

Pan American Marine Energy Conference 2024

Barranquilla



REPORTS ON THE THIRD PAN AMERICAN MARINE ENERGY CONFERENCE – PAMEC 2024

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With two seas at its disposal, it is inevitable to think that part of Colombia's future must focus on harnessing the abundance offered by marine resources. This becomes even more relevant in the current context of *energy transition*, which many countries around the world have embarked upon. This is where spaces like PAMEC play a crucial role, becoming incubators of ideas and synergies that enable the realization of projects focused on this paradigm shift towards clean energy.

In this third edition of the conference, there was significant participation from international guests, along with a broad spectrum of different types of generation technologies, allowing an insight into the path that has already been taken in other parts of the world and how this knowledge could be applied in various regions of the Americas where the initial steps are being taken in the implementation of such renewable energies. Another noteworthy aspect of the event was the interdisciplinary nature of the conferences; the

program did not focus only on technical advances but also addressed crucial cross-cutting issues such as environmental and socio-economic impact assessments. These factors have been perhaps the main reasons why renewable energy projects have not been implemented in Colombia in recent years.



Fig 1. Presentations at the PAMEC 2024 conference. (Photo: Mateo Valencia Betancurt)

A relevant effort by the PAMEC organizers is the integration of various stakeholders directly involved in contributing to different aspects of the marine energy sector. This includes university students, representatives of public entities, researchers, and entrepreneurs, enriching the knowledge spaces offered and adding dynamism to the relationships between academia and industry. An example of this was also the inclusion of small companies that are starting with their prototypes energy generation and/or the measurement of environmental variables and parameters. This further transforms PAMEC into a platform for collaboration and future investments.

Based on my personal experience at this conference, I can affirm that the knowledge gained will be of great value for my research work in the coming months. I was able to gather information regarding data, methodologies, and sources related to the technical evaluation of offshore wind infrastructure and wind resources from various speakers working in this field. Additionally, the interaction with other speakers opens the door to potential collaborative projects in the near future.

Finally, I must acknowledge that, with this being my first approach to the marine energy sector, I have been pleasantly surprised by the real possibilities of creating offshore wind, kinetic, tidal, and saline gradient energy projects, both in Colombia and the Caribbean. This, I believe, left all attendees highly motivated to continue contributing and innovating in these technologies.



Fig 2. Mateo Valencia Betancurt, full CEMarin scholarship recipient and speaker at the PAMEC 2024 conference. (Photo: Mateo Valencia Betancurt)

There are significant technical, political, regulatory, environmental, and social challenges in the coming years regarding the implementation of marine energies, particularly in countries like Colombia. It is crucial that integration of research continues to be promoted from all sectors, coupled with proper planning by government entities. The ultimate aim of this is to establish mechanisms that facilitate project development and, in turn, encourage investment in these energy sources by local and international actors.

Álvaro Jose Salazar Benavidez

Undergraduate student in Mechanical Engineering
Universidad del Valle

The third Pan American Marine Energy Conference (PAMEC 2024) addressed different topics related to marine energy, providing a comprehensive vision of the challenges and advances in this field at a national and international level. Since the event, I have reflected on the lessons learned and the personal and professional development I gained as a participant.

The importance of understanding the socioeconomic aspects associated with the implementation of marine energy projects stands out. The interaction between economic development and environmental sustainability emerged as a key element for the long-term success of these initiatives. The conference highlighted the critical need to assess and address the environmental impacts of marine energy, employing technologies, materials and practices that minimize the impact on marine ecosystems. Detailed understanding of marine resources is essential for the design of marine energy facilities.

The conference highlighted the need to advance characterization techniques to optimize project placement and performance. The latest advances in offshore wind technology were explored, in conjunction with the efficiency and economic viability of this form of renewable energy. The promising application of salinity and temperature gradients was also discussed, given their potential in energy generation, which presents opportunities for the diversification of marine energy sources. Likewise, methodologies for carrying out projects related to marine energies were presented, as well as tools that allow for a better study of them.



