

# STRATEGIC PLAN

**H<sub>2</sub>V RN**  
HYDROGEN GREEN



**RN**  
RIO NEGRO



# CONTENTS

MESSAGE FROM THE GOVERNOR	5
EXECUTIVE OVERVIEW	6
1. INTRODUCTION	9
1.1 General	9
1.2 Climate Change Scenario	9
1.3 Regulations	10
1.4 Scientific-technological nucleus in Río Negro with worldwide recognition	13
1.5 Strategic Vision	14
2. PRE-FEASIBILITY STUDY	18
2.1 Objectives	19
2.2 Scope	20
2.2.1. Study area	20
2.2.2. Task plan	20
2.3 Renewable Resources and Power Grid	22
3. CONCEPTUAL ENGINEERING STUDY FOR A GREEN HYDROGEN PRODUCTION FACILITY	29
4. GREEN HYDROGEN TABLE OF RIONEGRINA	32
4.1 Objectives and Goals	32
4.2 Functions	33
4.3 Structure	35
4.4 Organizations	36
4.5 Institutions	36
4.6 State-Owned Enterprises	36
5. RIONEGRINO H2V PARTICIPATIVE COUNCIL	38
5.1 Technical participatory council	38
5.2 Citizen participatory council	39
6. MAIN OPPORTUNITIES FOR THE PROVINCE	42
7. FRAMEWORK AGREEMENT FOR GREEN INDUSTRY PROJECTS IN RIO NEGRO	45
8. STRATEGIC COMMUNICATION	48
8.1 Management axes	49
8.2 Institutional information	49
8.3 Cycle of exhibitors and permanent forum "Hydrogen Thursdays"	49
8.3.1. Book "Hydrogen Thursday"	50
8.3.2. Library of Encounters	50
8.3.3. Nature and Technology Magazine	50
8.4. Thematic news	50
8.5. Social Networking	51
8.6. Outreach videos	51
8.7. Frequently Asked Questions	51
8.8. Educational strategy	52
8.9. Green Hydrogen Experience	53

9. TRAINING	53
9.1. Río Negro Trabajo + Futuro Program	53
10. FINAL CONCLUSIONS	54
10.1. Interest of the Province of Río Negro in the production of Green hydrogen	54
10.2. Strengths of Rio Negro	54
10.2.1. Industrial Parks	55
10.3. Main objective in the short term	56
10.4. Markets of interest to the Province	56
10.5. Initiatives	57
10.6. Challenges	57
10.7. Conjuncture	58



## GREEN HYDROGEN AS A STATE POLICY

In Río Negro we believe in the opportunity to build a better and sustainable future for each and every one of its inhabitants, for those who visit it and for all those who find in our territory the right place for the development of their multiple activities and investments.

To achieve this, we decided to address public policies that transform the reality in which we live. For this reason, the Province has been implementing an advanced plan that reinforces mitigation tasks against the effects of climate change, through a cross-cutting action of all provincial government agencies, in line with the Nation and the Region.

Thus, Río Negro is positioned as the right province for the development of the Hydrogen economy as a State policy and as a possible generator of the so-called Green Hydrogen, a clean fuel that does not generate impact on the environment and is in high demand worldwide.

Different specialists, local scientists, businessmen and officials from different parts of the world analyzed the potential of our province as the right place to develop a new inclusive and sustainable energy matrix in Argentina.

Río Negro has the necessary qualities of the energy produced by the wind, the sun and the sufficient availability of water to project itself as a clean energy generator.

Green Hydrogen is said to be the fuel of the future and for us, the future is today. Therefore, it is time to move forward on the structural change of the energy matrix in a more dynamic and stable direction, which is at the same time inclusive, federal, sovereign and sustainable.

**Arabela Carreras**  
**Governor of Río Negro**

# EXECUTIVE OVERVIEW

Hydrogen is the most abundant and lightest element on earth. It has the highest energy content of common fuels by weight (almost three times that of naphtha). Hydrogen is not found free in nature and must be "extracted" from various sources. One of them is based on renewable energies that drive the electrolysis of water. This is the so-called "green hydrogen". As a flexible energy carrier, hydrogen offers a clean, integrated, multisectoral alternative energy systems approach that will make a decisive contribution to solving the environmental problem and securing the energy future.

The world is eager to find a new energy carrier to replace oil and gas, and hydrogen, as the most energy-dense element, is the natural driver for this. Hydrogen technologies are reaching their stage of industrial maturity, based on decades of basic and applied scientific development. There is consistent evidence and signals from the world market regarding the current hydrogen situation, as well as its concrete short-, medium- and long-term future.

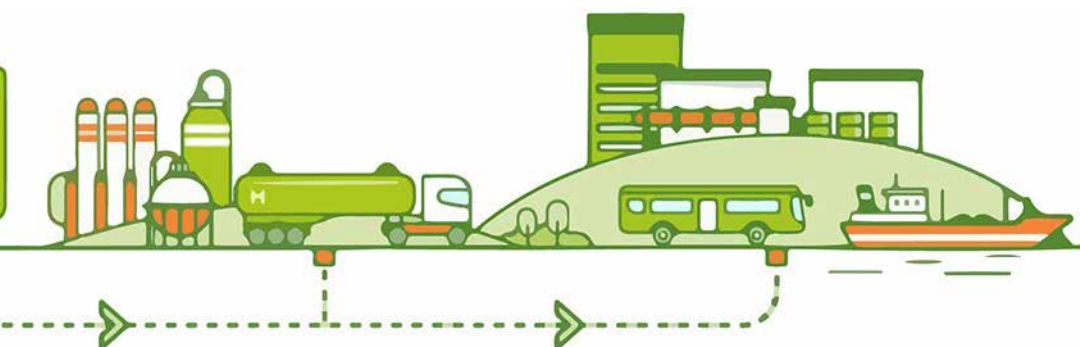
There are three types of production processes for obtaining hydrogen: gray (fossil), blue (climate-neutral hydrogen through carbon capture and storage - CCS) and green hydrogen (sustainable production based on renewable energies). Each of these options has a different time scale, volume, and cost, while gray hydrogen helps kick-start the market, the "net development direction" worldwide is toward green hydrogen.



The Argentine Republic and the province of Río Negro, have unique natural conditions to become a key player in the green hydrogen economy at local, national, and international level. On the other hand, it has a vast scientific knowledge and institutions capable of developing this type of technology. Thus, to evaluate the current national and international hydrogen markets, the possible opportunities for industrial and scientific cooperation and the next steps necessary for the province of Río Negro to transform this opportunity into reality, several concrete actions have been initiated because of a firm political decision on the part of the Governor's Office.

Therefore, the provincial government has assumed as a State Policy to promote scientific, academic, and productive development through actions where these are complemented in a virtuous way with environmental sustainability, promoting the generation of new energy vectors based on renewable energy sources and their application through scientific and technical development such as green hydrogen throughout its production chain.

Positioning the Province in the national and international scenario on this matter is an objective mission to become a regional scientific reference and a place for national and foreign investments



A close-up photograph of a large green leaf with prominent, parallel veins. The leaf is oriented vertically, with the central vein running down the middle. The background is a soft, out-of-focus green, suggesting a natural setting. The lighting is bright, highlighting the texture and color of the leaf.

# 1 INTRODUCTION

# 1 INTRODUCTION

## 1.1\_GENERAL

In the country, the use of hydrogen is related to the chemical industry (fertilizer production, hydrocarbon refineries, oil industry) and to date has no energy use on a commercial scale. The hydrogen used is of the gray type (that which is produced from natural gas, and from which CO<sub>2</sub> is not captured). The price of natural gas accounts for part of the cost of Gray Hydrogen, which is the benchmark comparable to Green Hydrogen (that produced from renewable energy).

Argentina has a local gray hydrogen market (hydrogen produced by methane steam reforming), where 327,695 MM tons/year are consumed mainly in the petrochemical (85%), chemical (8%) and refining (7%) industries. Therefore, the transition from gray hydrogen to a green hydrogen economy could also be possible through the industrial sector, once green hydrogen reaches a larger scale of production and thus an adequate level of competitiveness.

