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## Editorial

### RIBIERSE-Cyted: Network for the Large-Scale Integration of Renewable Energies in Electrical Systems) – Results for 2024

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#### 1. Description of the Scientific-Technical Network

The RIBIERSE-CYTED network, *i.e.*, the Network for the Large-Scale Integration of Renewable Energies in Electrical Systems (723RT0150; 2023-2026), is a hub for researchers and technologists attached to Ibero-American universities, companies, and local administrations. From a scientific and technical perspective, this network contributes to the decarbonization of the electricity sector by favoring the large-scale integration of renewable sources into electric power systems. It promotes and articulates a framework for joint university-business cooperation and scientific research with a shared Ibero-American vision, and it encourages knowledge of the renewable context from service providers to end users.

To this effect, the proposed lines of action, which are derived from the specific objectives (SOs) of this network, are grouped into three areas. The first line includes the assessment of energy planning models and tools, as well as the prediction, evaluation, control, and management of the renewable sources currently in use in Ibero-American countries. All this, with the aim of extending, developing, and systematizing their application. The second line deals with analyzing the effective application of methodologies in real cases. Finally, the third line is dedicated to the technical training of researchers and suppliers of sustainable systems, as well as to the electrical eco-literacy of end users.

Editorial

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- Analyzing opportunities for external funding for the CYTED
- Holding Workshop #2
- Planning technical reports

As a consequence of this strong dynamism, all actions, distributed among 13 SOs, have led to the following activities:

- **23 research projects**, most of which are mainly aligned with SO04 (*Development of technical and economic tools for optimal electrical management in the hybridization of different renewable technologies, storage types, and 'E-Mobility'*), SO05 (*Identification of technological, regulatory, and socio-economic benefits and barriers for the massive integration and hybridization of renewables in Ibero-American countries*), and SO06 (*Study of the impact on current/future electrical systems of this integration, with an emphasis on temporal variability; promotion of mitigation measures*).
- One infrastructure work, *i.e.*, the construction of a new microgrid at the Automatic Control Laboratory of Universidad Nacional de San Luis, Argentina.
- Two technological contracts, one for technical and scientific contract consultancy for a local company named *Candela Solar* (Argentina) and another one involving computational methods for the planning and operation of distribution networks while considering renewable energies (Colombia).
- 38 Master/Bachelor final projects from network member universities in Spain, Colombia, Brazil, and Cuba. In addition, four doctoral theses from partner universities in Spain, Colombia, and the Dominican Republic, one of which is collaborative. Out of these works, a total of 40 is aligned with SO04.
- Four internships carried out by PhD students. Two of them were carried out at the University of Jaén (Spain), another one at Oak Ridge National Laboratory (USA), and the last one at Universidad de Talca (Chile).
- 23 short mobilities, with hosting centers in Spain, Chile, Guatemala, Panama, Mexico, Colombia, Argentina, Puerto Rico, Brazil, and Portugal. Most of these initiatives received external funding for their implementation.
- Five national conferences organized by member universities of the network (Argentina, Brazil, and Panama).
- Four international conferences: the VII International Ibero-American Congress on Smart Cities, ICSC-CITIES 2024, co-organized by the University of Valladolid (Spain), Universidad de la República (Uruguay), Universidad Autónoma del Estado de Morelos (Mexico), Instituto Tecnológico de Costa Rica, and the University of Jaen (Spain); the 3rd International Congress on Electrical Engineering, Electronics, and Automation and the 8th International Scientific Convention (CCIUTM-2024), co-organized by Universidad Técnica de Manabí (Ecuador) and the University of Jaén (Spain); and the 18th Brazilian Power Electronics Conference (COBEP), co-organized by two member universities from Brazil, *i.e.*, (Universidade Federal Fluminense and Universidade Federal do Juiz de Fora).
- Two postgraduate courses in Argentina: i) *Methodology for the dissemination of engineering sciences* and ii) *Distributed generation systems*.
- Four technical courses in Spain, Mexico, and Colombia.

