UNTREF UNIVERSIDAD NACIONAL DE TRES DE FEBRERO

CIEA Centro Interdisciplinario de Estudios Avanzados UNTREF

PROGRAM OF STUDIES ON NUCLEAR ENERGY AND INNOVATION

PROGENI (by its acronym in Spanish)

INDEX

INTRODUCTION

Global public health, climate change, the generation of quality inclusive employment, the generation of energy in a clean and reliable manner, and international security appear as the five challenges for global governance in the world to come. Beyond the debates in the literature regarding whether we are facing the "fourth industrial revolution", and without intending to delve into it, there is no doubt that we are facing a paradigm shift in the five fields. A world that discovers its weaknesses regarding the protection of the population's health, even in the developed world, an economy that is moving towards systems with less "employability" and is therefore generating more political and social instability; a paradigm shift in the way energy is generated and distributed, towards massive electrification and less polluting energy sources; a world that faces security challenges very different from the Cold War's paradigm, with new state and non-state actors increasing prominence in a scenario of high uncertainty, and finally, the inescapable challenge of climate change, which acquired a sense of urgency unthinkable at the end of the last century.

What is striking is that nuclear technology is related —in one way or another— to the five challenges. Today, it is recognized worldwide as an industry that enhances development with reasonable rates of employability, as a source of clean energy, with a positive impact on climate change and with enormous potential in terms of sustainable and cheap applications in matters of health prevention and in the fight against global pandemics. At the same time, this technology is closely related to current threats to global security.

In this context, the **National University of Tres de Febrero** creates the **Program of Studies on Nuclear Energy and Innovation** (PROGENI, by its acronym in Spanish): an area within the **Interdisciplinary Center for Advanced Studies (CIEA)** of the University devoted to addressing all the rough edges this vast field has, both as academic research and seeking to influence public policy. The objective is to turn the Program into a regional benchmark in this subject, reaching out to all the actors with a broad and holistic perspective, with different ideological and disciplinary points of view.

THE PROGENI

The PROGENI is a space for research and promotion of public policies for the development of a sector in which Argentina is a relevant country in the international arena. It can only ensure its sustainability and future development if it is based on a complementary strategy of international insertion. This has implications —as we have stated— in very diverse fields. An institutional space is born that gathers together public policy ideas and provides a space for research based on evidence.

The PROGENI is organized into **three subprograms**, each autonomous regarding its object of study, but interconnected in a structure that gathers them together: **nuclear technology**. The objective of this set-up is to contribute efficiently to the production of academic material and intervention in debates in the field and to the provision of advice and useful content for the design of public policies on the subject in the region, networking with similar centers in the world, with international organizations (IAEA, CTBTO, OPACQ, among others) and with the industry. It also focuses on training human resources specialized in the subject, which turns this Program into a regional model.

The Program's subprograms, which will be described in detail below, are as follows:

1. Nuclear technology and development
2. Nuclear energy and climate change
3. Innovation in the nuclear field.

NUCLEAR TECHNOLOGY AND DEVELOPMENT

In the framework of what has been called "the third wave of the State and of development" we understand that it is relevant to focus on the Argentina's nuclear sector, as a case of specialized bureaucracy of high development and density, in the context of a country of medium development and low state quality standards. Following 1992 Evans' model[1], between the two extremes of model of the state (the *developmental states* and the *predatory states*) there is a group of countries that show development "niches" or "clusters" in a specific field. These are bureaucracies that have managed to become sophisticated, despite the low-quality framework of institutions, in states that cannot yet be classified as developed. Cases as the Banco Nacional de Desarrollo Económico y Social (BNDES) in Brazil, or the Indian technology sector, have been quite studied. In this theoretical framework, we focus on nuclear technology as a catalyst/agent/driver of development from a double perspective: as a general case of study in the third wave of development's literature and, also, as a provider of tools to different actors in order to have a positive impact on public policies, both nationally and in line with international organizations in the nuclear sector (IAEA as the most relevant, but not the only one). In summary: we understand that the nuclear technology's contribution towards development is an under-studied field in the region. Therefore, it demands attention because of its enormous potential. In the Argentine case, this can be approached from a double perspective:

- Analyzing Argentina's nuclear sector as an example of "Embedded Bureaucracies".
- From the perspective of the Principal-Agent relationship: The Argentine nuclear sector is a very paradigmatic case of an "Agent" with high capacities in a general context of limited state capacities. The Argentine nuclear sector (the CNEA in especial) has historically shown, on the one hand, remarkable inter-temporal coherence and, on the other, enormous autonomy from the State in terms of agenda-setting.

[1]Evans, P., The state as problem and solution, in: S. Haggard and R. R. Kaufman, *The politics of economic adjustment*, Princeton, NJ: Princeton University Press, 1992, pp. 139-181.

In addition to the systematic study of the specialized nuclear bureaucracy and its contributions to development, the PROGENI opens up as a space to support those who seek a better impact of nuclear application programs for development in sectors as diverse as the medical, food and agricultural industries and on the fight against diseases.

