

# THE DEVELOPMENT OF EDUCATION AND TRAINING IN RADIOLOGICAL PROTECTION IN ARGENTINA

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## 1- Introduction

One striking fact in the field of radiological protection is the contrast between the important trajectory of this discipline, which through great material, intellectual and scientific efforts has collaborated in the formation of a nuclear activity with high safety standards, and the limited development of historical studies on this field from which important conclusions can be drawn.

Among the most relevant are the writings of J. Samuel Walker<sup>1</sup>. They were designed primarily to study the history of activity within the US which also has some fragments dedicated to the comparison with international regulations. The History of the International Atomic Energy Agency<sup>2</sup>, published in commemoration of the 40th anniversary of the institution, also provides relevant data even though its main theme is to show the complex evolution of this international body. Also noteworthy are the contributions of Jacques Lochard and Olivier Godard, who work on the subject from the particular link with the precautionary principle<sup>3</sup>. Similarly, the works of Lindell<sup>4</sup>, Clarke and Valentin<sup>5</sup>, and that of Ortiz López<sup>6</sup> together constitute an excellent systematic scheme of important events brought from within the discipline itself.

Undoubtedly these are works whose importance is not under discussion. However, all of them have the peculiarity of not exceeding the perspective of a chronological account of events linked to the decision of setting regulatory regulations. Most important facts, of course, and which account for the great scientific effort made by physicists, chemists, engineers and biologists, of a very high level and academic formation.

But a work based on historical science that aims at the reconstruction of this fruitful activity suggests a critical use of documentation and sources, a contextualization of the different historical moments in which radiological protection is developed; a perspective that correlates the paths taken by the profession with the general development of nuclear activity, as well as with the political and economic life in which it is deployed.

In the following paragraphs, some theoretical elements will be presented for the understanding of the history of the development of nuclear activity in Argentina in connection with a contextualization of Argentine scientific and technological policy. Elements that may contain a contribution to a holistic understanding of the central theme of the work: education and training

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<sup>1</sup> WALKER, J. Samuel; *A short history of nuclear regulation. 1946 – 2009*, USNRC, 2010; “The Atomic Energy Commission and the Politics of Radiation Protection, 1967-1971”, in *Isis*, Vol. 85, No. 1 (March, 1994), pp. 57-78; and *Permissible Dose. A History of Radiation Protection in the Twentieth Century*, University of California Press; 1<sup>st</sup> edition (November 6, 2000)

<sup>2</sup> FISCHER, David; *History of the International Atomic Energy Agency. The First Forty Years*, IAEA, Viena 1997.

<sup>3</sup> GODARD, Olivier and LOCHARD, Jacques; “L’histoire de la radioprotection. Un antécédent du principe de précaution”. CECO-995. 2005. <hal-00243007>

<sup>4</sup> LINDELL, Bo, DUNSTER, H. J. & VALENTIN, Jack; “International Commission on Radiological Protection History, policies, procedures”, *Seguridad Radiologica*, (18), 2000, p. 4-12.

<sup>5</sup> CLARKE, Roger and VALENTIN, Jack; “The History of ICRP and the evolution of its policies”, *Annals of the ICRP*, ICRP Publication 109, 2009.

<sup>6</sup> ORTIZ LOPEZ, Pedro; “Eight decades of ICRP recommendations in medicine: a perspective”, in *Annals of the ICRP 45*, Marzo 2016.

in radiological protection, as a relevant element in the construction of a more general "nuclear culture".

## **2 - Historical context and technological exception**

There are different interpretations about the history of nuclear activity in the Argentine Republic. In this paper, it is argued that the development of the sector presents a particular evolution: on the one hand, it has an exceptional character, and on the other hand, its own development has been generated in a certain "relative autonomy" with respect to the more general paths of the country's politics and economy. One factor that has contributed to this characteristic has been the generation of a "nuclear culture"; and scientific-technical training has been an important element in this regard.

As a starting point it will be considered a traditional classification that raises a duality between the different economic-political systems, establishing the differentiation between central countries and peripheral countries<sup>7</sup>. This distinction is closely linked to the criterion of an international division of labor between basically industrial countries, and agricultural and countries. This implies particularly highlight the social and economic inequalities that are evident in each category, as well as the geographical distribution (North-South) which resulted from this classification. However, as with all forms of conceptualization, the application to particular cases admits gray or intermediate areas.