## 1.2\_CLIMATE CHANGE SCENARIO

This problem is one of the main threats facing the environment. Being of anthropogenic origin, many countries have shown their interest in the issue and have entered into various international agreements, committing themselves to address it, which will be mentioned in the following section.

## 1.3\_REGULATIONS INTERNATIONAL

- Paris Agreement
- Kyoto Protocol
- United Nations Framework Convention on Climate Change
- Vienna Convention for the Protection of the Ozone Layer
- Montreal Protocol on Substances that Deplete the Ozone Layer and its Amendments
- Ministerial Declaration of the 2nd World Climate Conference
- UN Climate Action Summit

### NACIONAL

- Reform of the National Constitution of 1994. Incorporation of Article 41, on the right to the environment. Since then, several Minimum Environmental Budget Laws have been enacted, framed by Law 25675 General Environmental Law.
- Law No. 27,621. Environmental Education Law.
- Law No. 27,592. Yolanda Law. It imposes mandatory training on climate change and environmental care for all members of the National State.
- Law No. 27,520. Minimum Budgets for Adaptation and Mitigation of Global Climate Change.
- Law No. 26,123. Hydrogen Promotion.
- Law No. 24,331 on Free Trade Zones.
- Reactivation of the Free Trade Zone in Sierra Grande. In December 2021, the President, Alberto Fernandez, and the Governor, Arabela Carreras, sign the agreement for its implementation.
- Framework Agreement on Green Industry Projects in the Province of Río Negro, signed between Fortescue Future Industries, the National Ministry of Productive Development, and the Province of Río Negro.

## PROVINCIAL

- Law No. 3,247. Environmental Education Law.
- Law No. 2,517. Environmental Charter of the Province of Río Negro.
- Law No. 4,474. Climate Change Observatory within the scope of the Provincial Water Department.
- Law No. 5,140. General Law on Climate Change.
- Law No. 3,796. Promoción del Hidrógeno Verde.
- Law No. 3,484. Private Initiative Regime.
- Decree No. 342/21 Green Hydrogen Table of Río Negro.
- Law No. 2,492. Priority for the constitution of a Free Trade Zone in Sierra
- Law C No. 2,887. Río Negro adheres to National Law No. 24.331 on Free Trade Zones.

## PROVINCIAL PUBLIC ENVIRONMENTAL POLICY

Highlighting Río Negro's commitment to care for the environment, and concerned about the effects of climate change, the province has prepared a matrix of carbon dioxide (CO<sub>2</sub>) emissions. This is one of the main anthropogenic greenhouse gases. The document shows that of the total CO<sub>2</sub> emitted by the province, 67.2% comes from the energy sector, 21% from agriculture, livestock, and land use; 11.2% from waste and 0.6% from industrial processes.

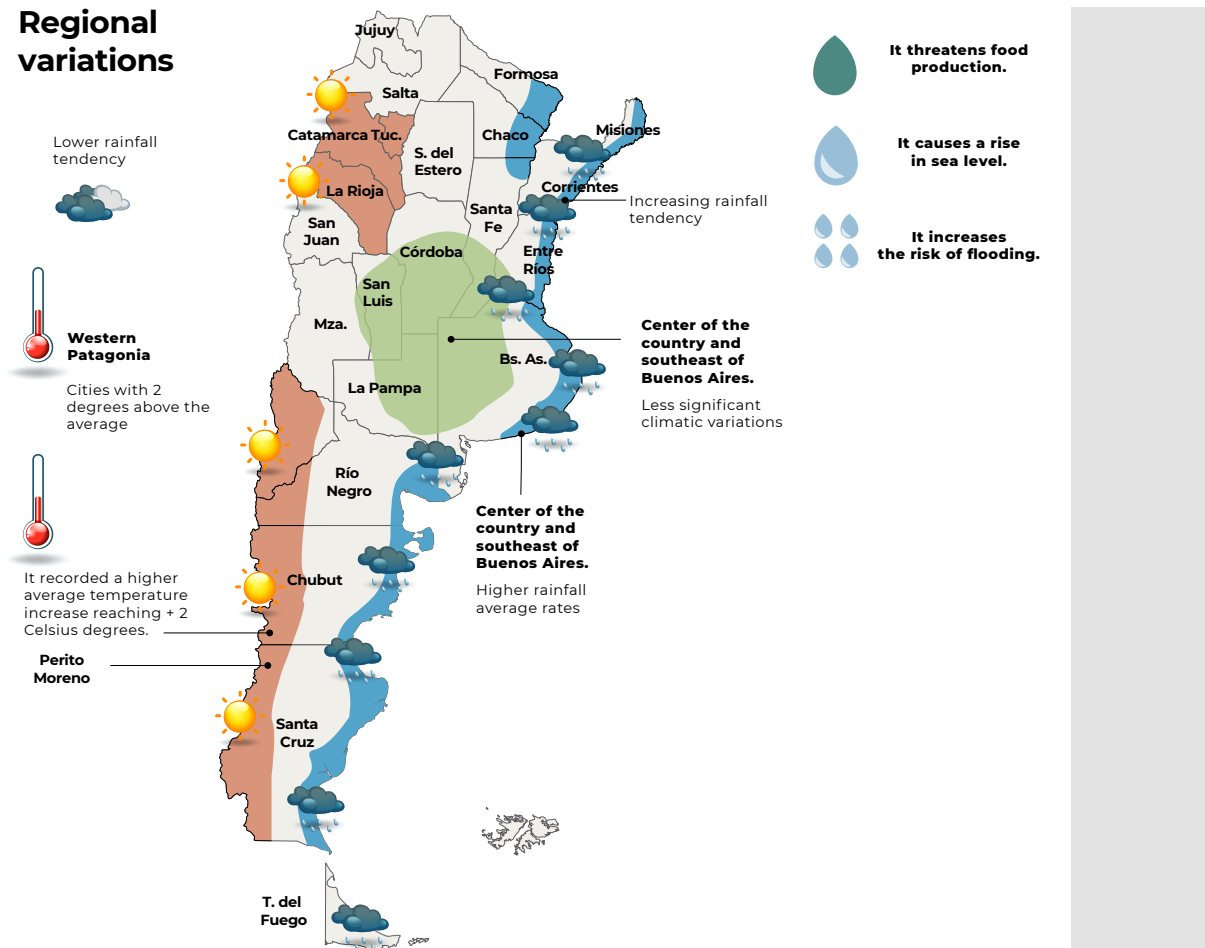
Based on these data, the provincial adaptation and mitigation strategy was planned and designed in coordination with the Nation and external consultants. This synergy generated the Provincial Response Plan, which invites all stakeholders to participate. The three major emitters were identified:

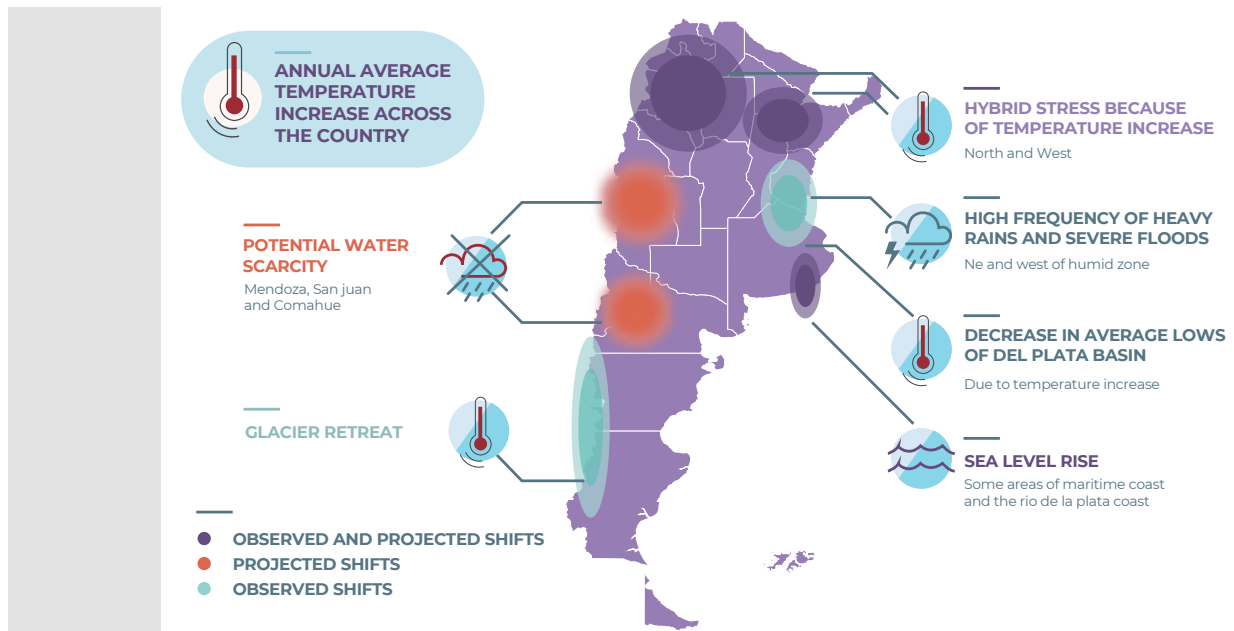
- **Energy Sector:** Energy efficiency program, training of local governments, replacement by clean energies, promoting pedestrianization and construction of bike paths, establishment of environmental insurance, adherence to Yolanda Law No. 27,592, which establishes mandatory training in environmental matters for all officials of the three branches of government.

• **AFOLU sector (agriculture, forestry, and other land uses):** Program to promote and develop holistic-regenerative-adaptive livestock farming in rainfed areas of the southern region, development of biodigesters in feed lots. Program to promote forestry activities in the Sub-Andean Sector, with energy use of by-products (biofuel, chipping, palletization).

- **Waste sector (Provincial Girsu Program).**
- **Provincial Plan for disaster risk reduction (Civil Defense)** identifying areas and events where the province has a higher vulnerability index.

### Regional variations

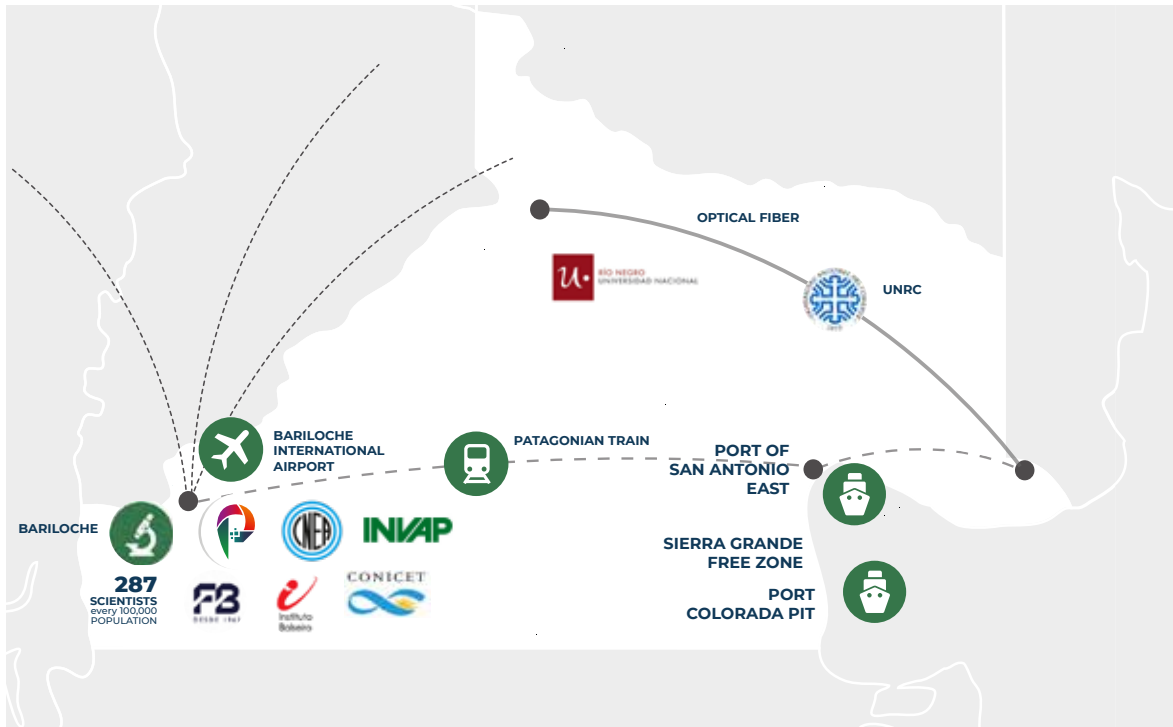




## 1.4\_SCIENTIFIC-TECHNOLOGICAL NUCLEUS IN RÍO NEGRO WITH WORLDWIDE RECOGNITION

In the Province of Rio Negro there is a scientific-technological nucleus of consolidated maturity, which capitalizes on basic knowledge from the academic environment as a starting point, with a wide scientific trajectory, to converge in applied research and development. This core is made up of a diversity of academic entities (e.g., the following are among them) National University of Rio Negro, National University of Comahue, National Technological University, Balseiro Institute), scientific research (CNEA, CONAE, CONICET, Bariloche Foundation)

and liaison, together with technology-based companies with high experience in the development, design, construction and commissioning of complex multidisciplinary systems such as INVAP SE, ALTEC SE together with the productive ecosystem that accompanies the developments and productions.



## 1.5. STRATEGIC VISION

### It is based on the following aspects:

- As a **chemical product**, complementing the supply of gray hydrogen in the productive sectors that generate demand.
- As an **energy vector**, based on its capacity to be produced, stored, transported, and reconverted into energy using highly efficient end-use processes, significantly superior to the use of fossil fuels in internal combustion engines.
- As a promoter of the path towards the **mitigation of greenhouse gas emissions**, facilitating the energy transition in full compliance with the national commitments assumed in the United Nations Framework Convention on Climate Change (UNFCCC).



## The strategic vision on Green Hydrogen seeks:

- To converge in the guidelines proposed within the **objectives of the United Nations Sustainable Development**, in its Economic, Social and Environmental dimensions.
- Of the 17 2030 Goals, 4 are directly linked to the production of green hydrogen:
  - **SDG 7. Affordable and non-polluting energy:** Decarbonization of the energy system is one of the main political objectives of the 21st century. Hydrogen becomes the energy source of the transition. It is inexhaustible (since it is the most abundant element in the universe) and provides renewable energy without CO2 emissions.
  - **SDG 8. Decent work and economic growth:** It is not only an environmental benefit that is promoted with green energies, but also an economic one: as a generator of employment and foreign exchange through exports.
  - **SDG 9. Industry, innovation, and infrastructure:** Scientific innovation is needed to jump-start the green hydrogen industry. Rio Negro has all the resources to do so. The concentration of science and technology organizations, especially in Bariloche, also promotes strategic alliances with the industrial sector.
  - **SDG 13. Climate Action:** Energy from green hydrogen is an enabler on the road to decarbonization. It is set to be the fuel of the energy transition.



In short, the aim is to generate a new hydrogen **production chain** in the Province of Rio Negro, encouraging the growth of the national industrial sector focused on the industrial technological core of the Province of Rio Negro, motivated by its interest in participating in the construction of generation plants, as well as participating in the value chain of Green Hydrogen at national level, and promoting the export of related technology.

A new **productive and financial development** with social awareness and inclusion.

Generate a **virtuous circle** between scientific academia and skilled labor in terms of training people in this new technology.

Establish transversal channels in **complementarity** with traditional industries.

In relation to the previous point, converge towards a greater presence of triple impact industries in the Province if we understand as such those companies that use the power of their business and markets to engage in social and environmental objectives.