- One diploma course in Panama.
- One Technical Day, organized by a Spanish university (Miguel Hernández University of Elche).
- The annual coordination meeting of the RIBIERSE-CYTED in the city of Mérida, Mexico, co-organized by Universidad Autónoma de Yucatán (Mexico) and the University of Jaén (Spain).
- Four events in other categories, organized by member universities in Spain, Honduras, and Ecuador.
- One Engineering Week organized by Argentina's partner university.
- One seminar organized by Universidad de Puerto Rico.
- One symposium organized by the Cuban university of the network, the First International Symposium on Electromobility and Energy Transition (Electromovilidad 2024).
- Two webinars organized by universities in Spain and Colombia.
- One workshop organized by the University of Jaén: I International Workshop. Hardware and computational tools applied to the management/optimization of networks and microgrids with renewable energies.
- Three technical workshops organized by the Cuban member university.
- One cycle of postgraduate conferences with speakers from members from Spain and Mexico, which was published on the CYTED website.
- 143 articles published in scientific journals, 63 of which were collaborative works.
- Three scientific books, two of which were collaborative works.
- 39 articles related to participation in scientific events (conferences), 31 of which were collaborative works.
- Two deliverables with the participation of all RIBIERSE members.
- 18 internal deliverables.
- 33 news pieces available on the CYTED website, reporting on the achievements made by the network. In addition, 41 CYTED pieces have been disseminated through other channels and are related to congresses, courses, conferences, engineering weeks, workshop seminars, doctoral theses, short mobilities, and attendance to scientific events.

All these activities, categorized as *Achievements*, *Events*, and *Publications*, are aligned with the RIBIERSE-CYTED network's SOs and have been materialized in a total of 417 deliverables.

### 3. Partner interrelation activity in the network

Coordination work for the RIBIERSE-CYTED network was carried out through different meetings, held in person and/or online with different actors and objectives, *i.e.*,

- An annual coordination meeting
- Partner coordination meetings
- Meetings at international conferences

- Events (conferences, congresses, postgraduate courses, diploma courses, courses, seminars, other events, thematic weeks, seminar, symposium, workshop, webinar, technical days)
- Meetings on the lines of action of the RIBIERSE-CYTED network.

In 2024, each of the activities was carried out individually by a partner or collaboratively. The total number of activities in which each partner has participated is shown in Fig. 2. In addition, Table I and Fig. 3 show the individual and collaborative activities conducted by each partner.

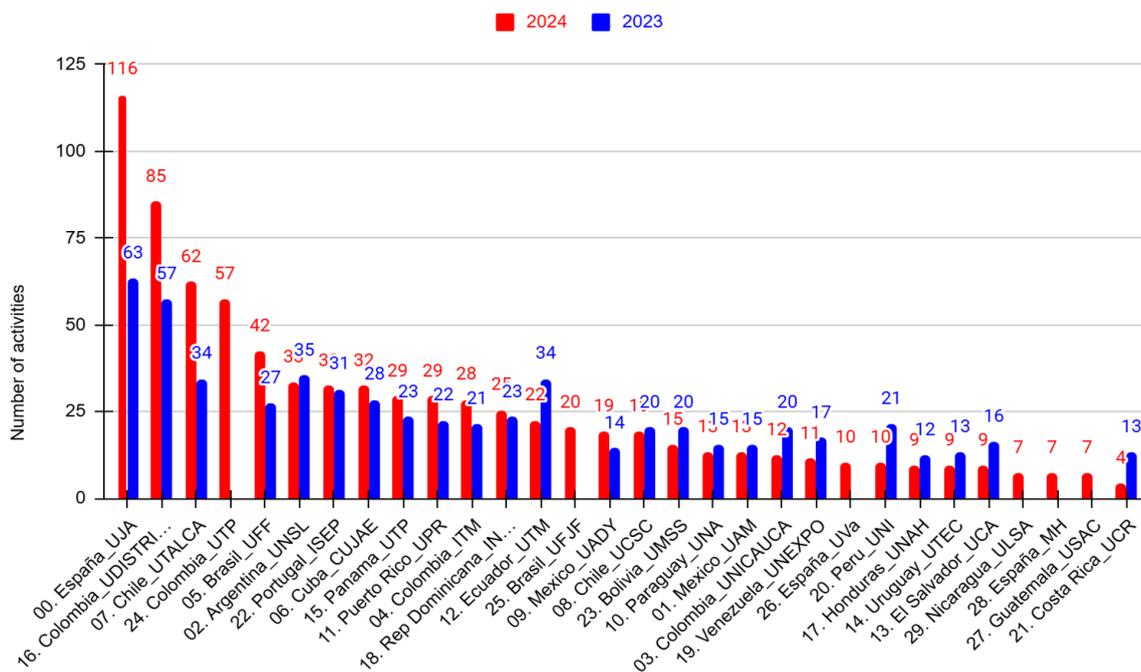


Figure 2. Total activities conducted by each partner

The second year of development of the RIBIERSE-CYTED network (2024) has been characterized by significant growth in terms of collaboration between partners, which is evidenced by the significant number of collaborative activities conducted during this period. In all categories, the percentage of collaborative activities has grown substantially, as shown in Fig. 4.