At the international level, and more specifically at the regional level, we find numerous processes that are under development, in which the states seek to develop public policies using the offer existing in the field of promoting the peaceful uses of nuclear technology in the framework of bilateral and/or multilateral initiatives that require assistance from a technical point of view, but especially oriented to project management. For that reason, a space such as the one proposed is key, be it because of the technical experience acquired, or because of the already established network of contacts in different fields, from project financing to obtaining the social and environmental license, through the planning and execution of public policies involved in the development of infrastructure for development.

NUCLEAR ENERGY AND CLIMATE CHANGE

Climate change is, as stated in this document's introduction, one of the most important challenges to global governance in the years to come. Recently, it has acquired a significant sense of urgency, accelerating the need to find solutions. In the energy sector, this has involved a return of nuclear energy to the scene. Despite the fact that it has not reached the public debate yet (the public opinion still shows significant levels of rejection, especially after the Fukushima Daiichi accident), it is, in fact, recognized among experts worldwide that there is no possibility of solving greenhouse effect problems without nuclear energy. Indeed, it is a topic that has been strongly debated around the world, both academically and at the government and industry level. A really good example of this is the recent conference hosted by the International Atomic Energy Agency: "*International Conference on Climate Change and the Role of Nuclear Power*"[2].

It is also a growing issue at the government and industry level. The World Nuclear Association (WNA), an organization that represents the largest companies in the industry worldwide, has set, as its primary objective, to influence this debate from the perspective of an industry that is demanding transformation and shows commitment to the future. As a result of this decision, the report "*The Silent Giant*"[3] was born as a document that focuses on the contribution of nuclear energy as a clean source, and on the need to innovate in order to accompany the paradigm shift generated by the boom of renewable energies.

Another element worth of highlighting is the proactivity that characterizes the civil society: numerous organizations work as examples of how civil society is proactively influencing the public agenda.

[2] References about the Conference: https://www.iaea.org/sites/default/files/19/10/cn-275-programme.pdf

[3]Available in:https://www.world-nuclear.org/our-association/publications/position-statements/the-silent-giant.aspx

At the government level, perhaps the two most important initiatives are: first, the *International Framework for Nuclear Energy Cooperation* (IFNEC)[4], an intergovernmental initiative composed by the countries with the largest nuclear development, with Argentina as a founding member, which works as a powerful forum for intergovernmental discussion in which climate change is one of the main topics in debate. Another clear example of the proactivity of the nuclear industry in this field is the *Nuclear Innovation: Clean Energy Future* initiative (*NICE Future Initiative*)[5]: the first intergovernmental initiative specifically oriented towards climate change, founded by the United States, Japan and Canada, and in which Argentina has been admitted as a member two years ago.

In summary: there is a huge scope of action, which has a huge impact on the industry and governments. This subprogram is created to be a leading actor in this matter, with the ability to have a direct impact on public policy.

[4]Available in:www.ifnec.org

[5]Available in:https://www.nice-future.org/

INNOVATION IN THE NUCLEAR SECTOR

As previously mentioned the governments, the industry and the academic world agree that it is hard and challenging to achieve the objective of rapid and real de-carbonization in power generation without the nuclear source. Regardless of the impact this has on public opinion, the expert world agrees that having reliable and cheap nuclear energy would be the best option. What does this mean? Nuclear energy is clean, as it does not emit greenhouse gases. This condition, plus the fact that the energy is continuously available 24/7, makes it, potentially, an ideal complement to the renewable energies (which are intermittent) and, therefore, "part of the solution". However, the nuclear reactors that are currently operating face several problems: they require high initial capital and a lot of construction time, and are not very flexible; therefore, they are not very useful as a basic complement to renewable energies. It is as if the world were claiming "we want nuclear power, but not the same we have had for the past 50 years."

The result of this combination of present crisis and future potential is a strong demand for industrial **innovation**. For some years now, this has been the most important point of the agenda. On the one hand, dozens of conferences and meetings have been organized, placing this topic at the center of the debate, both in the technical field and from a public policy perspective. On the other hand, in the countries of greater economic development, an investment flow both public and private towards innovative technologies can be found on two levels:

- In the short term, there is strong work in progress to achieve new fission technologies that meet the requirements of flexibility, security and better investment conditions. The clearest examples are the reactors known as Small Modular (SMRs). Argentina's CAREM reactor is one of the most advanced prototypes. However, the search for innovation is not limited to SMRs, and today there exists an important set of initiatives in the search for smaller and simpler reactors, in a new business model.
- More towards the long term, several start-ups are working in the design and construction of small fusion reactors (in the US, Canada, China). This is a path that is just beginning.

The PROGENI is founded to contribute to this impulse, bearing in mind that Argentina is a relevant actor on this scenario.

THE PROGENI IS FOUNDED TO PARTICIPATE, WITH A REGIONAL VIEW,

IN AN ACTIVE GLOBAL DEBATE.