Fig 3. Presentations at the PAMEC 2024 conference. (Photo: Álvaro Jose Salazar Benavidez)

My participation at PAMEC 2024 was enriching from both a professional and personal point of view. Interaction with renowned experts, exposure to cutting-edge research, and the opportunity to present my own work have contributed significantly to my academic and professional growth.



Fig 4. Alvaro Jose Salazar Benavidez, full CEMarin scholarship recipient and speaker at the PAMEC 2024 conference. (Photo: Álvaro Jose Salazar Benavidez).

Additionally, the diversity of perspectives and collaboration with professionals from different backgrounds have expanded my understanding of the multidisciplinary challenges associated with marine energy. The connections established during the conference offer the possibility of future collaborations and continued development in this area.

In conclusion, the third Pan American Marine Energy Conference has been a catalyst for both the advancement of research and its practical application in the field of marine energy. The lessons learned and experiences gained will continue to positively influence my academic and professional career.

I sincerely appreciate the opportunity to participate in this event



Fig 5. Participants in the PAMEC 2024 conference. (Photo: *Álvaro Jose Salazar Benavidez*).

María Susana Pérez Grisales

Master's student in Chemical Engineering
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Participating in PAMEC 2024 has been enriching, providing me with valuable learning about the current state of marine energies worldwide. Among the lessons learned, the importance of developing new knowledge and capabilities around the creation and implementation of different marine technologies that take advantage of the marine energy resource stood out, as well as its relevance in facing current and future challenges in terms of climate change and a just energy transition. In this sense, it is important to join forces between the triad of academia, industry and the state, in order to promote the maturation and implementation of these technologies, which is often hindered by a lack of support from a financial point of view and, in many circumstances, political will.

The successful implementation of these technologies also entails additional challenges, such as energy storage, optimization, and the creation of policies and regulations, which must advance jointly to guarantee their integration with the national electrical grid and efficient use in other economic activities of the industry.



Fig 6. Presentations at the PAMEC 2024 conference. (Photo: María Susana Pérez Grisales).

During the presentations, the importance of involving communities was highlighted, not only to raise awareness and improve acceptance of the projects, but also to evaluate the relevance of the proposed solutions, considering the needs of the people in relation to their customs, cultural aspects and means of subsistence. Beyond providing a diagnosis of the current situation, this approach can help define the route to follow to better take advantage of local potential and link the economic activities of the region with the most appropriate energy solution, thus minimizing environmental impacts. An example highlighted during the conference was the potential use of offshore wind energy to power the offshore aquaculture industry.

The event was also an excellent space to share thoughts, exchange opinions and make new connections. I consider that a researcher's work is related to the ability to imagine new and numerous ways of applying knowledge. Hence, this type of event and space has great value for both the researcher who disseminates his or her results and experiences, and for the student who is looking for a professional and academic life project related to marine energies. Additionally, the experience of being able to participate in the congress to disseminate the results of one's own work and research is also very satisfying. The latter is a memorable academic challenge for those of us who have this experience for the first time, as it provides not only visibility, but also new opportunities for work and collaboration both locally and internationally.

During the event, I experienced an academic community open to collaborating and committed to promoting the future changes necessary in the energy transition, and to the education of new generations to motivate future researchers and promote greater social awareness. Personally, this participation provided me with new perspectives and tools to enrich my current academic work, as well as ideas to continue my academic and professional training.

I thank the Corporation Centre of Excellence in Marine Sciences - CEMarin, for the financial support that made my attendance at this event. Finally, I want to highlight the importance of continuing to promote these academic spaces and promote technological developments and research around the use of marine energy, as well as its key role as a source of energy to reduce interdependence in terms of energy access and promote locally-oriented alternatives towards the democratization of energy.