Fig. 5 presents a circular diagram of collaborations. Here, line thickness reflects the number of collaborative activities, and circle size denotes the number of individual activities. This figure highlights the change in the interrelation between the partners involved in collaborative activities. The graph for 2023 faithfully reflects what happened in the first year of the network's journey, as collaboration between member partners was still difficult, sometimes due to lack of knowledge regarding each research group's lines of work or the personal relationships that could benefit professionals in the medium and long term. However, in 2024, more than 50% of the partners had already established solid collaboration with a significant number of their counterparts.

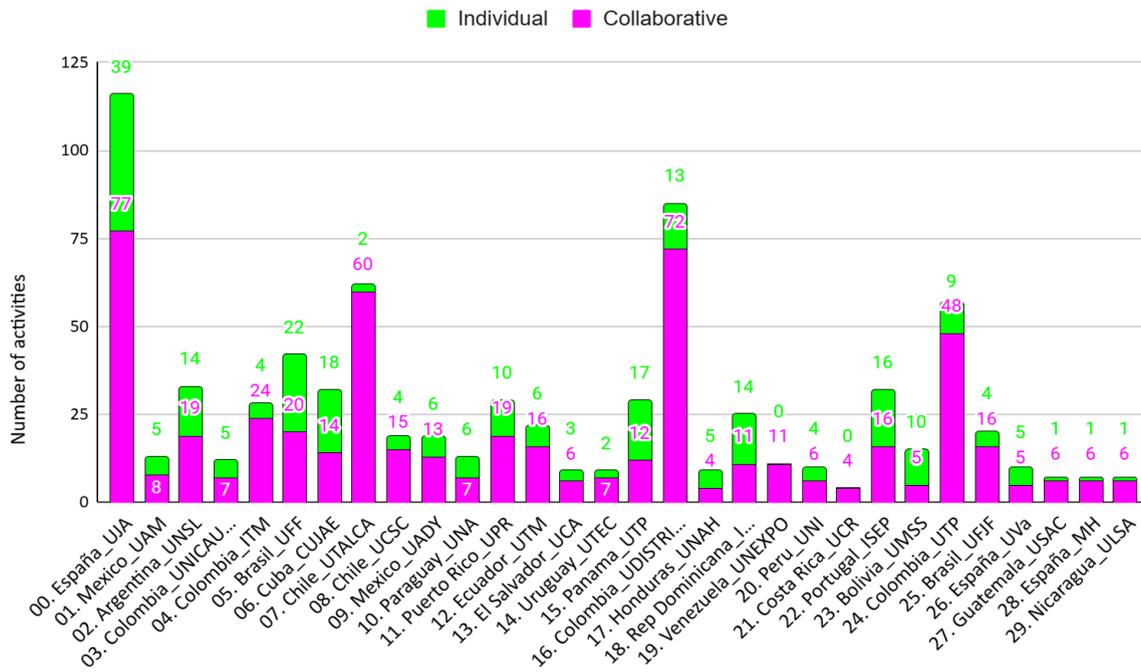


Figure 3. Individual and collaborative activities carried out in 2024

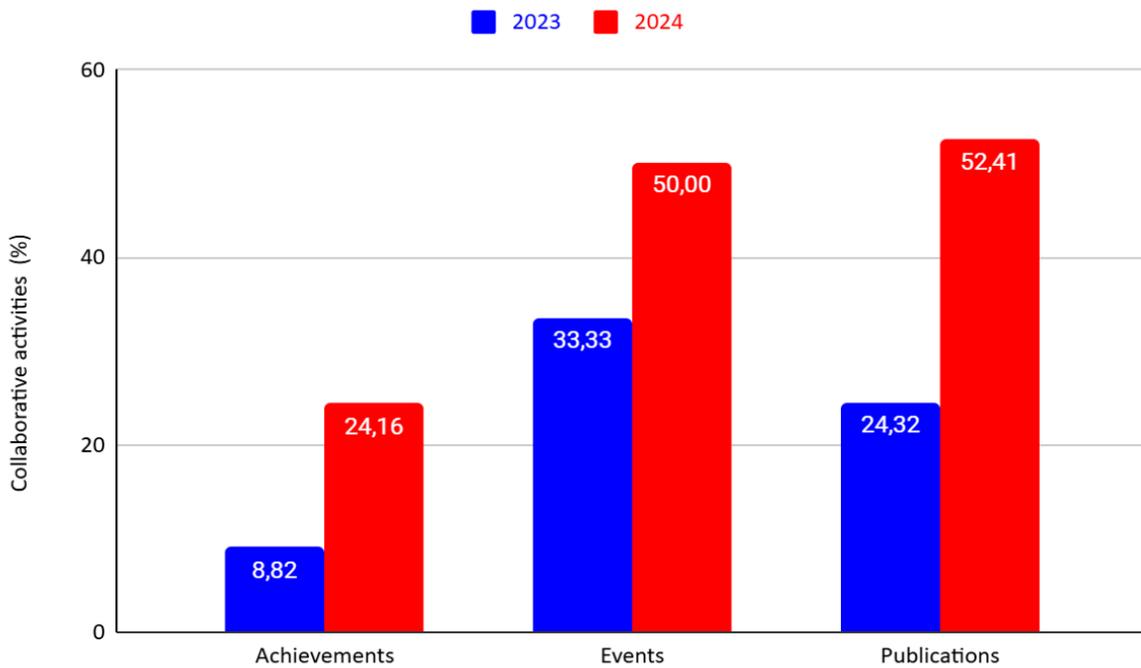


Figure 4. Percentage of collaborative activities by category 2023 vs. 2024

Table I. Individual and collaborative activities conducted in 2024

	00. España_UJA	01. México_UAM	02. Argentina_UNSL	03. Colombia_UNICAUCA	04. Colombia_ITM	05. Brasil_UFF	06. Cuba_CUJAE	07. Chile_UTALCA	08. Chile_USSC	09. México_UADY	10. Paraguay_UNA	11. Puerto Rico_UPR	12. Ecuador_UTM	13. El Salvador_UCA	14. Uruguay_UTEC	15. Panamá_UTP	16. Colombia_UDISTRITAL	17. Honduras_UNAH	18. Rep. Dominicana_INTEC	19. Venezuela_UNEXPO	20. Perú_UNI	21. Costa Rica_UCR	22. Portugal_ISEP	23. Bolivia_UMSS	24. Colombia_UTP	24. Brasil_UFJF	26. España_UVa	27. Guatemala_USAC	28. España_MH	29. Nicaragua_ULSA
00. España_UJA	39	6	12	6	8	11	9	22	10	9	4	14	11	6	7	12	20	4	10	11	5	4	10	5	12	5	5	6	6	4
01. México_UAM		5	4	4	4	4	4	4	4	6	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