Taking the above idea, it could be considered the setting of nuclear energy in Argentina as a case of development of a technology that involves a strong capital investment in a peripheral country.

The initial forecast for these countries is the import of capital-intensive technology, mainly because they have not developed an industry of their own that allows such concretions. Nevertheless, the economic-political dynamics of Argentina reached a certain autonomous industrial capacity.

In the early days of the nuclear plan, our country was in the beginning of the economic stage called "industrialization by import substitution": Both the difficulties in attracting industrialized products from Europe due to the consequences of World War II and the placing of commodities in the main selling area in a cost-effective manner pose a deterioration in the results of the exchange. This situation generated the stimulus towards a policy of diversification of the productive matrix, with the objective of meeting with domestic production the need for consumer, and capital goods. This decision was accompanied by a process of public investment (increasing public debt), plus technological transformation.

Although Argentina showed a slightly stronger structure compared to the countries of the region, it was also marked by similar tendencies: social and political instability; trajectories marked by persistent ups and downs in economic directions; military coups that constantly threaten democratic freedoms and legal institutionality; and also the economic and political pressure from central countries exerting their capacity to influence the internal decisions of peripheral countries in favor of their particular interests.

To carry out the aforementioned policies, the state played a key role. In this process of public investment and productive and technological transformation, it is important to note particularly the drive for a strong institutionalization strategy. This included not only the unprecedented development of highly complex technology but also a unique policy of building technological linkages with ties to other areas of the public sector, together with the decision to deepen the training of human resources.

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<sup>7</sup> This conceptualization was developed mainly by economists linked to the Economic Commission for Latin America and the Caribbean (known by its Spanish acronym CEPAL). Similar theoretical categories were after developed by Immanuel Wallerstein in his theory of the *world-system model*, and by the theory of economic cycles proposed by Giovanni Arrighi.

Autonomous nuclear power production has not been the only project presented at that stage in the history of Argentina. However, as Diego Hurtado points out:

It is a process that began in the middle of SXX and not foundered in the eddies of a military coup or economic crisis, as was the case with other local technology start-ups. Notwithstanding tenacious international pressures and periods of proverbial social and political instability, the development of nuclear technology has a clear enough trajectory to merit the category of exception.<sup>8</sup>

To summarize: the peripheral country's conditions did not allow to glimpse the certain possibility of an industrial and technological undertaking of the magnitude of a nuclear system. The emergence of a particular ideological and political-economic scheme posed a scenario in which a country like Argentina could consider installing a complex technology such as nuclear. While there were other projects of similar importance, their fate was not identical. Nuclear activity was able to make its own way despite all the constraints raised, confirming the character we pointed out at the beginning: its exceptionality. This exceptional situation therefore is expressed both in relation to the peripheral status of Argentina as well as in relation to other industrial technology initiatives that were projected at a similar time in a country with clear profiles of political and economic instability.

### **3- *Techno-politics, relative autonomy and "nuclear culture"*.**

By the '70s, Argentina appeared behind India as the second most advanced country in the nuclear field among developing countries. However, the basic treatment that the world gave to this project did not seem to have the purpose of explaining or understanding it. A considerable number of international writings about nuclear programs in non-central countries insisted on the idea that these projects had a non-peaceful destination. That is, according to this particular configuration, Argentina appeared as a destabilizing element for the global system. Contrary to this guideline, the nuclear initiative of Argentina will be characterized as a form of techno-politics of peaceful option. Gabrielle Hecht states with great clarity that this term refers to

(...) the strategic practice of designing or using technology to constitute, embody, or enact political goals. Here I define technology broadly to include artifacts as well as non-physical, systematic methods of making or doing things.<sup>9</sup>

This idea involves at least two relevant aspects: on the one hand, the materiality of technology as a component of political processes, or as a vehicle for political objectives; and on the other hand, the competence of the technologist, his knowledge applied in various processes as a form of political participation. That is to say, both "the technological thing" and the knowledge that manages it exceed its singularity, possess an extra meaning: the former constitutes an element that embodies a policy, and the latter are active subjects of a more general or state policy. Applying this categorization to the Argentine nuclear development, Hurtado explains that

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<sup>8</sup> HURTADO, Diego; *El sueño de la Argentina Atómica*, Edhasa, Buenos Aires, 2014, p.15. Translation from spanish: Alejandro Margetic.

