CTCN
CLIMATE TECHNOLOGY CENTRE & NETWORK

CTCN Technical Assistance
Request Submission Form

Please fill in the form in the grey spaces, by following the instructions in italic.

Requesting country:	***Brazil***

Request title:	***Technical assistance for the animation of the Brazilian hydrogen energy research and development network***

Contact information:

{Please fill in the table below with the requested information. The request proponent is the organization that the request originates from, if different from the National Designated Entity (NDE).}

	National Designated Entity	**Request Applicant**
Contact person:	***Márcio Rojas da Cruz***	
Position:	**Coordinator of Global Climate Change**	
Organization:	***Ministry of Science, Technology, Innovation and Communications - MCTIC***	
Phone:	***55 61 2033-7923***	
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Postal address:	*Esplanada dos Ministérios, Bloco E, sala 258 – Brasília, DF – Brasil* *CEP: 70.067-900*	

Technology Needs Assessment (TNA):

{Select one of the three boxes below:}

☐ *The requesting country has conducted a TNA in .... (please insert date of TNA completion)*

☒ *The requesting country is currently conducting a TNA*

☐ *The requesting country has never conducted a TNA*

{If the requesting country has completed a TNA, please indicate what climate technology priority this request directly relates to. Please indicate reference in TNA/TAP/Project Ideas.}

CTCN Request Incubator Programme:

{Please indicate if this request was developed with support from the Request Incubator Programme:}

☐ *Yes*

☒ *No*

Geographical focus:

{Select below the most relevant geographical level for this request:}

☐ *Community-based*
☐ *Sub-national*
☐ *National*
☒ *Multi-country*

{If the request is related to the sub-national or multi-country level, please indicate here the areas concerned (provinces, states, countries, regions, etc.)}

This is proposed to be a multi-country project to foster collaboration between the European Union region and Brazil. The European Hydrogen Association represents several European countries and will interact through CTCN with the Brazilian Hydrogen Association that represents Brazil.

Theme:

{Select below the most relevant theme(s) for this request:}

☐ *Adaptation to climate change*
☐ *Mitigation to climate change*
☒ *Combination of adaptation and mitigation to climate change*

Sectors:

energy, environment, climate change, infrastructure/urban development, transport, education, industry

Problem statement *(up to one page):*

{Please describe here the difficulties and specific gaps of the country in relation to climate change, for which the country is seeking support from the CTCN. Please only provide information directly relevant to this request, and that justifies the need for CTCN technical assistance.}

The scientific and industrial community involved in actions related to climate change, as well as in the development of technologies and applications in the field of hydrogen and fuel cells in Brazil has been very active during the past years and has experienced a steady increase. However, there is need for connecting these activities conveniently to foster their synergetic development in order to facilitate the sustainable deployment of applications such as distributed generation of electricity and electrical mobility. These two broad areas may have a very beneficial impact on climate change in Brazil if conveniently interconnected with new renewable energies, including hydrogen energy. Conventional renewable energies, such as solar, wind and hydraulic, as well as new renewable energies, such as ocean, geothermic, biomass-based and hydrogen energies are complementary for combining the intermittent energy production of the formers with the reversible production-storage feature of the latter. That is, producing hydrogen with renewable energies and storing it to be used in fuel cells for generating electric energy during renewable generation intermittence is highly advantageous. Brazil is particularly oriented towards renewable energies and possesses an important availability of water and biomasses, which are the main sources for hydrogen production.
The European Union countries have accumulated in the course of the last decades the world most important and varied knowledge and experiences on developing hydrogen energy

technologies, devices, standards and utilization methodologies. This involves a wide range of stationary and mobile applications that includes the distributed generation of electricity and heat, the use in different transportation modalities and powering devices. The effort made in Europe in this area is meant to contribute with stringent European prospects for the near future to increase the amount of renewable energy generation and utilization as a way to mitigate environmental impacts in urban areas and to control climate change. The European Hydrogen Association is depositary of the European knowledge and experiences in this area and as a CTCN member is able to provide to the Brazilian Hydrogen Association and to Brazilian institutions technical assistance to develop a sustainable and target oriented network, in order to support the dissemination of knowhow, information and experiences, stimulate cooperation among projects, organizations and experts and to identify funding for joint projects and network animation.

