Controlled Nuclear Fusion: Energy Conflict and Theoretical Feasibility

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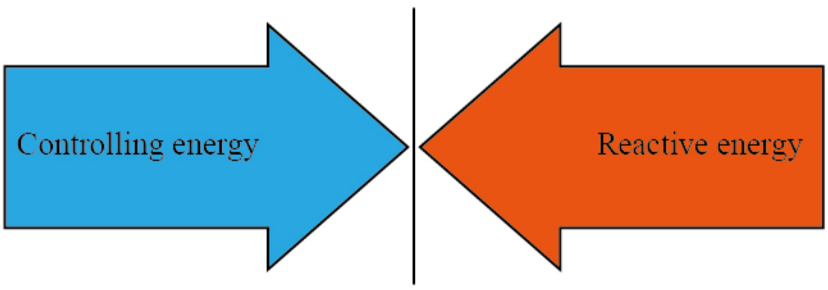
Abstract
Controlled nuclear fusion, as a potential solution for clean energy, achieves its controllability primarily through an energy counteraction mechanism. Based on the framework of energy counteraction, this paper explores the contradiction between energy surplus and controllability in controlled nuclear fusion. The research indicates that while controlled nuclear fusion is theoretically feasible, existing technologies face significant challenges in simultaneously achieving energy surplus and system stability. Therefore, the conclusion of this paper is that, at present, the feasibility of controlled nuclear fusion is extremely low.

Chapter 1: The Concept and Application of Energy Counteraction

1.1 The Theoretical Basis of Energy Counteraction
Due to the extreme high temperatures and pressures required for nuclear fusion reactions, no known materials can withstand these conditions, making energy counteraction the only viable method for control. This method of control is fundamental to achieving nuclear fusion reactions, and it is also the control mechanism utilized in the nuclear fusion reactions within stars.
Definition of Energy Counteraction: It refers to the control and maintenance of a system by managing the interaction between the controlling energy and the system's reactive energy. Figure 1

Figure 1 Energy counteraction



1.2 Specific Methods of Energy Counteraction
(1) Magnetic Confinement
(2) Inertial Confinement
(3) Hybrid Approaches
(4) Gravitational Potential Energy (primarily observed in stars)

1.3 The Role of Energy Counteraction in Controlled Nuclear Fusion
(1) Maintaining the conditions necessary for nuclear fusion to occur, which include temperature, pressure, and the density of the plasma.
(2) Controlling the plasma to prevent it from coming into contact with the walls of the reaction chamber, thereby reducing energy loss and damage to the equipment.

Chapter 2: The Contradiction Between Energy Surplus and Controllability

The successful realization of controlled nuclear fusion depends on two fundamental characteristics: energy surplus and controllability. The energy surplus must be positive; a negative value implies an energy loss, which would render nuclear fusion unsuitable as a means of energy supply. Simultaneously, the controllability of the system must be ensured to guarantee the stability and repeatability of the fusion reaction.

2.1 Insights from Solar Nuclear Fusion

The sun achieves nuclear fusion reactions through gravitational confinement. The Sun's controlling energy (gravitational potential energy) is in a delicate balance with the energy released by nuclear fusion. The energy released by the reaction slightly exceeds the controlling energy, with the "energy surplus" portion radiating outward, forming the Sun's solar radiation. But it is well known that the overall efficiency of the Sun is only 0.7% . The nuclear fusion reactions in the Sun reveal several characteristics of a stable fusion system:

(1) The system has a certain scale.
(2) The system is controlled by means of energy counteraction.
(3) The forces of energy counteraction are relatively balanced.
(4) Only a tiny fraction of the energy escapes.

Figure 2

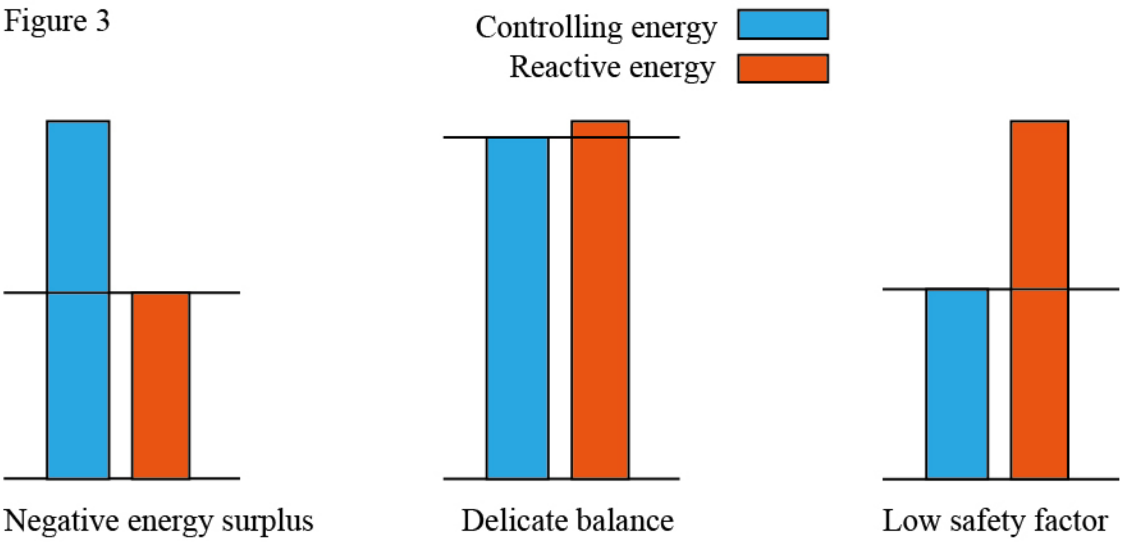
Figure 2 Delicate balance

Obviously, this escaping energy can be regarded as energy surplus, and the balanced forces of energy counteraction keep the system in a delicate equilibrium state.

2.2 The Contradiction Between Energy Surplus and Controllability

Since the system is in a delicate equilibrium state, from the perspective of controllability, the system is actually in a critical state—on the brink of losing control. For traditional safety standards, the system's safety factor is very low. At the same time, the system can only provide a small amount of energy surplus. If one aims to obtain more energy surplus, it would be necessary to increase the system's energy leakage, which would further decrease the system's controllability and could even lead to collapse. Conversely, if one increases the controlling energy to enhance controllability, it might result in a negative energy surplus. Figure 3

Figure 3



Conclusion

The control of fusion systems is achieved through the mechanism of energy counteraction, where a balance is only reached when the forces of energy counteraction are relatively equal, allowing the system to operate stably. Therefore, after the system reaches a state of equilibrium, there is only a small amount of energy leakage. However, at this point, the system is in a delicate balance, teetering on the edge of losing control. By traditional safety standards, the system's safety is very low. Any change to this balance can have severe consequences: a decrease in energy surplus, or even a shift to a negative energy surplus. Alternatively, the system's controllability may further decrease, or the system may collapse, leading to equipment damage. On the other hand, if the overall efficiency of controlled nuclear fusion systems is much lower than that of existing energy systems, the practical value of controlled nuclear fusion will also be called into question. Therefore, at present, the feasibility of controlled nuclear fusion is extremely low.

Discussion

The nuclear fusion systems in stars possess distinct advantages: The system outputs a huge amount of energy with extremely low overall efficiency. A "gratis" control energy derived from gravitational potential energy, and a greater availability of safety redundancies. These benefits are inherent to the stars' vast mass, which is not something that artificial controlled nuclear fusion systems can replicate. It is evident that nuclear fusion reactions are characterized by a scale sensitivity, which influences the feasibility and efficiency of controlling the process on a smaller, artificial scale.