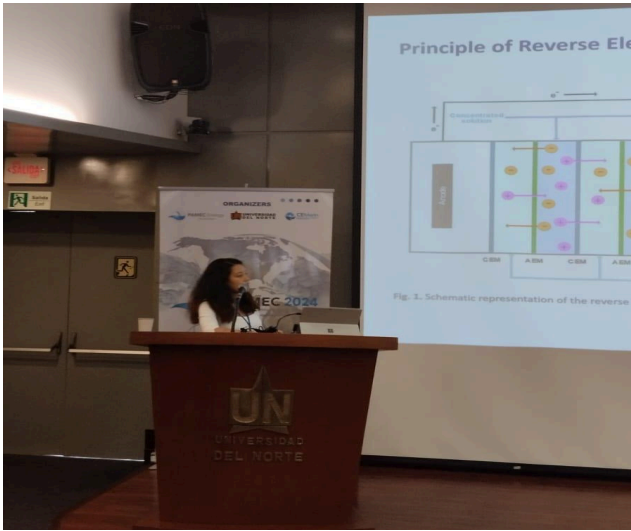


Fig 7. María Susana Pérez Grisales, partial CEMarin scholarship recipient and speaker at the PAMEC 2024 conference. (Photo: María Susana Pérez Grisales).

Mateo Arias González

*Master's student in Chemical Engineering
Universidad Nacional de Colombia*

Attending the PAMEC 2024 conference was an excellent opportunity for me as a researcher in training and as a member of a marine energy research project.

Despite being involved in this sector, the specific focus of my thesis and the project on saline gradient energy means that my knowledge prior to this conference about other forms of utilization of the energy available in the sea was very superficial. For this reason, a first aspect to highlight is the information received about other forms of energy available in the sea and their areas of work. From a more technical approach, I was able to learn about the technologies that are being developed to take advantage of waves, tides, offshore winds and thermal gradients, their operating principles, the different TRL or levels of technological development, and the main challenges they face in their implementation.

The talks with a more oceanographic focus gave me an overview of the availability of different energy resources in several countries of the Pan American community, the form and importance of the acquisition, processing and dissemination of environmental data, and the modelling based on these to evaluate the viability of marine energy projects. The last element to highlight is that of environmental impacts. In these talks I was able to learn more about the dynamics of marine ecosystems, the flows of nutrients and energy, and the interaction of the species present with the different proposed devices.

The talks by members of different sectors of national and international academia, as well as members of the national energy industry represented by ECOPETROL, made me aware of

the great potential that the country, and specifically the Barranquilla area, have in resources such as thermal gradient, offshore wind gradient and saline gradient associated with the mouth of the Magdalena River. Thanks to this I understood and share the vision of Professor Andrés Fernando Osorio Arias that the establishment of the EGS-RED pilot in Bocas de Ceniza is consolidated as an important first step in the eventual creation of a centre for marine energy in this city, from which human capital can be centralized in the sector and future pilot facilities can be promoted for testing and scaling this and other technologies associated with the seawater economy.

The networking spaces and workshops within the framework of the conference allowed me to make enriching contacts on a personal and academic level. I learned about local startups like NEOWave and its manager's vision of putting the knowledge acquired within academia into practice and into the market. I had contact with people like Diego Acevedo and Andrea Copping, who have a very broad and therefore motivating vision of the use of marine resources and their integration with other sectors (for example, using air conditioning for hydroponic crops or using seabed nutrients for the aquaculture industry).

I also had the opportunity to meet the colleagues and professors from the saline gradient project, and to learn first-hand about their academic developments, as well as to share part of my own research through the poster I presented. I was able to learn about the funding models for renewable energy research in countries like the United States, and make valuable contacts in the NREL and PNNL laboratories that can help me continue my academic career in the future.

Likewise, I had a very enriching talk with Efraín Rodríguez, representative of ECOPETROL, and I better understood their vision as a company and as a research institute regarding the energy transition in Colombia and the integration of marine energies into this effort. I could even put on the table some of the barriers that I personally perceive to exist due to the relationship (or lack thereof) of the ICP with universities and/or entrepreneurs who are interested in working on this issues that is so important for both the global context and the national economy.