<sup>9</sup> HECHT, Gabrielle; *The Radiance of France. Nuclear Power and National Identity after World War II*, Cambridge, The MIT Press, 1998, p. 15.

The decision to acquire a natural uranium power reactor in the late '60s for the purpose of using Argentine uranium and minimizing dependence on the US - then the only supplier of enriched uranium - is not understandable without the testing of engineers, technologists, and scientists Which made this decision economically and technically feasible and which, in turn, guided successive political decisions, such as the place of nuclear energy in the national electricity system or the choice of technology for the second power plant<sup>10</sup>

Based on this idea, two other concepts emerge that will clarify a viewpoint that will then be considered in relation to training in radiation protection: "nuclear culture" and relative autonomy. To speak of *relative* autonomy involves determining the particular logic of a singular practice, composed of an object with its particular characteristics, and by the treatment of the social groups that are constituted around it. Thus, for example, nuclear activity can be distinguished from any other productive practice because of its specificity and the unique knowledge that puts it at stake.

Although all forms of human activity develop in a particular historical context that affects them, each one will assume a specific dynamic determined by its own forms of production. To figure out this kind of "autonomy" for the development of Argentine nuclear activity does not mean that this sector has been shaped and developed by the only intervention of men and women linked to that activity; But rather that it is necessary to understand that these men and women developed a unique activity, different from other productive practices influenced by political and economic conditions, national and international, as well as other local and supranational institutions. And this is what marks the "relative" of autonomy: a particularity - the nuclear - inserts in a more complex and extensive system that influences it; But that does not repeat its dynamics, nor that of other practices of similar level of aggregation. That is, it is relative, since its forms are not absolute in the sense that it is completely self-determined.

In this way, each sphere of activity generates a specific, autonomous "culture" that is differentiated from others by the link that establishes a group with its object - and the relation with its context - as well as by the subjective modes of action - ideological and practical- that are expressed in this complex relationship.

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The understanding of the historical context and, within it, the expression of a specific techno-politics that develops in a "relatively autonomous" way and that generates a particular culture leads, in this case, to the idea of "nuclear culture".

The development of a "nuclear culture" is perhaps one of the keys to the success of this form of techno-politics. This culture allowed it to resist in the moments of greater financial weakness, to the changes of political direction that our country has suffered, to the attacks of the international pressures, but also to the internal debates.

Nuclear culture is mainly built from the appropriation by a social group - which could be called "nuclear community" - of a very specific scientific-technical knowledge that involves the handling of an object that appears to the layperson as inaccessible and ominous.

This specific culture is embodied in an institutional and symbolic system that includes a network of organizations, knowledge, regulations and resources that operate together, and around which are formed identities, values, beliefs and modes of action that make possible a practice that tries to establish roots in other sectors of society and state.<sup>11</sup> This "cultural knowledge" with strong

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<sup>10</sup> HURTADO, Diego; op.cit. p. 24. Translated from Spanish by Alejandro Margetic

<sup>11</sup> Cfr. HUGHES, Thomas; "The evolution of large technological systems" en BIJKER, W.; HUGHES, Th., PINCH, T.; *The social construction of Technological systems*, Cambridge, The MIT PRESS, 1989.

scientific connotations becomes an ideological armor of defense and power at the same time for the group that is constituted around it.

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From both the historical context and the idea of techno-politics, on the one hand, and from the category of relative autonomy and the formation of a nuclear culture on the other, It follows that the training and the knowledge of the specialists form a key to the understanding of the nuclear activity as a whole.

