».* Mesa de Acceso Universal a la Energía (MAUE). Madrid (Spain). June 2024.

- Andrés Ramos Galán, *"Editor of Computational Management Science".* Springer. Heidelberg (Germany). October 2011- Today.

- Andrés Ramos Galán, *"Member of the Scientific Committee of International Conference on Renewable Energy Research and Applications (ICRERA)".* International Journal of Renewable Energy Research - IJRER. September 2012- Today.

- Andrés Ramos Galán, *"Chairman in Power system models. First Part: Scientific achievements and contributions to electrical engineering in «Jornada Homenaje al Profesor Ignacio Pérez Arriaga. 40 Aniversario del IIT.»".* Instituto de Investigación Tecnológica. Universidad Pontificia Comillas. Madrid (Spain). July 2024.

- Juan Carlos del Real Romero, *"Permanent member of Congress of Adhesion and Adhesives".* Grupo Español de Adhesión y Adhesivos (GEAA). Zaragoza (Spain). January 2000- Today.

- Juan Carlos del Real Romero, *"Permanent member of International Conference on Structural Adhesive Bonding".* Porto (Portugal). January 2011- Today.

- Juan Carlos del Real Romero, *"Permanent member of International Conference on Advanced Joining Processes - AJP".* January 2019- Today.

- Juan Carlos del Real Romero, *"Member of the Scientific Committee of XXII Congreso Internacional de Adhesión y Adhesivos".* Grupo Español de Adhesión y Adhesivos (GEAA); y Asociación Española de Fabricantes de Colas y Adhesivos (ASEFCA). Malaga (Spain). November 2023.

- Juan Carlos del Real Romero, *"Member of the Scientific Committee of 14th European Adhesion Conference (EURADH) & 7th World Congress on Adhesion and Related Phenomena (WCARP)".* DECHEMA Gesellschaft für Chemische Technik und Biotechnologie e.V.. Garmisch-Partenkirchen (Germany). September 2023.

- Saeed Rezaeian-Marjani, *"Editor of International Journal of Power and Energy Systems".* ACTA Press. Calgary (Canada). April 2023- Today.

- Michel Rivier Abbad, *"Chairman in Power system regulation. First Part: Scientific achievements and contributions to electrical engineering in «Jornada Homenaje al Profesor Ignacio Pérez Arriaga. 40 Aniversario del IIT.».* Instituto de Investigación Tecnológica. Universidad Pontificia Comillas. Madrid (Spain). July 2024.

- Luis Rouco Rodríguez, *"Editor of Electric Power Systems Research".* Elsevier Science Ltd.. Lausanne (Switzerland). January 2000- Today.

- Luis Rouco Rodríguez, *"Editor of IET Generation, Transmission and Distribution".* The Institution of Engineering and Technology (IET). Hertford (United Kingdom). April 2016- Today.

- Luis Rouco Rodríguez, *"Editor of IEEE Transactions on Power Systems".* Institute of Electrical and Electronics Engineers Inc. - IEEE. Piscataway (United States of America). January 2017- Today.

- Luis Rouco Rodríguez, *"Chairman in Power system stability. First Part: Scientific achievements and contributions to electrical engineering in «Jornada Homenaje al Profesor Ignacio Pérez Arriaga. 40 Aniversario del IIT.»".* Instituto de Investigación Tecnológica. Universidad Pontificia Comillas. Madrid (Spain). July 2024.

- Carmen Valor Martínez, *"Editor of International Journal of Consumer Studies".* Wiley-Blackwell. Hoboken (United States of America). May 2020- Today.

7. Data about IIT

The relevant numbers of the academic year 2023 - 2024 are shown below, as well as the historical evolution of the turnover of the Institute and of its staff, separated into academic staff and research assistants:

8.204 M€ Turnover

94 Professors and researchers

74 Research assistants

119 Research projects

49 Consultancy projects

9 Services and analysis projects

2 Books

13 Chapters in books

135 Papers published in JCR journals

15 Papers published in other journals

28 Papers presented at conferences

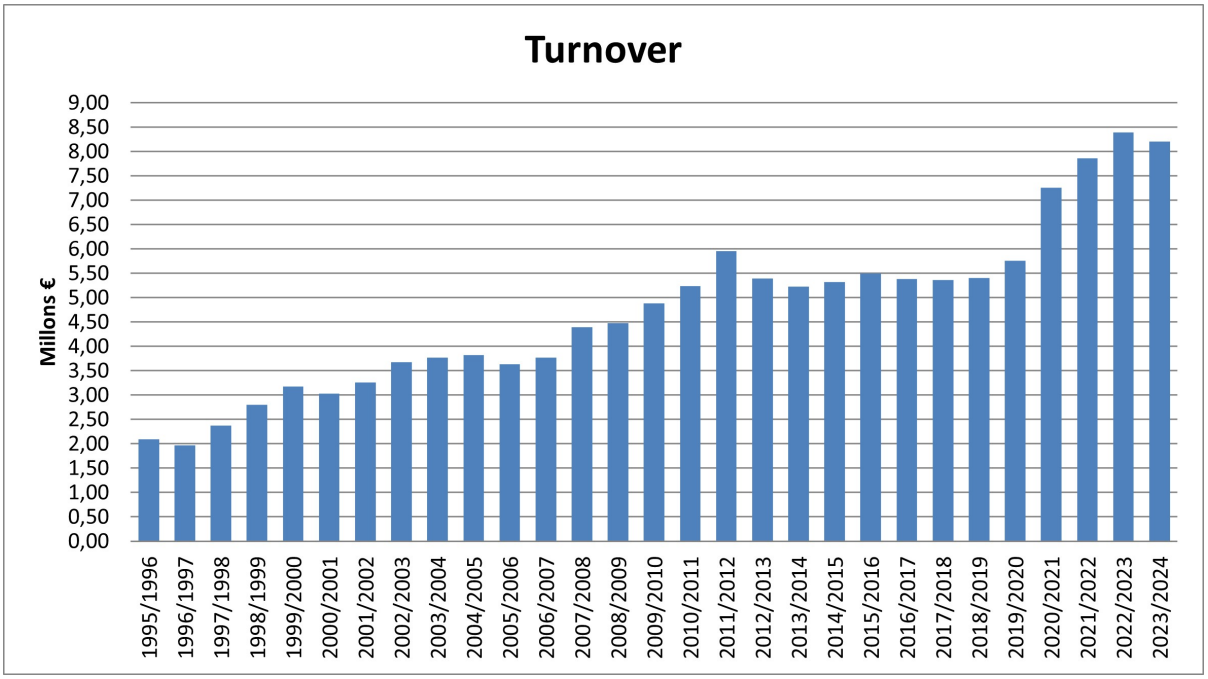
18 Technical reports and 13 Working papers

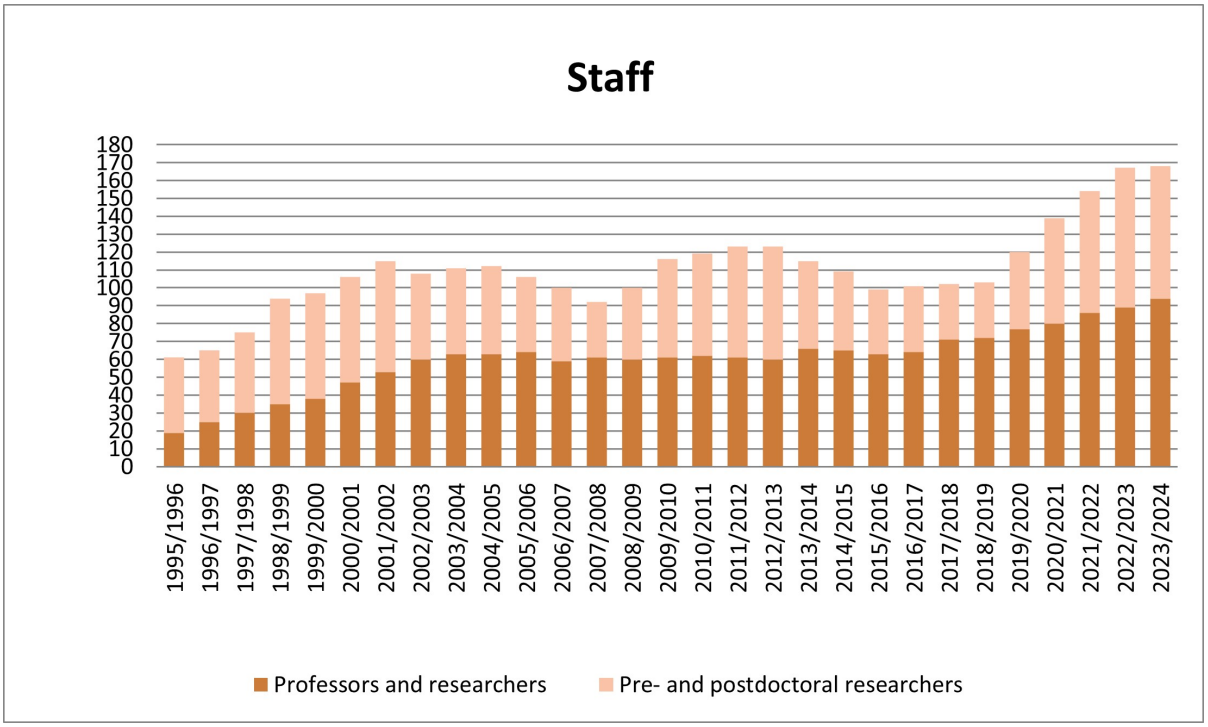
17 Submitted theses

86 Ongoing theses

23 Courses offered to external entities

Data about IIT





Institute for Research in Technology
ICAI School of Engineering
Comillas Pontifical University

C/ Santa Cruz de Marcenado 26
28015 MADRID
SPAIN

iit.comillas.edu

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