In this sense, I also highlight the importance of the pilot plant, and the data and analysis that we can obtain on site as a letter of introduction to public and private companies for eventual collaborations with potential economic and social benefits for national technology and for the communities within the scope of these energy projects.

Finally, I would like to highlight the opportunity that attending the conference gave me to meet the people behind the sector, and to give thanks for the opportunity to visit, for the first time since working on this project, the immense and imposing Magdalena River, our resource of interest.



Fig 9. Visiting the Magdalena River during the PAMEC 2024 conference. (Photo: Mateo Arias González)

I take away new visions about the marine energy sector, good contacts for future projects, and the motivation to work to overcome the challenges we have this year with the EGS pilot. I would like to finish by thanking CEMarin for the support that made our participation in the PAMEC 2024 possible.

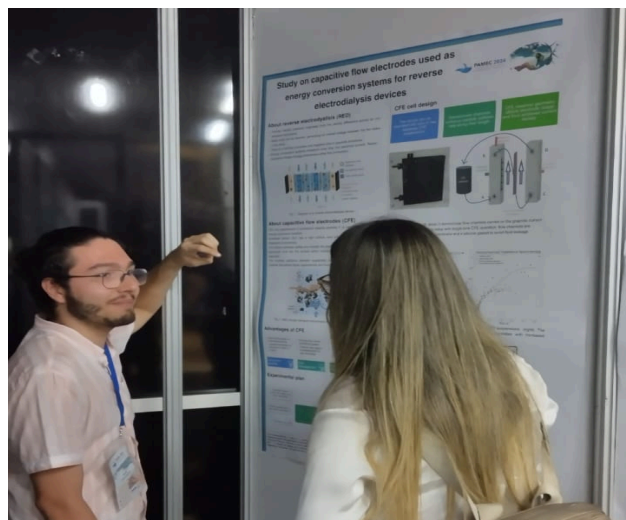


Fig 10. Mateo Arias González, partial CEMarin scholarship recipient and speaker at the PAMEC 2024 conference. (Photo: Mateo Arias González)

Miler Iván Maya

Undergraduate student in Civil Engineering
Universidad del Valle

The third Pan American Marine Energy Conference (PAMEC 2024) provided a platform for discussion and the exchange of knowledge on the advances and challenges in the field of marine energy. The country's geographical and climatic characteristics, and its favourable regulatory framework make it an ideal setting to development marine energy projects, positioning Colombia as a country with high potential in this field.

As a scholarship recipient, my participation as both an attendee and a speaker allowed me to gain valuable understanding of the latest technologies, research and policies in this crucial sector. Among the lessons learned, I highlight the following:

- Socioeconomics of marine energy:

The conference emphasized the importance of considering the socioeconomic impacts of marine energy projects, discussing strategies to ensure the equitable participation of local communities in economic benefits, and the need to develop a skilled workforce for the marine energy industry.

- Environmental effects:

The need to minimize the environmental impact of marine energy was highlighted, presenting innovative technologies and practices for the protection of the marine ecosystem.

- Resource characterization:

The conference addressed the importance of understanding the marine resources available for the development of marine energy projects, highlighting the need for international cooperation for the research and development of renewable energies.

- Marine wind energy:

The latest advances in offshore wind technology were explored, including more efficient turbines with greater capacity. The advantages and challenges of large-scale offshore wind energy

were discussed.

- Currents, tides and waves:

The conference explored the potential of ocean currents, tides and waves as sources of renewable energy. Innovative technologies were presented for the conversion of energy from waves, tides and currents.

- Salinity and temperature gradients:

The potential of osmotic energy and ocean thermal energy as alternative energy sources was discussed. Pilot projects and feasibility studies were presented for the generation of energy from salinity and temperature gradients.



Fig 11. Presentations at the PAMEC 2024 conference. (Photo: Miler Ivan Maya).