Create foundational areas for specific insurance with an impact on different phases of the production chain, as well as the possibility of generating sovereign green bonds and cryptocurrencies.



# 2

## PRE-FEASIBILITY STUDY

# 2

## PRE-FEASIBILITY STUDY

The Province of Río Negro has commissioned **Fraunhofer Institute for Energy Economics and Energy System Technology (IEE)** to carry out a Pre-feasibility Study, called "**STUDY ON THE PRODUCTION OF GREEN HYDROGEN IN THE PROVINCE OF RIO NEGRO**", which determined that our territory is suitable for the generation of green hydrogen on a commercial scale.

The study has been completed and submitted to the Governor.

The study seeks to determine the technical-economic feasibility of adopting Green Hydrogen as an energy vector and as a chemical product, contemplating the province of Río Negro as a productive area, to cover the demand (estimated by the medium and long term prospective) at regional level, and to meet part of the national and international demand.

The study considers that Gray Hydrogen prices (which are explained by Natural Gas prices), propose a lower cost alternative to meet demand.

The study also contemplates, in view of the vast natural assets of the Province, strategic locations for the production that satisfies the domestic market, and for that destined to the foreign market, considering the transportation routes and, as the case may be, the ports.

Finally, the study is based on a strategic relationship between the Province and Fraunhofer to obtain financing and investment in projects for Green Hydrogen production plants for domestic consumption and subsequent export.

## 2.1. OBJECTIVES

The general objective of the contracted study, in line with its Purpose, is to determine the feasibility of adopting Green Hydrogen for its two main uses, within the framework of sustainability and in accordance with the long-term low-emission development strategies proposed by the National Government, which aim to achieve carbon neutral development by 2050, through the implementation of a National Adaptation and Mitigation Plan.

The general objective is complemented by the following specific objectives:

- i. Define and quantify the renewable energy sources plausible to be associated to the production of Green Hydrogen, focusing on the excellent wind resource available in the Province, especially in Cerro Policía, due to its capacity to complement the Chocón hydroelectric power plant and others in the region;
- ii. Define and quantify the available sites for various Green Hydrogen production plants, according to their scale and target market.
- iii. Determine and estimate the current demand for hydrogen.
  - Study the future demand for Green Hydrogen with a prospective that uses plausible scenarios in the region and in the country.
  - Evaluation of compliance with the objectives, goals and agreements assumed within the framework of sustainability.
  - Determine the technical-economic optimum on the various options to produce Green Hydrogen, to cover the expected internal demand and for an external market.

- Evaluate whether there is the possibility of carrying out, through the Province's executing arms, a complex, productive and strategic technological project, where even the initial technological risk can be assumed, with duly identified vertical action plans;
- Evaluate financing options for projects and infrastructure expansion necessary for the integration of the infrastructure.
- Evaluate the promotion instruments in force in Argentina;
- Evaluate the regulatory framework.

## 2.2. SCOPE

### 2.2.1. ESTUDY AREA

The area of study focuses on the field of Energy Economics, from a core and inclusive approach to environmental policies and sustainability.

The Secretariat of State of Energy, through the Secretariat of Electric Energy, and the Ministry of Government and Community, through the Secretariat of Investments, plus a coordination table created ad-hoc, will coordinate the study.

### 2.2.2. TASK PLAN

The study is conducted in two phases. The first phase corresponds to data acquisition; the second phase corresponds to analysis and conclusions:

#### **a. Variables analysed:**

- Geography of the province and the region;
- Renewable resources and associated capacity factors;
- Water sources, quality and use;

- Transportation routes;
- Ports and port infrastructure;
- Electric power transmission lines and Natural Gas transmission lines;
- Location of known hydrogen demands;
- Demand forecasting in the medium and long term;
- Definition of plausible markets in the region and in the country.
- Identification and rejection of unlikely markets in the region and in the country.

**b. Data analysis:**

- Analysis of the region's characteristics, diversity, and availability of resources. Evaluation of prerequisites for technology development and induction adapted to local realities.
- Technological analysis: state of the art; available technologies for production - storage - transport applicable in the region.
- Hydrogen applications: evaluation of the main applications and their possible adoption in the country and particularly in the region.
- Hydrogen market: development of the domestic market and study of the evolution of the foreign market; identification of opportunities, key players.
- Infrastructure for the domestic and export markets from Rio Negro.
- Feasibility: construction and installation of the generation plant as a productive complex technological project with the capacity to cover domestic demand and with the capacity to export.



- Economic analysis: levelized cost of green hydrogen based on collected-estimated parameters (scenarios involving meeting regional domestic demand, national domestic demand, export scenarios).
- Sensitivity analysis of the critical variables of the production chain.
- Analysis of current regulatory policy and identification of necessary regulatory or promotional actions.

## 2.3. RENEWABLE RESOURCES

The thorough survey and study of the natural resources necessary for this electrolysis technology yields optimal results to produce Green Hydrogen.

### **Wind resource**

- It is characterized by strong and permanent wind with an average wind speed of 8 to 12 m / s, this value being among the highest in the world.

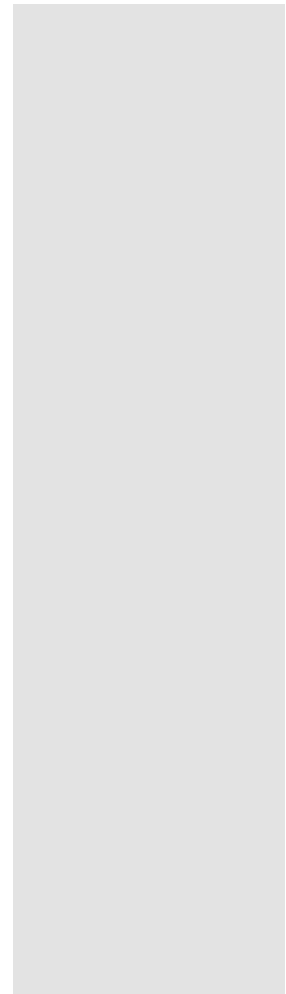
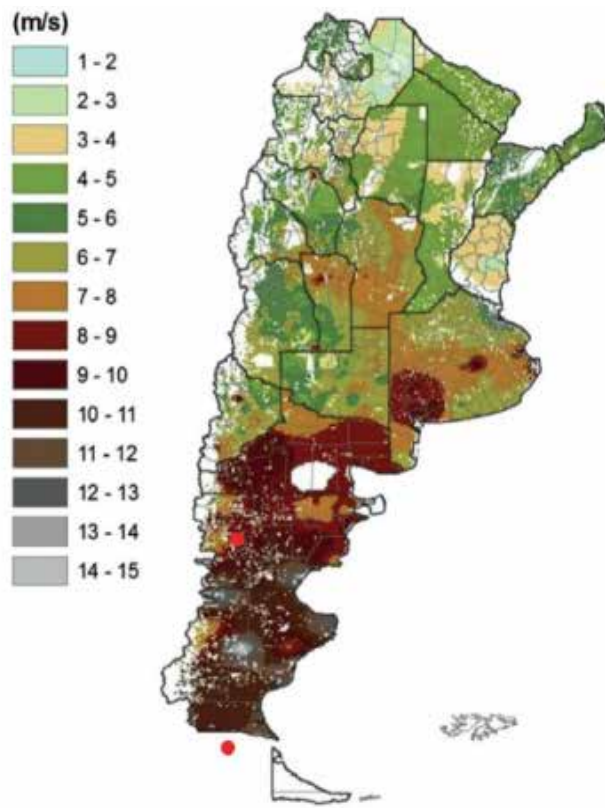
### **Solar Resource**

- Measurements show average efficiency results for this resource, but it can lead to more balanced energy production by supplementing wind power over time.

