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A Global Licensing and Regulation Framework for Fusion Energy

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ABSTRACT

- Fusion energy has the potential to significantly mitigate climate change while meeting growing global energy demand
- Rapid deployment is essential, making the licensing and regulatory framework a critical factor.
- The United States, Germany, Japan, and the United Kingdom plan to regulate fusion power plants differently from fission plants.
- Typically, regulation begins with national frameworks that will then go through a phase of harmonization, potentially culminating in a global framework.
- This paper argues that a reverse approach may be more effective: establishing a global licensing and regulatory framework for fusion energy from the outset.

BACKGROUND

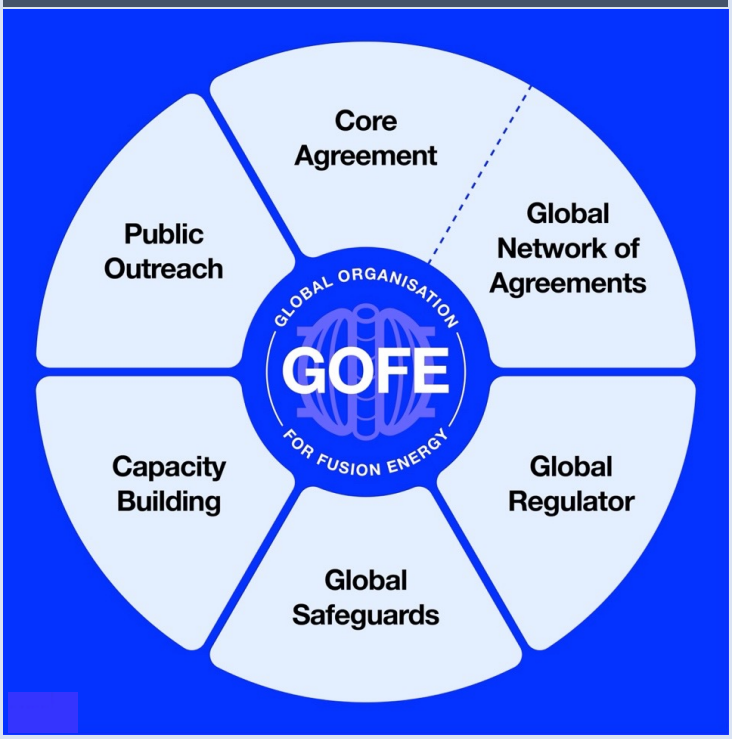
- Global energy demand will continue to grow, driven predominantly by the industrialisation aspirations of developing economies and the global expansion of electricity-intensive AI.
- To effectively address climate change, many fusion power plants will need to be built in countries that currently lack the technical knowledge and regulatory expertise required for fusion energy.
- A global framework for regulation and licensing, including the option to outsource tasks to a global organisation could accelerate deployment.

REGULATE FUSION LIKE PARTICLE ACCELERATORS

Nuclear Fission Power	Particle Accelerator	Fusion Energy
		
MAIN COMPONENTS: Fissionable Material Moderator Control Rods Cooling	MAIN COMPONENTS: Strong Magnets RF EM Waves Cryogenics Vacuum	MAIN COMPONENTS: Strong Magnets RF EM Waves Cryogenics Vacuum
RADIATION: High Radiation (during and after operation) High Radioactivity	RADIATION: High Radiation (only during operation) Low Radioactivity	RADIATION: High Radiation (only during operation) Low Radioactivity

Fusion power plants share the same core components as particle accelerators. Unlike fission plants, they use no fissile material and therefore pose far lower radiological risks. While neutron sources could still be used to produce fissile material, such cases fall under existing safeguards already applied to particle accelerators. Fusion plants therefore should not be regulated under the same framework as fission power reactors.

7-Point Plan for a Global Framework



1. Global Organisation for Fusion Energy (GOFE)
including manufacturers, operators, and industry representatives.

2. Core Agreement
enabling reciprocal recognition of certifications (US, UK, EU, etc.).

3. Global Network of Agreements
with voluntary opt-in by participating countries.

4. Global Regulator
optional for countries, with the possibility of outsourcing regulatory functions to GOFE.

5. Global Safeguards
to prevent the diversion of materials for non-peaceful purposes.

6. Capacity Building
Fund to support training, institutional development, and peace-building efforts.

7. Public Outreach
to raise awareness, build trust and global public support for fusion energy.

CONCLUSION

- Fusion power is expected to begin contributing to the electricity supply by the mid-2030s.
- Regulation and licensing will be crucial for the speed of deployment.
- A GOFE will likely emerge, either as a new entity or through the expansion of an existing body.
- Regulation and licensing will ultimately be harmonised, supported by safeguarding mechanisms, capacity building and public outreach.
- If the goal is rapid deployment, these structures must be established now rather than waiting for fragmented national approaches to converge.
- Why take the long route if the destination is already clear?