Past and ongoing efforts *(up to half a page):*

{Please describe here past and on-going processes, projects and initiatives implemented in the country to tackle the difficulties and gaps explained above. Explain why CTCN technical assistance is needed to complement these efforts, and how the assistance can link or build on this previous work.}

Brazil has been very much active in world discussions concerning both climate change and renewable energies, including hydrogen energy. Examples include the Brazilian participation in the IPCC (Intergovernmental Panel on Climate Change) and in the IPHE (International Partnership for Hydrogen and Fuel Cells in the Economy). This has occurred in consequence of a systematic effort made during the last decade to develop research, development and creation of public policies in these areas. For example, Brazil has launched a Road Map for Hydrogen Energy in 2005 and hydrogen energy related networks exist since 2004. Particularly, the solid oxide fuel cells network, Rede PaCOS, has held several congresses in the area and promoted the interaction of researchers for collaborative work development. However, this has not yet converged into effective policy actions to favor the scientific and industrial communities in the country. The European experience in these areas may be transferred in an adaptive way by means of the CTCN technical assistance. The results foreseen may include fostering the existent scientific and industrial networks, the creation of new ones, the development of joint projects, with primary input from the European Hydrogen Association to support and to structure a Brazilian Hydrogen Association.

Assistance requested *(up to one page):*

{Please describe here the scope and nature of the technical assistance requested from the CTCN and how this could help address the problem stated above and add value vis-à-vis the past and on-going efforts. Please note that the CTCN facilitates technical assistance and is not a project financing mechanism.}

The deployment of new technologies is a process very much dependent on technical assistance to conveniently implement activities and procedures to make real applications viable. Several engineering applications concerning hydrogen energy options have been regulated by codes and standards in Europe, allowing the controlled field experimentations conduction and evaluation. These include the production, storage under pressurized or liquid forms, distribution and local delivery of high-purity hydrogen, its successful use in fuel cells for low-power distributed generation of electric and heat energies, its use in the transportation sector in automobiles, buses, trucks, motorbikes, airplanes and boats, its utilization in small-power mobile devices, among others. The intensity of these field experiences has increased considerably in the last decade as Europe works towards decreasing dependency on fossil

fuels, increasing the level of renewables utilization and controlling emissions to mitigate environmental impacts. Brazil already has a very renewable energy matrix. In fact, twice as much as the European target to be reached in two decades. This accounts positively in the Brazilian case, because a culture of non-fossil fuel utilization has already been well established. In this scenario a two away profit gaining is envisaged because Europe will absorb the Brazilian renewable energy drive and Brazil will certainly leap-frog important time and money consuming activities under the advise of more experienced experts on hydrogen energy activities. The European Hydrogen Association that is well integrated in most of the European accomplishments in the area, as a CTCN member, will be well placed to share best practices with Brazilian institutions and companies. Among these, there are significant examples of Brazilian achievements that may be potentialized by the technical assistance offered. These include the project on hydrogen production by water electrolysis utilizing excess generation potential of the huge Itaipu hydroelectric power plant, the very successful effort made on developing and demonstrating hydrogen fuel cell buses for urban use, the ingenious development of solid oxide fuel cells that are able to operate with the direct utilization of anhydrous carbonaceous fuels such as ethanol and methane-rich fuels, the expertise for fabrication and testing of polymer electrolyte and solid oxide fuel cells, the innovative development concerning ethanol reforming for hydrogen production and a host of other activities distributed in more than one hundred institutions throughout the country, involving universities, research centers and private companies. The EU Framework Programme 7 (FP7 for 2007 - 2013) interim evaluation (http://ec.europa.eu/research/evaluations/index_en.cfm?pg=fp7) stated that there needs to be an 'intensification of international cooperation' activities focused on 'engaging with partners outside of Europe on equal terms and in programs and activities of high mutual interest'. The same report recommended the 'coherent strategic development' of the EU's policy for international cooperation in research and innovation. The European Hydrogen Association, as a network member of CTCN, is committed to leverage its experience in national and regional network building and its involvement in FP7 and the new EU Horizon programs to support the CTCN Network in developing networks to facilitate the introduction of hydrogen energy applications to adapt to and mitigate climate change, as well as to reduce local emissions in emerging economies. The European Hydrogen Association is willing to help on the animation of the Brazilian Hydrogen Association, transferring its unique experience of building a network of key stakeholders active in the deployment of clean technologies for energy production and storage, considering stationary, mobile and transport applications. In addition to that, these activities will serve as a model for the Brazilian Hydrogen Association to become a CTCN member and also to transfer technical assistance to other institutions in Latin America.

