

FUSION 2020

Fusion can be the energy of the future. We need investment now to turn the science into practicality.

Investing now will ensure America has a sustainable, clean, and safe energy supply for the future.

Failure to invest will condemn America to another century of energy dependence on other countries.

Fusion - Summary

During the last 30 years, researchers around the world have made great and largely unrecognized progress toward achieving controlled fusion energy.

Fusion is the energy created by forcing atomic nuclei together. At the heart of fusion energy is the world's most famous equation, $E=mc^2$, which summarizes how mass can be converted into energy. The primary fuel for fusion is derived from ordinary water.

Fusion power is safe and clean, and when commercialized, it will solve the world's energy problems. It does not create a chain reaction and there is no possibility of a meltdown.

Researchers now agree that engineering challenges, as much as science, are the primary obstacles to realizing fusion's potential.

China, the European Union, Japan, Russia, and South Korea are pushing forward with aggressive efforts to resolve these challenges and secure leadership in the energy technology of the future. In contrast, U.S. efforts have been crippled for decades by limited investment.

The implications of delay go beyond the loss of American technological leadership, and include major world-wide risk for the loss of control of nuclear material.

Investing resources and effort at an appropriate level for fusion, together with support for nearer-term energy programs, can reestablish American technological preeminence, achieve absolute **energy independence, and ensure American prosperity.**

What is Fusion Energy?

- Fusion energy is obtained by forcing together atomic nuclei of hydrogen.
- The amount of energy available through fusion is extraordinary. A single gram of fuel can yield 90,000 kilowatt hours of energy. It would take 10 million pounds of coal to yield as much energy as one pound of fusion fuel.

What is the Environmental Impact of Fusion?

- Fusion systems have no chain reaction or meltdown risk. They produce no radioactive waste stream. They produce no greenhouse gas.
- Fusion plants would take up no more space than conventional coal or natural gas fueled facilities, and can be located near population centers where power is needed. Thus they need no long-distance transmission lines.
- As fusion can produce base-load power, no energy storage system is required. The fuel supply for a one billion watt (1 Gw) plant would amount to less than one pound per day.

Are We Ready to Proceed?

- At Lawrence Livermore National Laboratory in California, DOE-sponsored work under the banner of the National Nuclear Security Administration has brought the National Ignition Facility (NIF) into operation.
- The preliminary design of an American magnetic pilot plant is underway. A team based at the Princeton Plasma Physics Laboratory is ready to move forward rapidly, given funding.

What Will American Fusion Leadership Cost?

- To achieve a fusion power commercialization of the kind described above would require a total investment of approximately \$35 billion over a period of 10 to 15 years.

What is the Difference between Fusion and Present Nuclear Power?

- Fusion does not create a chain-reaction and there is no possibility of a meltdown.
- Fusion does not use uranium or plutonium and **cannot be used as a weapon.**

What Are the Potential Strategic Gains?

- Success will establish absolute energy independence for this country.
- The rapid development and deployment of fusion energy will constitute a concrete investment in American technological preeminence in the world.
- The scientific ancillary benefits cannot be overstated.

Fusion energy is real. The key opportunity is to turn what is happening in labs all around the world into fully commercialized plants. As every American business knows, we invest today to win tomorrow. This future is fusion.

It's time to invest in an American future.

Are There Reasons for Immediate Action?

- There are two critical issues calling for action: competition and nuclear proliferation.
- China has a major program in fusion. They have announced a fast-track goal of net-power demonstration facilities in the 2021-2040 time frame. The U.S. has already lost its position in solar and wind to the Chinese.
- Increasing energy demand will drive nations toward uranium enrichment and fission power. Experience shows that countries with such reactors will tend toward reprocessing fuel, which is an acknowledged proliferation risk.

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