02. Argentina_UNSL			14	4	4	8	5	14	7	4	4	7	5	4	4	4	13	4	5	4	4	4	6	4	7	4	4	4	4	4
03. Colombia_UNICAUCA				5	4	4	4	5	4	6	4	6	4	4	4	6	5	4	4	4	4	4	4	4	5	4	4	4	4	4
04. Colombia_ITM					4	4	4	21	4	4	4	6	4	4	4	4	21	4	4	4	4	4	4	4	6	4	4	4	4	4
05. Brasil_UFF						22	5	10	4	4	4	7	5	4	4	4	7	4	5	4	4	4	8	4	4	12	4	4	4	4
06. Cuba_CUJAE							18	5	6	4	4	5	10	6	4	6	5	4	5	6	4	4	4	4	4	4	4	4	4	4
07. Chile_UTALCA								2	11	4	5	9	5	4	4	4	37	4	7	4	4	4	8	4	20	5	4	4	4	4
08. Chile_USSC									4	4	4	4	5	4	4	6	4	4	5	6	4	4	4	4	4	4	4	4	4	4
09. México_UADY										6	6	6	4	4	4	6	4	4	4	5	4	4	5	4	4	4	4	4	4	4
10. Paraguay_UNA											6	6	4	4	4	6	4	4	4	5	4	4	5	4	4	4	4	4	4	4
11. Puerto Rico_UPR												10	5	4	4	6	10	4	8	4	4	4	6	4	5	4	4	4	4	4
12. Ecuador_UTM													6	4	4	4	4	5	4	5	4	4	4	4	4	4	4	4	4	4
13. El Salvador_UCA														3	4	6	4	4	4	6	4	4	4	4	4	4	4	4	4	4
14. Uruguay_UTEC															2	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
15. Panamá_UTP																17	4	4	4	4	4	4	4	4	4	4	4	4	4	4
16. Colombia_UDISTRITAL																	13	4	5	4	4	4	6	4	41	4	4	4	4	4
17. Honduras_UNAH																		5	4	4	4	4	4	4	4	4	4	4	4	4
18. Rep. Dominicana_INTEC																			14	4	4	4	4	4	4	4	4	4	4	4
19. Venezuela_UNEXPO																				0	4	4	5	4	4	4	4	4	4	4
20. Perú_UNI																					4	4	4	4	4	4	4	4	4	4
21. Costa Rica_UCR																						0	4	4	4	4	4	4	4	4
22. Portugal_ISEP																								16	4	5	9	4	4	4
23. Bolivia_UMSS																									10	4	4	4	4	4
24. Colombia_UTP																										9	4	4	4	4
24. Brasil_UFJF																										4	4	4	4	4
26. España_UVa																											5	4	4	4
27. Guatemala_USAC																												1	4	4
28. España_MH																													1	4
29. Nicaragua_ULSA																														1