Expected benefits *(up to half a page):*

{Please outline here the medium and long-term impacts that will result from the CTCN technical assistance, including how the assistance will contribute to mitigate and/or adapt to climate change.}

The technical assistance to be given through CTCN will create actions directly related to the energy sector in Brazil because it is involved with the introduction and fostering of the utilization of hydrogen energy. Hydrogen energy activities are mainly associated with the distributed generation of electric energy with emphasis on renewable energies and biomass utilization and the electrification of the transport system. These sectors are able to contribute with mitigation of climate change both in urban metropolitan areas that concentrate an important portion of the Brazilian population and also in rural areas, where Brazil is very active on agribusiness and where sustainable farming methods will represent a great environmental contribution. This action will be facilitated because of the existence of a varied legal framework already established in Brazil that is expressed by Law 12.187 from Dec. 29th, 2009 that establishes the

National Politics on Climate Change, as well as several laws of the electrical energy sector to foster the utilization of renewable energies and to regulate tariffs, distribution, concessions, transmissions, such as Laws: 10.438 from April 26th, 2002; 10.762 from Nov. 11th, 2003; 12.212 from Jan. 20th, 2010; 12.782 from Jan. 11th, 2013 and 13.360 from Jan. 17th, 2016. The work to be developed through CTCN and the European Hydrogen Association will find a fertile environment on renewable energies in Brazil, being able to positively impact actions related to climate change in both medium and long terms.

Post-technical assistance plans *(up to half a page):*

{Please describe here how the results of the CTCN technical assistance will be concretely used by the applicant and national stakeholders, to pursue their efforts of resolving the problems stated above after the completion of the CTCN intervention (list specific follow-up actions that will be undertaken).}

One important result that can be foreseen after the completion of the herein proposed CTCN intervention is the possibility for the Brazilian Hydrogen Association itself to become a CTCN member and to act in the Latin American region in a similar way that the European Hydrogen Association is now planning to do. This will be facilitated by the fact that the 22nd World Hydrogen Energy Conference will be held in Rio de Janeiro during June 17-21, 2018, being organized by the Brazilian stakeholder that is involved in the implementation of the present CTCN project, the Hydrogen Laboratory at Coppe-Federal University of Rio de Janeiro.

Other results will certainly include 1) the hydrogen energy activities already being developed in Brazil on the area of transportation, with successful implementations already made on hydrogen fuel cell buses that will be emphasized; 2) the dissemination of knowledge on the hydrogen energy area that will foster the interest for the new collaborative projects, new events and financing possibilities for new scientific and technological activities; 3) the increment of fuel cell developments, which is the main device for energy conversion to be used; 4) the induction to adopt codes and standards to facilitate and make engineering implementations convenient and safe; 5) the combination with the Brazilian potential already developed on biomasses and renewable energies to establish cleaner engineering procedures for hydrogen energy associated with low-environmental impacts; and 5) the increase of the public awareness on the subject to facilitate acceptance of the new technologies.

Key stakeholders:

{Please list in the table below the main stakeholders who will be involved in the implementation of the requested CTCN technical assistance, and what their role will be in supporting the assistance (for example, government agencies and ministries, academic institutions and universities, private sector, community organizations, civil society, etc.). Please indicate what organization(s) will be the main/lead counterpart(s) of CTCN experts at national level, in addition to the NDE.}

Stakeholder	Role to support the implementation of the assistance
Hydrogen Laboratory – COPPE – Federal University of Rio de Janeiro	***Coordinate the creation of the Brazilian Hydrogen Association and the animation of hydrogen energy networks***

European Hydrogen Association	***Support to create the necessary basis and structure for a sustainable implementation of activities on hydrogen energy and climate change.***

Alignment with national priorities *(up to half a page):*

{Please demonstrate here that the technical assistance requested is consistent with documented national priorities (examples of relevant national priorities include: national development plans, poverty reduction plans, technology needs assessments (TNAs), LEDS, NAMAs, TAPs, NAPs, sectorial strategies and plans, etc.). For each document mentioned, please indicate where the priorities specifically relevant to this request can be found (chapter, page number, etc.).}

The Brazilian NAMAs – National Appropriate Mitigation Actions – from the United Nations Framework Convention on Climate Change – UNFCCC – are well specified in the following:

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http://unfccc.int/files/meetings/cop_15/copenhagen_accord/application/pdf/brazilcphaccord_app2.pdf

- http://www.mmechanisms.org/document/NAMA/NAMA_LCA15_brazil_EN.pdf
- https://unfccc.int/files/focus/mitigation/application/pdf/brazil_namas_and_mrv.pdf

and give particular emphasis on alternative energy sources; energy efficiency; biofuels and farming, which are several of the activities very much impacted by the adoption of hydrogen energy technologies. Such Brazilian priorities are also supported by the legal framework already established in Brazil that is expressed by Law 12.187 from Dec. 29th, 2009 that establishes the National Politics on Climate Change, as well as several laws of the electrical energy sector to foster the utilization of renewable energies and to regulate tariffs, distribution, concessions, transmissions, such as Laws: 10.438 from April 26th, 2002; 10.762 from Nov. 11th, 2003; 12.212 from Jan. 20th, 2010; 12.782 from Jan. 11th, 2013 and 13.360 from Jan. 17th, 2016.

This demonstrates that the technical assistance within the present CTCN project is very well consistent with the documented Brazilian priorities.

Development of the request *(up to half a page):*

{Please explain here how the request was developed at the national level and the process used by the NDE to approve the request before submitting it (who initiated the process, who were the stakeholders involved and what were their roles, and describe any consultations or other meetings that took place to develop and select this request, etc.)}

The conception and evaluation procedures for the present proposition of technical assistance through the CTCN were very carefully performed. Preliminary discussions for the conception of the content to be proposed were made between European and Brazilian professionals interested in the theme, involving the European Hydrogen Association, the Hydrogen Laboratory at Coppe, Federal University of Rio de Janeiro, and members of the Organizing Committee of the 22nd World Hydrogen Energy Conference to be held for the first time in Brazil in 2018. Initial versions of the present formulary were created and submitted to the National Designated Entity, NDE, at the Ministry of Science, Technology, Innovation and

Communications – MCTIC. The text was analyzed by NDE and by the Ministries of Mines and Energy; Transport; and Development, Industry and Trade at the request of the NDE. All the resulting considerations were taken into account in the text. The observations were taken into account and it was further rewritten. Finally, meetings were done remotely and in person at the NDE, to clarify CTCN actions and interests, after what the final text has been elaborated.

Expected timeframe:

{Please propose here a duration period for the assistance requested.}

12 months

Background documents:

{Please list here relevant documents that will help the CTCN understand the context of the request and national priorities. For each document, provide weblinks if available, to attach to the submission form while submitting the request. Please note that all documents listed/provided should be mentioned in this request in the relevant question(s), and that their linkages with the request should be clearly indicated.}

The main documents that give support and involve themes related to the present CTCN project proposal are:

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http://unfccc.int/files/meetings/cop_15/copenhagen_accord/application/pdf/brazilcphaccord_app2.pdf
- http://www.mmechanisms.org/document/NAMA/NAMA_LCA15_brazil_EN.pdf
- https://unfccc.int/files/focus/mitigation/application/pdf/brazil_namas_and_mrv.pdf
- Brazilian Law 10.438 from April 26th, 2002;
- Brazilian Law 10.762 from Nov. 11th, 2003;
- Brazilian Law 12.187 from Dec. 29th, 2009;
- Brazilian Law 12.212 from Jan. 20th, 2010;
- Brazilian Law 12.782 from Jan. 10th, 2013;
- Brazilian Law 13.360 from Nov. 17th, 2016.

The Brazilian laws cited above are linked to texts in Portuguese

Monitoring and impact of the assistance:

{Read carefully and tick the boxes below.}

☒ By signing this request, I affirm that processes are in place in the country to monitor and evaluate the assistance provided by the CTCN. I understand that these processes will be explicitly identified in the Response Plan in collaboration with the CTC, and that they will be used in the country to monitor the implementation of the CTCN assistance.

☒ I understand that, after the completion of the requested assistance, I shall support CTCN efforts to measure the success and effects of the support provided, including its short, medium and long-term impacts in the country.

Signature:

NDE name: Márcio Rojas da Cruz

Date: 05 - 12 - 2016

Signature:

THE COMPLETED FORM SHALL BE SENT TO THE CTCN@UNEP.ORG

Need help? The CTCN team is available to answer questions and guide you through the process of submitting a request. The CTCN team welcomes suggestions to improve this form.

>>> Contact the CTCN team at ctcn@unep.org