The generation, deepening and profusion of knowledge, that is to say, the decision of a policy of training and training in our country, both at the university level and in the scientific-technological field, have been inescapable factors in the process of forming a broader national policy. At the same time, the knowledge acquired collaborated in the creation of a specific culture, in this case a "nuclear culture". Transitively, this "nuclear culture" is an elementary factor in the evolution of this particular activity, as a techno-political one. In short, not only the nuclear activity in our country will be incomprehensible without analyzing the link with the scientific-technical sector; nor will the development of science, and scientific formation, without the political historical correlate in which it is developed.

In short, the nuclear activity in our country assumes an exceptional character due to the conditions of the country in which it is developed, and in relation to other undertakings of similar size that have not achieved similar progress. Secondly, this exceptionality is expressed in its materialization as techno-politics. This techno-politics has a relatively autonomous development -which further characterizes the exception nature of the activity- and, at the same time is cause and consequence of the formation of a strong specific culture, based on the scientific management of the technological object, which has allowed the progress mentioned.

## ***2- Radiological Protection Education & Training in Argentina.***

It is understandable now that the training and training policies of the subjects involved in nuclear activity have played a role on a scale that includes but also exceeds what is strictly linked to the scientific knowledge of its object.

Training in radiation protection, of course, has not been the only aspect of this complex knowledge. But without a doubt, it has been an element of paramount importance. Up to this point, an attempt has been made to draw up some historical and theoretical guidelines without which a complete understanding of the evolution of radiological protection training could not be undertaken. From here on, it will show some singular elements of that trajectory of scientific-technical education & training.

It has been said that the scientific-technical formation has had an imprint in the formation of a nuclear culture, on the one hand, and in the generation of knowledge that convey the possibility of concretizing a techno-politics, on the other. Along the same lines, a nuclear culture involves a social group that assumes a series of values, identities, forms of organization, and action all of them in the treatment of a specific subject based on a scientific-technical knowledge developed. This knowledge then constitutes a binding element of that culture.

It is important to consider in these paragraphs some elements that cross the history of the training in Radiological Protection in Argentina. In this sense, the future of this educational policy will be seen as a form of broader development of a techno-politics in the sense that the generation and strengthening of a nuclear culture, around which a social group is established and acts with defined identity and values.

These educational practices have the destiny to become an element of production of some subjects of a specific community. That is, it is not enough to point out the characteristics of the singular knowledge, but also this knowledge embodied in some subjects will form the active

component in a particular techno-politics. It is understood therefore that without the specific actions carried out by this group, that project cannot be carried out properly, and therefore without them there is no success of a more general public policy.

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The series of events that will be described below constitute relevant moments -material and symbolically- in the path of consolidation of the educational practice of radiation protection. In addition, this organizational consolidation constitutes a link certainly not weak in the chain of practices typical of a techno-politics. The criteria that are proposed as a guide for interpretation for this series of events are at the same time traits of the importance that this discipline has achieved in the entire nuclear activity.

The elements that mark a route in the historical summary that follows are: a strong institutionalization, a constitutive specificity, and the constant linkage with different scientific / educational sectors as well as political. It can be deduced that each of the traits we have just mentioned is interwoven in a network of practical actions that crystallize in organizational achievements. Thus, a strong institutionalization implies the specificity of a practice that is linked, in this case, to anchoring in the higher education system, and to the link with international organizations. Only in analytical rather than empirical terms can an element be isolated from another.

It is inevitable to emphasize that the installation of a nuclear power reactor, as with all nuclear technological applications, becomes feasible only with a radiological safety system that adequately goes along these advances. That is, a robust radiological protection system that records high levels of security makes the technological developments viable. It is unthinkable, or at least was not for our country, a project of nuclear technology without accompaniment according to the radiation protection point of view. To such an extent, this characteristic assumed a central role that from the outset, both radiological protection and its teaching constituted inescapable requirements, specifically sanctioned by a legal framework of the highest level.