## NATIONAL WIND RESOURCE

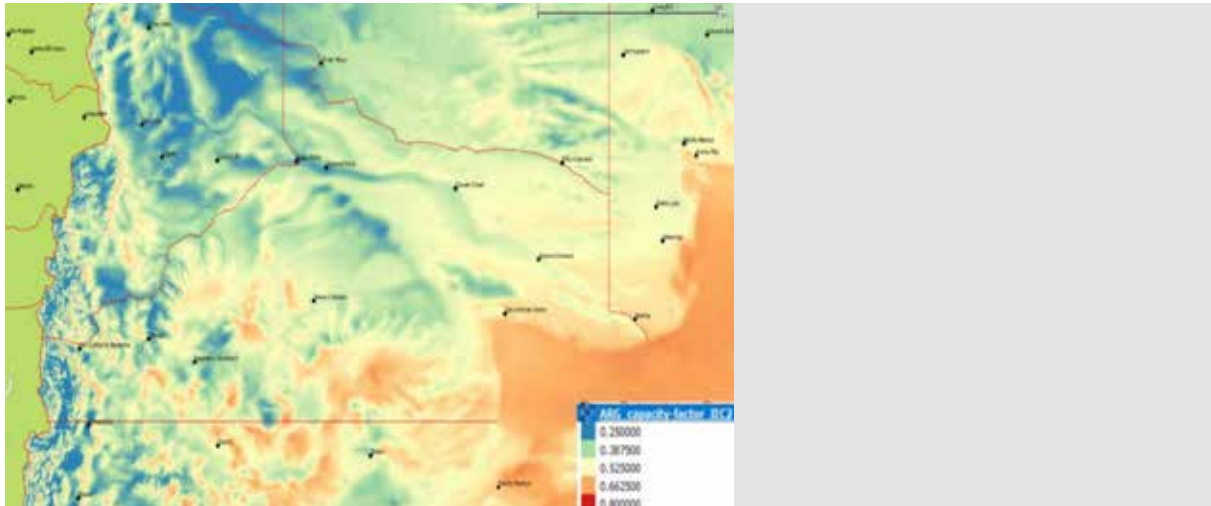
### AVERAGE WIND SPEED

ANNUAL  
AVERAGE SPEED



## Wind resources in the province of Río Negro

Based on open source data available from NASA



Good wind conditions that manifest themselves in full load hours, which are extremely high compared to the average global wind resource.

AVERAGE WIND SPEED 8.65 M/S = IDEAL FOR GREEN HYDROGEN PRODUCTION

## Water resources

On the border with the province of Neuquén, the Limay River becomes the Negro River near Cipoletti and from there flows through the province of Río Negro to the Atlantic Ocean.

Additional water resource: 175 km long artificial open channel that takes water from the Negro River 40 km from the city of Coronel Belisle called 'Canal Pomona - San Antonio'

- Capacity of 980.000 m<sup>3</sup> (500 l/s)
- It is currently operating at 40% of its design capacity
- Destination is 38 km from Puerto San Antonio Este

#### Evaluation of water analysis

- the water quality of all the samples was sufficient in terms of
- conductivity
- pH value
- alkalinity
- solids in suspension.

No additional water treatment is required prior to introducing the water into the hydrogen production facility's water treatment system.



## High-voltage power grid infrastructure

Transporting electricity over existing power lines is cheaper than transporting hydrogen or water, making it clear that it is more important to build the electrolysis plant near the water supply and hydrogen intake than near the wind farm. However, the power grid must also be able to handle large amounts of electricity.

High-voltage electrical network in the province of Río Negro



## Wind resource and water availability

### WIND RESOURCE AND WATER AVAILABILITY

- PRE-FEASIBILITY STUDY TO PRODUCE HYDROGEN FROM WIND ENERGY AND WATER



#### WIND RESOURCE RN



#### WATER AVAILABILITY



A hand is shown in the lower right corner, pointing towards a futuristic digital interface. The interface is composed of various green and yellow hexagonal shapes, some of which are glowing or have a grid-like pattern. The background is a solid green color with a subtle pattern of hexagons and lines.

# 3

## CONCEPTUAL ENGINEERING STUDY FOR A GREEN HYDROGEN PRODUCTION FACILITY

# 3

## CONCEPTUAL ENGINEERING STUDY FOR A GREEN HYDROGEN PRODUCTION FACILITY

In view of the pre-feasibility study by means of which it was scientifically proven that the Province of Río Negro is a feasible and competitive place for the development of green projects in relation to the production of Green Hydrogen, on this occasion, a new scientific study project on applied science has been entrusted to the Fraunhofer Institute IEE for the conceptual study of a first electrolytic ecological production plant in our Province.

The project is presented as a proposal as a scientific partner at the forefront of knowledge and development in this type of technology for our provincial administration within the framework of this Strategic Plan.

The study is expected to take 6 months to complete and will be analyzed at a specific location based on the previous study plus all the advances in this technology to date.

It is convenient for the Province to lead a process of structuring a project such as the one proposed here in order to attract private investments for the execution of the project, in complementarity with our scientific community, the current green projects and future ones, given the ideal scenarios already studied for the development of this new productive chain that will result in greater resources, possibilities and integration of our society in the Province of Río Negro.

The present study to be developed falls within the so-called "Energy Transition"



through applied science. It consists of the acquisition of knowledge for the development of the industrialization of hydrogen generation through renewable energy.

This industrialization is materialized in ecological plants that, through the generation of their own energy (by windmills or similar) and the use of clean fresh water, generate the so-called Green Hydrogen (H<sub>2</sub>V) through Electrolysis. Oxygen is obtained as a secondary product, which is in high industrial and medicinal demand.

In addition to being a scientific partner of the developments, the German Institute is linked to at least one local academic educational institution to train future professionals related to the project.



**4**

**GREEN HYDROGEN  
TABLE OF RIONEGRINA**

# 4

## GREEN HYDROGEN TABLE OF RIONEGRINA

The "Mesa de Hidrógeno Verde Rionegrina", created by Provincial Decree No. 342/21, is a transversal and interdisciplinary body, in charge of agreeing and defining active and sustained public policies on science, innovation, research and development of green hydrogen, as well as productive investment projects based on this type of green energy resources in the Province of Rio Negro.

The Bureau will serve as a consultative governing body, as a short-, medium- and long-term proposal to institutionalize the development of applied science, innovation, research, and application of green hydrogen as a new energy vector, as well as productive investment projects based on this type of green energy resources, which in turn will ensure the periodic review of the proposed objectives.

### 4.1. OBJECTIVES AND GOALS: 4 fundamental pillars

- **ENERGY SECURITY:** It mainly refers to the need to build an energy system with optimal characteristics of availability, reliability, and flexibility, diversifying energy sources to produce green hydrogen.
- **ENVIRONMENTAL SUSTAINABILITY:** implies incorporating the environmental dimension in decision-making processes, both in the formulation and implementation of energy policies and in the development of projects for the use of land, water, energy, and infrastructure resources, to prevent possible environmental impacts and contribute to a dynamic and sustainable development.
- **EFFICIENCY AND COMPETENCE:** Understanding that this

development requires specific programs and standards that are constantly updated according to the progress in technological innovation and following the best international standards.