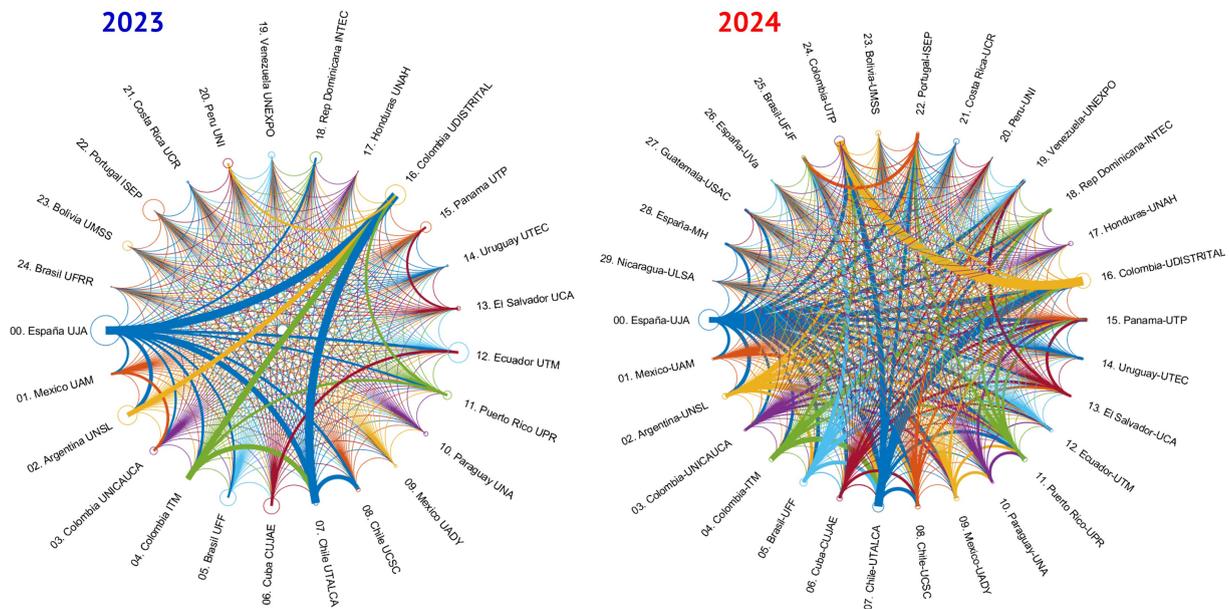


Figure 5. Interrelation between partners in collaborative activities (2023 vs. 2024)

## 4. Conclusion

The RIBIERSE-CYTED network includes partners from 22 countries, involving a total of 272 people. In this context, administrative management and expense forecasting has become a complex issue, especially regarding the management and organization of the II Annual Meeting of the RIBIERSE-CYTED network, held in the city of Mérida, Mexico, as well as regarding the mobility of several partners.

The different time zones of the 22 countries in the network make it difficult to agree on work schedules for events and collective meetings. To overcome this challenge, the proposals for new activities have been divided into subtasks, linking the partners in work nodes, an approach that was strengthened after the II Annual Meeting.

There has been great synergy between partners during the network's second year thanks to the initial dynamism, which has enabled the extension of our work modes to other groups, as well as their involvement, completing the activities scheduled for 2024 and exceeding the expectations in many cases. It is worth noting that all these achievements demonstrate the great commitment of the members, who are grateful for the support offered by the Ibero-American Program of Science and Technology for Development (CYTED)\*\*. Nonetheless, the funding and support provided to the RIBIERSE-CYTED network by the University of Jaén, Universidad Autónoma de Yucatán (UADY), and all the participating universities and companies external to the network have been crucial for achieving so many activities.

\*\*The CYTED program was created by the governments of the Ibero-American countries to foster cooperation in science, technology, and innovation while aiming for harmonious development.

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