From its origins in Argentina, the nuclear activity was legitimized by a corresponding legislation that sustained its development. Significantly, this same legal framework has considered as an essential element the presence of specific measures of radiation protection as well as the training of people linked to the use of ionizing radiation. One thing worth remembering is its anticipatory nature: this legislation is established in early 1958. Compared with other equally important milestones at the international level, we could note that this is a precursor decision: Five months before UNSCEAR approved its first report (13/6/1958), almost one year before Publication 1 of the International Commission on Radiological Protection (ICPR) (late 1958), and in conjunction with the beginnings of the organization of the International Atomic Energy Agency, Argentina already had a regulation issued by a competent authority that exhaustively established the requirements for the use of radioisotopes and ionizing radiation, implying at the same time a radiation protection training. The "Regulations for the Use of Radioisotopes and Ionizing Radiations" approved by the board of the National Atomic Energy Commission (known by its Spanish initials CNEA) and put into effect on January 24, 1958 by Decree 842/58 of the National Executive Power, ruled in article 19 that any person interested in the use of radioisotopes should:

(...) have acquired in a specialized center of the country or abroad the knowledge and experience properly documented to enable it for the use of the radioisotopes that it wishes to apply with a dedication not less than one year or in its defect

- a- To have attended in the country or abroad a practical-theoretical course on the use of radioisotopes sufficient to be trained in the specific use of the radioisotopes and to have passed corresponding examinations. This course

should obtain the knowledge directly linked to radiation physics, radioactivity, radiochemistry, measurement instruments, radiological health physics and protection. Its duration will not be less than 50 hours theoretical and practical classes, or

- b- have performed professional practice in a center authorized for the use of radioisotopes that the applicant wishes to apply according to set by the CNEA.<sup>12</sup>

Moreover, an aspect of vital importance to note is the creation of a single public institution that centralized all nuclear activities in the country. The CNEA would concentrate R & D tasks necessary for the development of Argentine nuclear plan. In this way the only nuclear organism of the country had among its main objectives the scientific-technological planning of the sector.

But it should also be added that since the beginning of this public body was also present the Management of Radiological Protection, an area that was led by Dr. Dan Beninson<sup>13</sup>, one of the world's leading figures in this discipline. Just as a comment, those who remember the past of this organism refer to the Management of Radiological Protection and Security of the CNEA as "The Management"- "La Gerencia". These elements clearly point out the importance that has been given in Argentina, and is given, to the control of radiological risks for the worker, the public, and the environment. It is a clear expression of an organization that tends to the institutional strengthening and the building of institutional networks.

Another significant element of the importance of the principles of radiological protection is its influence on the whole of nuclear activity. Abel Gonzalez, clearly states that in Argentina,

The basic principles for radiation safety are based on the ICRP recommendations and are fully tailored to the fundamentals of the international safety regime being built under the aegis of the IAEA. The current Argentine basic radiation safety standards declare as its objective "achieving an appropriate level of protection of individuals against the harmful effect of ionizing radiation and safety of radiation sources" and fully follow the ICRP principles. However, Argentine regulations are unique in that these basic principles have been extended to the so-called "nuclear safety" standards, which are based on the same principles than those of radiation safety standards.<sup>14</sup>

These ties of practical integration of the whole system, decisively suppose a policy of formation that accompanies all the national effort placed in the development of nuclear activity.

Some other important milestones will then be considered in the measures taken on training in radiological protection in Argentina.

The formalization of the training in Radiological Protection, assuming a university education profile, was carried out towards the end of the '70s. Between 1977 and 1979, the Radiation Protection and Security Management of the CNEA gave the first courses on Radiological Protection and Nuclear Safety for the training of its own personnel.

Soon, in 1980, the CNEA and the Faculty of Engineering of the University of Buenos Aires (FIUBA, initials in spanish), the most prestigious university in Argentina, celebrate an agreement whose main objective is to fit into the national university system the "Postgraduate Course in

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<sup>12</sup> Cfr. <http://www.radioproteccionsar.org.ar/online/doc/publicaciones/reglamento-decreto.pdf>

<sup>13</sup> Dan Beninson was chairman of CNEA; chairman of UNSCEAR (1974 a 1979), and for many years a member of the ICRP, which he chaired from 1985 to 1993.

<sup>14</sup> GONZALEZ, Abel; "The Argentine Approach to Radiation Safety: its ethical basis", Hindawi Publishing Corporation, Science and Technology of Nuclear Installations, Volume 2011, Article ID 910718.

Radiological Protection and Nuclear Safety". The curriculum had a total of 1100 class hours, and the corresponding academic recognition (diploma awarded by FIUBA and CNEA)<sup>15</sup>.

