ESTABLISHING AFRICAN FUSION ENERGY RESEARCH CONSORTIUM: CAPACITY BUILDING AND INNOVATION PATHWAY

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1. INTRODUCTION

Africa is experiencing a growing demand for sustainable and clean energy solutions [1]. Fusion energy, with its potential for limitless and low-carbon power generation, represents a transformative opportunity [2]. However, Africa currently lacks a structured framework for fusion research, education, and workforce development. This proposal advocates for the establishment of the African Fusion Energy Research Consortium (AFERC)—a collaborative initiative aimed at fostering education, training, and research capacity across the continent. AFERC will empower African institutions and researchers to contribute meaningfully to global fusion energy development by bridging the knowledge gap. The Centre for Renewable Energy and Sustainability Transitions (CREST) at Bayero University, Kano is proposed to be the leading center for AFERC, serving as a hub for research coordination, training, and international partnerships.

2. OBJECTIVES OF AFERC

The consortium will focus on:

- Developing Educational Programs: Creating specialized university curricula and technical training in plasma physics, nuclear engineering, and computational modeling.
- Enhancing Research Capacity: Establishing research laboratories and collaborative projects among African institutions.
- Fostering International Collaboration: Partnering with global fusion research bodies, such as ITER, EUROfusion, and the IAEA, to facilitate knowledge exchange and technology transfer.
- Encouraging Industry Participation: Engaging African energy stakeholders in fusion technology advancements and commercial prospects.
- Training the Next Generation: Providing scholarships, workshops, and hands-on training for students and professionals.

3. PROPOSED STRUCTURE AFERC

AFERC will operate through a multi-tiered framework with close monitoring from the International Atomic Energy Agency's (IAEA) Technical Cooperation in Africa and African Commission on Nuclear Energy (AFCONE).

- Core Members: African universities, national research institutes, and nuclear regulatory bodies.
- Regional Hubs: Key institutions in countries with existing nuclear or plasma research expertise (e.g., South Africa, Egypt, Nigeria, Ghana).
- Affiliated Partners: International fusion research laboratories, funding agencies, and private sector stakeholders.
- Programs & Initiatives:
    - Development of MSc and PhD programs in fusion-related fields.
    - Joint research projects in plasma physics, magnetic confinement, and inertial fusion.
    - Faculty and student exchange programs to strengthen international collaboration.
    - Industry engagement for technology transfer and workforce development.

4. ROADMAP FOR IMPLEMENTATION

AFERC will be established through a phased approach:

- Phase 1 (2025-2027): Formation of core partnerships, securing funding, and initiating pilot educational programs.
- Phase 2 (2027-2030): Development of research facilities and expansion of regional collaborations.
- Phase 3 (2030-2035): Launching experimental fusion projects and integrating African contributions into global fusion efforts.

5. EXPECTED IMPACT

The establishment of AFERC will have a profound impact on Africa's scientific and energy landscape:

- Capacity Building: Development of a skilled workforce capable of advancing fusion research and technology.
- Scientific Contributions: Increased African participation in global fusion energy projects.
- Energy Security: Long-term potential for fusion energy integration into African power grids.
- Technological Advancement: Promotion of innovation and industrial growth in plasma physics, nuclear science, and engineering.

6. CONCLUSION

This initiative aims to position Africa as a key player in the global fusion energy landscape by establishing the African Fusion Energy Research Consortium. AFERC will lay the groundwork for a sustainable fusion energy future through strategic collaborations, education, and infrastructure development, fostering scientific excellence and energy independence across the continent. This proposal calls upon policymakers, academia, and industry leaders to support and invest in Africa's fusion energy potential.

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