CONTROLLED NUCLEAR FUSION FOR THE ENERGY TRANSITION, HEALTH, AND INDUSTRY

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We present an overview of the current Fusion Science and Technology landscape in both countries, as a basis for proposing a comprehensive binational institutional program for the energy transition, health, and industry.

The current Nuclear Fusion Science and Technology landscape is probably one of the broadest, deepest, and most diverse in the S&T world. The need to achieve high reaction rates under controlled and usable conditions, especially for the goal of mass energy production, has led to the establishment of a diverse ecosystem of scientific and technological concepts, applications, and stakeholders. The energy objective has not yet been achieved, but significant milestones have been reached, and in line with this pursuit, industrial and/or medical objectives have already been achieved or are being achieved, generating a net return to society and nourishing the virtuous circle between society and scientific research and technological development. Thus, the current status of Nuclear Fusion challenges power conglomerates with demands for resources and the offer of access to a significant share of the development.

In this context, it is worth highlighting a series of measures and institutional positions adopted by both countries:

· Institutional political decision: endorsement of the development of the activity, complementing the others already supported by the institution.

· Human resource development: training of professionals and technicians; internal and external outreach; inclusion in academic curricula; assessment of dedicated human resources.

· Addressing a manageable set of scientific and technological issues: energy, medical, and industrial applications; use/damage of/from radiation, especially neutrons; tritium generators/collectors; detection and control systems; study of compact systems; fuel injection in hot plasmas.

· Leveraging the local and international nuclear infrastructure: highly developed nuclear activity in Argentina with areas of convergence; inclusiveness of the international fusion community; international institutions with the capacity to provide scientific, technological, and economic support; opportunities for establishing IAEA collaboration programs [1].
· Installation of accessible fusion devices: tailored to the selected problems; versatile from a diagnostic and educational perspective; and economically viable.
· Development of support infrastructure and links with related industries: development and/or adaptation of laboratories; outreach to the nuclear, energy, and metal industries; accessible fusion devices: tailored to the selected problems; versatile from a diagnostic and handling perspective; educational use (mechanical, electrical, and electronic).

References

[1] https://www.iaea.org/es/temas/fusion (2025)