It was not more than a year (1981) that the IAEA began to sponsor this course by providing financial support for the participation of foreign students, particularly from Latin America and the Caribbean, making it the first recognized Post Graduate Educational Course (PGEC) partially funded by that international body.

The fact that this career assumed a university institutional profile and a scope beyond the borders of their country of residence was not enough to exhaust the different education and training needs in this discipline. Nuclear activity in general also required that all of its workers had adequate knowledge to develop their practices, and at the same time constituted an element of strengthening a nuclear culture. A minority but important sector of nuclear workers, with sufficient competence and experience to properly attend to their tasks, did not necessarily meet the formal requirements of a postgraduate university degree. Therefore, in 1983, the Radiological Protection Course - Technical Level, for postulants without a degree began to work. This course has a curriculum with a duration that currently reaches 360 hours of class.

The decades of the '80s and '90s were particularly difficult for nuclear activity in Argentina: the whole sector had to deal with a process of de-financing, among other political decisions that hit it. It was this culture once again, these symbolic ties in a social group, which prompted that despite the vicissitudes there was not a year in which training in radiological protection stopped.

Between the years 1994-1997 a process of reorganization of the nuclear activity took place. Law number 24,804/97, also called "nuclear law", made regulatory activity independent (previously exercised by the CNEA through its Radiological Protection Management) by creating the Nuclear Regulatory Authority (ARN, initials in Spanish). These changes resulted in the renewal of the agreement for the delivery of the Postgraduate Course, which was thus in charge of FIUBA and the newly formed ARN. The "institutional transfer", as will be seen, did not produce a loss in its organizational framework, since the ARN became the "heir" institution of the trajectory in the training in radiological protection.

In 1997, the postgraduate course in "Radiological Protection and Security of Radiation Sources" conceived in our country and with an experience of more than 17 years is replicated in the Syrian Arab Republic dictated with a program and characteristics similar to the one Argentinian. Years later another seven international centers will be added, proposing a structure equivalent to that developed by Argentina.

In 2003 a restructuring of the original course was proposed. In response to IAEA suggestions for the unequal development of Latin American countries in the nuclear area, the nearly one-year course was divided into two specific postgraduate courses: "Postgraduate Course in Radiation Protection and Security of Radiation Sources" (650 hours) and "Postgraduate Course in Nuclear Safety" (350 hours), being the second correlative of the first. This shows that the ARN-IAEA relationship is not marked by a purely financial linkage. The two organizations are in constant dialogue in the perspective of the development of a policy of continuous improvement regarding training in radiological protection. The synergy put into play, undoubtedly, has been a central element in the development of this training policy and shows the character of strong institutionalization and links with supranational organizations.

Following the same line, in 2006 the first IAEA Education and Training Appraisal (EduTA, English acronym) mission was carried out in a Latin American country: a general evaluation performed by international peers on the national educational infrastructure on radiological safety issues. The mission concluded with very positive results for Argentina. The specificity of educational practice is reinforced in its own development.

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<sup>15</sup> Although the CNEA is not properly an educational institution capable of developing university degree plans on its own, its academic and scientific prestige positions it as an institution sought by universities to develop projects or programs together.



On the one hand, these achievements contributed to the fact that the following year, both the Postgraduate courses, the Technicians course, and the ARN facilities used to teach these courses were certified under ISO 9000: 2000 norms,<sup>16</sup> And on the other hand, also as a sequel to the EduTA mission, in 2008 the Argentine Republic signed a Long Term Agreement (LTA) with the IAEA. Through this agreement Argentina assumed the responsibility of becoming a Regional Training Center (RTC) in Latin America and the Caribbean for Nuclear, Radiological, Transportation and Waste Safety. The ARN will be in charge of carrying out the management of the RTC, through its Education and Training Unit (UCE, Spanish acronym).