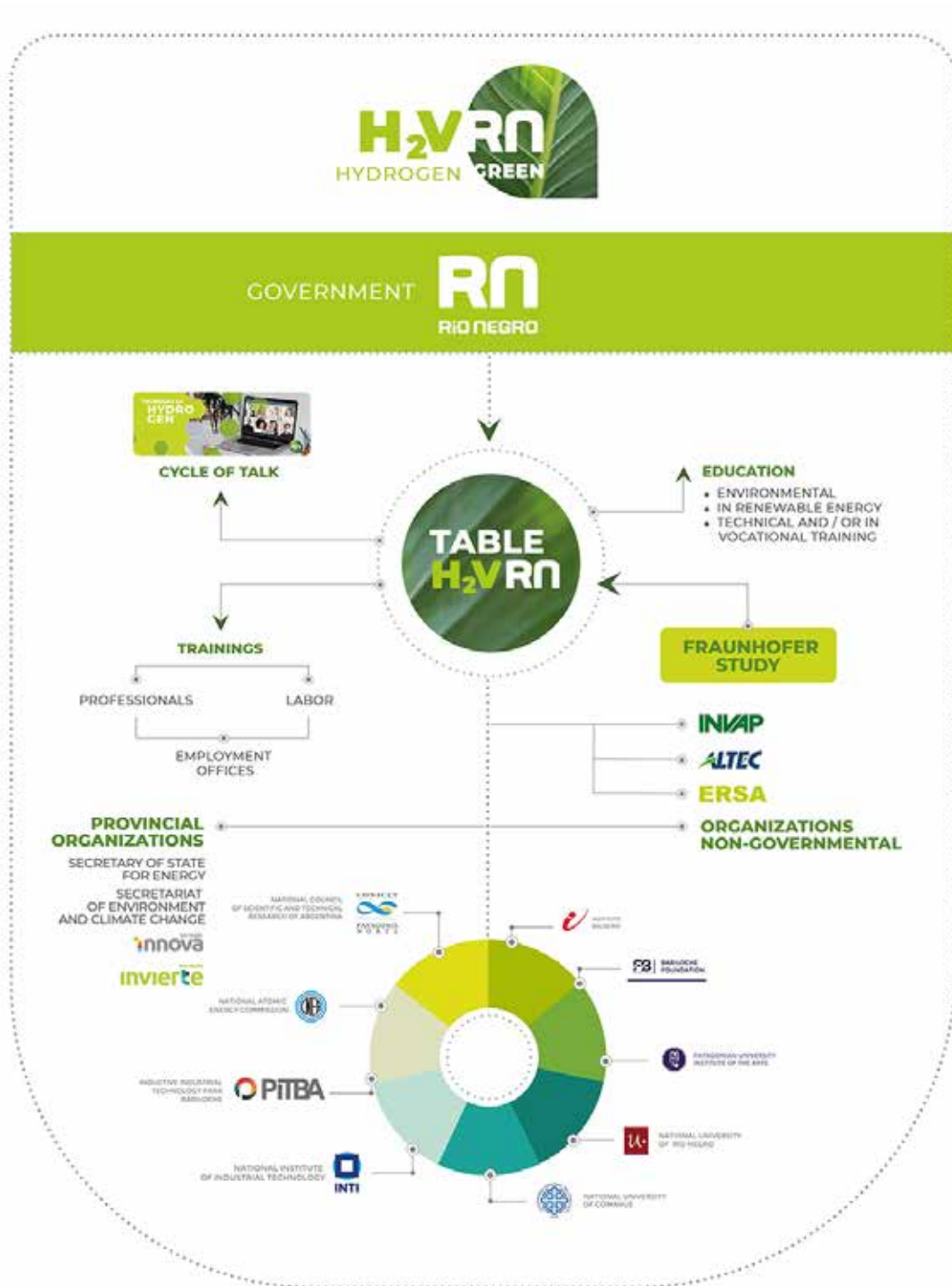
- **SOCIAL INCLUSION AND EMPLOYMENT:** The Bureau will ensure the development of technology that contributes to improving the quality of life of the population, not only by ensuring universal and equitable access to modern and quality energy services, but also by facilitating the generation of employment and the expansion of industrialization and installed capacity.

## 4.2. FUNTIONS

- Define the general guidelines for an integral and transversal approach to public policies associated with science, technology, innovation and development in the field of green hydrogen;
- Encourage, design and execute public policies that promote the generation of projects linked to productive, scientific and technical development in the field of energy transition and, especially, based on green hydrogen.
- Promote participatory scenarios that involve civil society and associated management in the development of initiatives and projects related to scientific development in energy, green hydrogen and its productive application;
- Identify renewable energy projects by expanding the existing database;
- Provide institutional support for the dissemination of projects at the national and provincial levels;
- To update the information bases on the different technologies applied for the production of green hydrogen;

- Coordinate national and international cooperation actions to ensure adequate application of resources in terms of subject matter, quality and timeliness;
- Identify barriers that prevent the sustainable development of renewable energy sources and associated technologies, and propose measures to promote them;
  
- Promote and strengthen inter- and intra-agency actions to ensure compliance with current regulations, identifying and proposing modifications to existing regulations and devices according to the needs detected;
  
- To understand that green hydrogen, hand in hand with the energy transition, comes as a natural consequence of new supply and demand paradigms at a global level, promoting the study and industrialization of sustainable energy vectors.
  
- To position the Province of Rio Negro as a leader in the social, educational, scientific, and commercial responsibility of green hydrogen.

### 4.3. STRUCTURE





The "Mesa de Hidrógeno Verde Rionegrina" is chaired by the Governor of the Province and coordinated by the official appointed by her.

In addition, it shall be made up of representatives of the following State Agencies, Institutions and Companies:

#### 4.4. ORGANIZATIONS

- Secretary of State for Energy
- Secretariat of Environment and Climate Change
- Innovation and Knowledge Economy Agency (RN INNOVA)
- Investment Agency (RN INVIERTE)

#### 4.5. INSTITUTIONS

- National University of Río Negro -UNRN-
- National University of Comahue -UNCO-
- Instituto Universitario Patagónico de las Artes -IUPA- (Patagonian University Institute of the Arts)
- Balseiro Institute
- Bariloche Foundation
- Institute for Energy and Sustainable Development -CNEA-
- National Institute of Industrial Technology -INTI- (Instituto Nacional de Tecnología Industrial)
- National Council for Scientific and Technical Research -CONICET-

#### 4.6. STATE-OWNED ENTERPRISES

- INVAP S.E.
- Eólica Rionegrina S.A.

Likewise, other national, provincial, or municipal agencies, public or private universities, specialized study centers and other organizations specialized in the subject may be invited to be part of it, either on a permanent basis or for the treatment of particular projects.



# 5

## RIONEGRINO PARTICIPATORY COUNCIL

# 5

## RIONEGRINO PARTICIPATORY COUNCIL

The Green Hydrogen Participatory Council was created by provincial decree. It is a non-binding advisory body, whose main mission is to advise the Government of the Province of Río Negro in the execution and follow-up of the actions to be implemented in the field of green projects.

It is made up of the Technical Participatory Council and the Citizen Participatory Council.

### 5.1. PARTICIPATORY TECHNICAL COUNCIL

In charge of accompanying and assisting the Provincial Government in the implementation stage of the policies developed in terms of green projects, outlining the strategies that are most conducive to their development.

#### MEMBERS

It is made up of representatives from the public and private sectors, specialists in the field of climate change and energy transition, with knowledge related to green projects.

#### MAIN ACTIONS

- To assist the Government of the Province in the implementation of the policies developed in the field of green projects.
- Advise on appropriate courses of action and strategies to be applied in this area.
- To formulate recommendations on specific issues related to the subject matter of its competence, whenever the Provincial Government so requires, and which will serve as a guide for the implementation of policies.

- Produce periodic progress reports on the actions and strategies implemented within the framework of the Strategic Plan, when required by the Government.

## 5.2. CITIZEN'S PARTICIPATORY COUNCIL

Its work consists of providing the community with information about green hydrogen and related public policies. It also aims to raise awareness of the social, economic, environmental and labor implications that the implementation of this Plan will have, through the use of various strategic tools. At the same time, it will allow access to information in a public and free manner. In addition, this Council will be empowered to promote a space for citizen participation.

### MEMBERS

It is made up of representatives from public and private areas and institutions, with expertise in the areas of public participation, dissemination, and training.

- **Training:** in charge of carrying out training mechanisms on the subject, to be executed in the territory and articulating with different institutions.
- **Citizen participation:** all citizens interested in joining the Council may do so in this discussion forum.

### MAIN ACTIONS

- Generate awareness spaces that allow the people of Río Negro to learn about the actions implemented in green projects and facilitate spaces for citizen participation.
- To travel the provincial territory to reach all the inhabitants of the Municipalities, Development Commissions, and rural areas, with the aim of disseminating the subject, channeling and managing the demands that may arise from there and bringing them to the attention of the agencies in charge of providing a response.