My participation in PAMEC 2024 allowed me to expand my knowledge about marine energy and its applications. Interaction with renowned experts and exposure to cutting-edge research gave me a broader perspective of the industry. The opportunity to present my own work at the conference allowed me to strengthen my communication and presentation skills.

PAMEC 2024 has been an enriching experience that has contributed significantly to my professional and personal development. The lessons learned and contacts I made have left me motivated to continue my learning and research

in the field of marine energy. I am committed to contributing to the development of this vital sector for the transition towards a sustainable energy future.



Fig 12. Miler Ivan Maya, partial CEMarin scholarship

Valery Franco Osorio

Undergraduate student in Health and Environmental Engineering
Universidad del Valle

At the third Pan American Marine Conference (PAMEC 2024) different topics related to renewable energies were addressed, specifically marine energies, which help participants understand the advances being projected worldwide and the challenges that are still being researched in different technologies. Personally, the people involved in the conference, not just the speakers, were very helpful due to the language barrier and the organization of the event. On the other hand, the event helped me develop a deeper understanding of the technologies, projects and developments that are advancing in research.

Regarding the topics covered in the auditorium, these included economic and environmental aspects, among others, that will be explained below.

Socioeconomics in Marine Energy stood out for its approach to achieving the implementation of projects of this nature. In addition, the importance of the interaction between economic development, environmental sustainability and the participation of the communities involved was explained, and emerged as a key element for long-term success.

The need to implement alternatives and practices that reduce the environmental impacts of all marine technologies was highlighted, as well as the importance of continuing research from this environmental focus for all types of energy.

The characterization of available marine resources is essential so that optimal designs of marine energy facilities can be produced. Additionally, the conference mentioned the need to improve characterization techniques and thereby optimize the performance and location of future projects.



Fig 13. Valery Franco Osorio, partial CEMarin scholarship recipient and speaker at the PAMEC 2024 conference. (Photo: Valery Franco Osorio).

Regarding Offshore Wind Energy, the latest technological advances were presented. This energy appears to be one of the most promising due to its economic viability and efficiency in the field.

For the effective integration of marine energies into the grid, we seek to develop strategies to implement it in existing electrical networks. The discussions highlighted the importance of smart strategies and storage systems, to ensure a smooth transition and constant supply to the network.

Issues related to currents, tides and waves were identified as fundamental for the efficient design and operation of marine energy technologies.

The application of salinity and temperature gradients were presented as alternative energy sources, highlighting the potential of osmotic energy and ocean thermal energy.

Applications for the integration of technologies that produce (green) hydrogen is a topic of ongoing research. The potential of hydrogen as a key energy vector for a sustainable future was highlighted.



Fig 14. Presentations at the PAMEC 2024 conference. (Photo: Valery Franco Osorio).

Participating in PAMEC 2024 has been a transformative experience on both a personal and professional level that has left a mark on my process. During the event, I had the opportunity to immerse myself in the world of marine energy and explore its various applications. Direct interaction with experts in the field gave me a more complete view of the sector. Additionally, the opportunity to present my own work at the conference helped me hone my communication and presentation skills, while making connections with professionals from

different areas allowed me to build valuable relationships and explore potential future collaborations.

In conclusion, the lessons learned and contacts made at PAMEC 2024 inspire me to continue dedicating myself to study and research in the field of marine energy. I am committed to actively contributing to the advancement of this vital sector in the transition towards a more sustainable energy future from an environmental perspective.

I consider it essential to promote the research and development of marine energy technologies with a low environmental impact, as well as to implement policies that encourage investment in sustainable projects in this area. In addition, strengthening international cooperation for the exchange of knowledge and resources in the field of marine energy, and developing training programs for the formation of qualified professionals are key steps to drive growth and innovation in this industry.

I would like to express my sincere gratitude to the PAMEC 2024 organizers for giving me the opportunity to participate in this conference. Likewise, I am deeply grateful to the CEMarin Corporation which granted me the scholarship to attend this event, which has been an important event in my academic and professional development.