The creation of the UCE raised once again a work of institutionalization and centralization of the policies of education and training, which allowed an action with greater emphasis on academic subjects. Since the implementation of this Unit, the ARN has been able to work in a more focused way with the UBA through its Faculty of Engineering. In this way, a series of updates, administrative and academic improvements were addressed, as well as the formalization of a series of practices, such as those listed below:

- In order to adapt to the new forms of organization of higher education in our country, the Postgraduate Courses have been transformed into "Specialization Degree in Radiological Protection and Security of Radiation Sources", and "Specialization Degree in Nuclear Safety ". Also, an update of the programs and their schedules was carried out.
- From the previous modifications, the titles are granted by the University of Buenos Aires (UBA) with recognition of the Ministry of Education. Until that time, the titles were issued by the Faculty of Engineering.
- The synergy of the administrative systems of both institutions (ARN and UBA) was improved, obtaining improvements in monitoring and registration systems, among others.
- - At the same time, improvements were made in the use of didactic and pedagogical resources such as the various forms of distance education platform, educational networks, among others.
- The academic recognition of the teachers from the nuclear activity has been achieved, since they must be formally appointed by the UBA as their own teachers.
- At present the process of assimilation of the diplomas of the graduates of previous editions of the postgraduates to the condition of "Specialists" according to the current regulations is very advanced, also permitting the homologation in universities of other countries.<sup>17</sup>

A special mention deserves the obtaining of National University Accreditation by the "Specialization Degree in Radiological Protection and Security of Radiation Sources". The Argentine higher education system establishes standards of educational quality that include a detailed evaluation of aspects that go beyond the program of academic contents: Administrative and infrastructure issues, updating libraries, teacher training and education, cost planning, improvement planning and self-assessment processes, among others. In 2013, this Degree was presented to the National Commission for Evaluation and University Accreditation (CONEAU), a competent national body that ensures that university programs meet a high standard of educational quality (in addition to the ISO certification already obtained). After an arduous work of the Unit that involved a detailed task of technical, academic, formalization and information gathering of support, the CONEAU began a systematic process of evaluation that culminated in a favorable verdict, granting the accreditation to the Specialization Course. On the other hand, the next challenges that the ARN arises are linked to a process of deepening and continuous

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<sup>16</sup> In 2010 and 2014, they were recertified under ISO: 9001: 2008, and this certification continues to be valid

<sup>17</sup> LARCHER, Ana; NICOLAS, Rubén y HURTADO, Diego; "Revalorización de la tradición educativa de la ARN y búsqueda de la excelencia académica", Paper presented at the 10th Latin American Regional Congress on Security and Radiological Protection- IRPA. "Radioprotección: nuevos desafíos para un mundo en evolución" april 2015, Buenos Aires.

improvement in their training and training tasks, in their academic aspects as well as infrastructure and administrative processes. In this regard, the following are indicated:

- Update and provide new teaching equipment to the headquarters of the CRC in the CAE (in progress)
- Provide a new approach to the traditional Radiological Protection Course - Technical level, based on the needs from the reactivation of the Argentine nuclear plan. (in progress)
- Design courses with new formats and specific contents facing new regulatory challenges. (in progress)
- Design mechanisms for monitoring and impact of the training activities developed (in progress)
- Review the Specialization Course in Nuclear Safety, according to the new IAEA Syllabus (in progress)
- Introduce new IT elements for improving teaching performances (in progress)
- Contributing to the IAEA's Global Training and Strategy 2011-2020, collaborating in the consolidation of national E & T programs in the region.
- Receive a follow-up EduTA mission (in progress)

These challenges that have just been listed are accompanied by the strengthening of the area of Knowledge and Academic Management within the UCE. The area aims to centralize general training information and focus on developing solutions to some of the challenges posed. On the other hand, this area is working on a Diagnostic Process of regulatory knowledge throughout the institution. As a result of this process, an update of the ARN Training Plan is expected.

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The scientific-technical training developed by ARN is a central axis of both its institutional trajectory and its projections. On the other hand, the character of a strong institutionality, with the development of a specificity, coupled with the connection with other scientific-educational sectors as well as political, both national and international in each one of the mentioned milestones. It is the realization of the "acquisition" by a social group of scientific and technical knowledge that is constituted as a binding element of a specific culture.

The education and training in radiological protection is a decision that, over time, has collaborated in the generation of a "nuclear culture" with all the ramifications that have been considered in this work, and which, as has been pointed out, is one of the factors which affect the particular development of nuclear activity as a whole.

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