- Coordinate with provincial educational referents, the mechanisms to disseminate and promote knowledge about the importance of the development of the green hydrogen production chain and its impact in our province.
- Promote the conclusion of agreements with schools, training institutions and universities to train professionals specialized in the subject.
- Elaborate material for training in the territory, from the information base formed by the Library of Meetings, created from the "Hydrogen Thursdays" workshops.
- Articulate public policies that may generate potential future job opportunities for those who have been trained in this area.



6

MAIN OPPORTUNITIES  
FOR THE PROVINCE

# 6

## MAIN OPPORTUNITIES FOR THE PROVINCE

In view of the arguments, strategies, resources, approach and concrete actions determined by the Province, we can outline the main real opportunities that result for the people of Río Negro:

- In the work of maximizing industrialization and investment possibilities in our province, given that we are in a strategic place for the development of green hydrogen, we would position the province at the forefront of this type of production.
- In terms of economic geography, there would be a process of environmentally friendly industrialization (triple impact) unprecedented for the Province.
- To promote the provincial and national development of a technology proven in the world and the production of the most energy-dense renewable fuel from Patagonia Argentina, which is being demanded by the main global powers
- Attract private capital to the Province of Rio Negro for the development and implementation of new technologies related to the production of green hydrogen, including wind energy developments at GW (Gigawatt) level.
- Intensive generation of skilled and unskilled labor within the Province of Rio Negro.

- Hydrogen is a product of high added value and high demand at global level, with which once the domestic market is supplied, there is assured and sustained external demand in the long term, driven mainly by the European Community, part of Asia and Australia.
- In relation to the previous point, this project would be positioned as a great generator of two central elements in the economy of the Province of Río Negro: i) the need for local labor and ii) the birth of an industry based on applied science with a clear export bias in the future.
- On the financial side, a genuine possibility of issuing certified green rionegrino bonds as well as H2V cryptocurrencies would be generated. Rio Negro would be the first province in this area, generating market and large volumes of liquid funding from these sources.
- On the insurance side, it will be possible to develop a whole new range of coverage for the different links of the new production chain (generation, transportation, production, storage, etc.), which would place our state-owned insurance company at the national forefront in this field.
- Development opportunity for the entire region, because it will generate a great economic movement of suppliers, routes, airports and everything that implies the economic activity of a new matrix and productive chain.



# 7

## FRAMEWORK AGREEMENT FOR GREEN INDUSTRY PROJECTS IN RIO NEGRO

# 7

## FRAMEWORK AGREEMENT FOR GREEN INDUSTRY PROJECTS IN RIO NEGRO

In August 2021, the **Framework Agreement on Green Industry Projects in the province of Rio Negro** was signed between:

- Argentina Fortescue Future Industries Sociedad Anónima
- Ministry of Productive Development of the Argentine Republic
- Provincia de Río Negro

General purpose of the agreement

- Search for sites in **Rio Negro** for **Green Projects**
- **Knowledge** production and **research** platform
- Obtaining **permits or regulatory frameworks**
- Apply **know-how, technology, and knowledge**

In November 2021, a Decree was signed authorizing Fortescue Fortune Industries to carry out **pre-feasibility** studies related to the project to produce Green Hydrogen and its derivatives in the province.

Through this measure, Fortescue will be able to develop the following studies, among others:

- **Study of the** necessary wind resources, to establish where it would be possible and convenient to build the wind farms for the generation of electric energy.



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- **Pre-feasibility studies** for the construction of transmission lines for the electricity generated in the wind farms.
  
- **Studies for the location of the Green Hydrogen production plant and its by-products.**
- **Studies to determine the port infrastructure** that will make possible the transportation and commercialization of processed green products.

For this purpose, electrical, topographical, geotechnical, hydrological, bathymetric, environmental, archaeological, ornithological, paleontological, and social analyses will be carried out.

A hand holding a black smartphone is positioned next to a laptop. The laptop screen shows a Windows desktop with various application icons. The background is a light-colored wooden desk. The entire image has a greenish tint.

**8**

STRATEGIC  
COMMUNICATION

**9**

TRAINING

**10**

FINAL CONCLUSIONS

# 8

## STRATEGIC COMMUNICATION

Within the framework of the publicly known Pandemic, digital channels have been maximized for the communication of decisions, position, and progress on the issue in the province. To this end, the different government stakeholders are establishing different points of diffusion from the traditional (radio and television) as well as on social networks.

On the other hand, the Hydrogen Roundtable has its own communicative response through the different representatives of the organizations that are part of it.

As the official place on the subject, the portal has been created:

**[www.hidrogenoverde.rionegro.gov.ar](http://www.hidrogenoverde.rionegro.gov.ar)**

It is a dynamic and interactive website where we can find:

- Management axes
- Institutional information
- Thematic news
- Social networks
- Outreach videos
- Hydrogen Thursdays" Speaker Series
- Registration and participation forms
- Frequently Asked Questions
- Educational strategy



## 8.1. MANAGEMENT AXES

- To position Río Negro as a producer of this sustainable fuel.
- Through transversality and interdisciplinarity, to position Rio Negro as a leader in terms of social, educational, scientific, and commercial responsibility for green hydrogen.
- Promote the participation of civil society and associated management among organizations, institutions, and companies in the development of initiatives and projects related to green hydrogen.

## 8.2. INSTITUCIONAL INFORMATION

Official communication channel of Rio Negro's public policies related to green hydrogen.

## 8.3. CYCLE OF EXHIBITORS AND PERMANENT FORUM "HYDROGEN THURSDAYS"

- Weekly one-hour virtual meeting with different experts in the field of green hydrogen and its multiple derivations.
- A space open to the community and society, with representation of companies, non-governmental organizations, scientific communities and anyone who experiences a need for knowledge about green hydrogen.
- 27 meetings held in 2021 with different specialists in the field.

### 8.3.1. Book "Hydrogen Thursday"

- Compilation of the first 20 meetings of Hydrogen Thursdays.
- This book promotes the central ideas of each lecture, making it possible to access the complete presentations and recordings of each of these meetings, through friendly and accessible formats, by means of QR codes.

### 8.3.2. LIBRARY OF ENCOUNTERS

Compilation of the talks given at the 27 meetings of the "Hydrogen Thursdays", with the participation of approximately 60 speakers from different disciplines.

### 8.3.3. NATURE AND TECHNOLOGY MAGAZINE

In agreement with the Province of Río Negro, the magazine *Naturaleza y Tecnología* published, on a regular basis, summaries of each of the presentations of the series of lectures of Hydrogen Thursdays, prepared by Lic. Daniela Bentivoglio. These publications were used to compile the Hydrogen Thursday book.

[www.revistanyt.com.ar](http://www.revistanyt.com.ar)

## 8.4. THEMATIC NEWS

Publication and dissemination of all news related to green hydrogen, its development, potential, projects, experiences, contributions and all other material relevant to the Government of Río Negro, prioritizing the public policies designed by the Green Hydrogen Round Table of Río Negro.



## 8.5. SOCIAL NETWORKS

Diversify communication related to the topic through all available social networks, targeting different age groups and interests.

- **Instagram:** @rionegroh2v
- **Facebook:** @RioNegroH2V
- **Twitter:** @RioNegroH2V
- **Youtube:** youtube.com/c/RioNegroH2V
- **Mail:** contacto@hidrogenoverde.rionegro.gov.ar

## 8.6. OUTREACH VIDEOS

Campaigns, conferences, "Hydrogen Thursday" content, TV spots and any other audiovisual tool that contains vital material for the dissemination, knowledge and experiences that produce the development of this sustainable fuel.

## 8.7. FREQUENTLY ASKED QUESTIONS

Development of a "glossary" of general and specific content on green hydrogen, with clear and accessible language, specific to government agencies and strategic public policies, such as these.

## 8.8. EDUCATIONAL STRATEGY

Considering that in Rio Negro Environmental Education has a preponderant role in all educational levels, the Ministry of Education and Human Rights has carried out several programs and strategies articulated with other agencies with the premise of caring for the environment. Likewise, inter-institutional environmental care actions have been carried out in several institutions of the province. Finally, it should be noted that the province offers the possibility of pursuing tertiary and university studies related to the environment.



## 8.9. GREEN HYDROGEN EXPERIENCE

Multisensory experience linked to environmental care. These are public policies that address the effects of climate change through a tour of the different localities of Río Negro to make known, through a sensory and playful experience, the actions against climate change being carried out by the Province, focusing on the development of green hydrogen and the benefits this implies for the environment and the regional economy.

# 9

## TRAINING

Within the articulating and strategic role, the State of Río Negro will promote education, research, development, and innovation activities related to green hydrogen, in coordination with institutions and organizations that will be in charge of professional training and services aimed at the development of new knowledge, training human resources specialized in the subject that will be able to apply for the jobs that will be generated.

At present, training courses are being developed in conjunction with the Argentine Construction Workers' Union and Teacher Training Institutes.

### 9.1. RÍO NEGRO WORK + FUTURE (TRABAJO + FUTURO) PROGRAM

An education and job training program are being developed to accompany green hydrogen investment projects in Rio Negro.

The initiative's focus is on the training and acquisition of new skills that respond to developments associated with technological innovation, widely accessible and of high quality.

For this purpose, an articulated work is being carried out between institutions and interdisciplinary organizations: Universities, Business Chambers, Workers' Organizations, Municipalities, Development Commissions, Ministries, National Institutions, Ministry of Labor, INET and other community institutions.

# 10

## FINAL CONCLUSIONS

### 10.1. INTEREST OF THE PROVINCE OF RÍO NEGRO IN THE PRODUCTION OF GREEN HYDROGEN

The Province is working and advancing in the development of science and technology of energy transition from an environmentalist approach, in tune with the national economy and the technological advances required for the gradual replacement of fossil hydrocarbons, knowing that it is not a feasible goal to achieve in the country in the short term, but it is undoubtedly a declared objective in the international scenario, which opens an incipient international market.

Hydrogen is one of the elements of this transition, along with electric vehicles, the increased use of natural gas in the energy matrix, renewable energies, nuclear energy, and energy efficiency. The province also wishes to make progress on this issue in line with the international commitments assumed by the country in terms of climate change and decarbonization of the world economy, and in line with the regulatory and technological actions promoted from the national level.

### 10.2. STRENGTHS OF RIO NEGRO

The province has the following pillars that constitute strengths to face the challenge of the production and value chain associated with Green Hydrogen:

- Important natural resources, especially water and wind. The province would be exporting wind energy and water.

- Adequate infrastructure, a deep-water port and a potential bio-oceanic corridor that can be developed based on the convenience of the exit to the Pacific, considering, in addition to the European market, the Asian market.
- Reactivation of the Sierra Grande Free Trade Zone.
- Highly specialized human resources, competitive in the international scenario, with experience in the export of nuclear reactors and satellites, in addition to various high value-added technologies.
- Facilities, laboratories, highly sophisticated instruments, researchers from universities, CONICET, CNEA, INVAP, etc., and possibly the scientific and technological pole with the highest density of gray matter in the country, located in San Carlos de Bariloche.

### 10.2.1. INDUSTRIAL PARKS

The Province has 22 industrial parks, 100% public. We are currently working on a new approach, based on:

- Strategic planning
- Systemic organization
- Provincial articulation
- Accompaniment for regularization
- 4.0 connectivity.
- Environmental impact mitigation

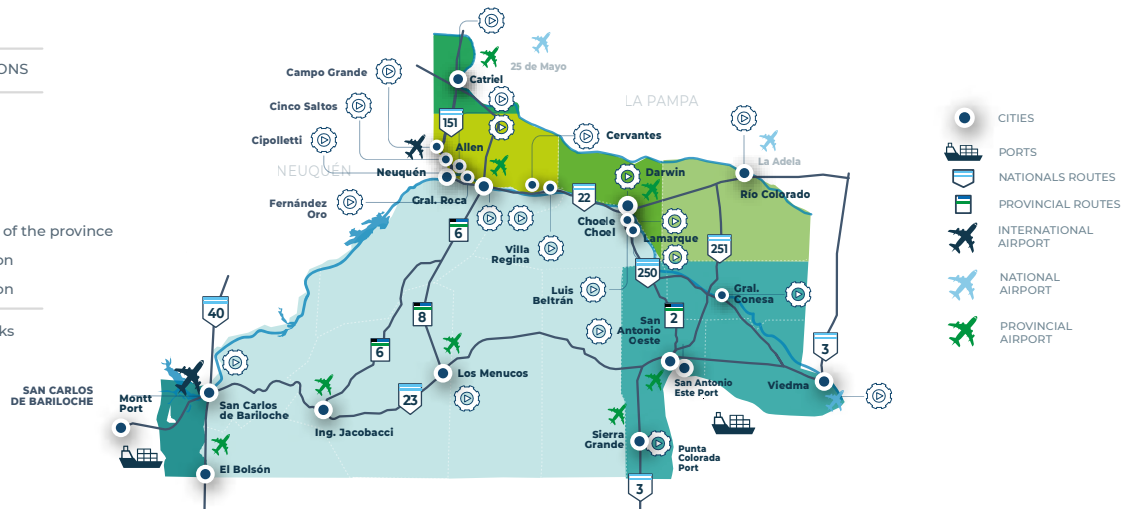
#### Vision

- Treatment plants
- Recycling programs
- Own power generation
- Mixed soil

NATIONAL PARKS  
**LOCATION**

ECONOMIC REGIONS

- North
- High Valley
- Middle Valley
- Northeast
- Southern line of the province
- Atlantic Region
- Andean Region
- Industrial Parks



### 10.3. MAIN OBJECTIVE IN THE SHORT TERM

Consolidate the topic of green hydrogen in the community, academia, and scientific community to establish itself as a national reference on the subject and generate the inherent developments for the construction of an electrolytic hydrogen production plant from wind energy and fresh water.

### 10.4. MEDIUM- AND LONG-TERM OBJECTIVE

To position itself in the technological and scientific development of this new fuel, in the industrialization of the value chain and export of green hydrogen, and the visibility of Río Negro as a place for national and foreign investments. It also seeks to reduce the CO<sub>2</sub> footprint of Argentine industry through the local consumption of green hydrogen produced in Río Negro, generating added value to export products.

## 10.5. MARKETS OF INTEREST TO THE PROVINCE

The province interprets that there are two markets for hydrogen production. Two markets named: H2V chemical and H2V energy, both with national and international markets. In both cases, the province is interested in the two value chains, which have points in common but some differences.

## 10.6. INITIATIVES

Strong insertion of the topic of green hydrogen to the citizenship, complemented by the German scientific study, plus the provincial green hydrogen table that brings together all the existing academic and scientific areas, consolidating the interest in the development of base technologies to produce green hydrogen together with the technological inputs and products involved in its new production and value chain.

## 10.7. CHALLENGES

At present, technology maturity levels are being reached in this area for the entire production chain. These aspects are currently reflected in the price of H2V, which is still high compared to traditional H2 (gray). This is a central aspect if H2V is to be considered commercially, although in the early stages of research and development (R&D) a whole economic and investment structure can already be mobilized that will set in motion a whole new industrial process in Rio Negro.

This initial R&D is responsible for advancing technological maturity to reduce the final price and gain competitiveness, accompanied by the role of the state in terms of legal and legislative security in this area.

## 10.8. CONJUNCTURE

The international and now national interest in the development of H2V finds the Province in an optimal scenario due to the degree of progress in the knowledge on the subject, as well as the possibility of having the natural resources, available land and deep water port for it.

This optimal scenario is in line with the rapid pace of progress in the production, transportation, and consumption of H2V by developed countries, which have an increasing need for energy in their daily lives.

The positioning of Rio Negro in the academic, technological, scientific, productive, and financial development with a view to future exports is of particular interest in its current policy in order to be a very attractive place in the current and future plans in the field, both nationally and internationally.

**RN**  
**RÍO NEGRO**