Cold Fusion,
A new kind of energy and a new threat to civilization

Edmund Storms
Santa Fe, NM

Topics: cold fusion, energy, LENR, nuclear reaction, tritium,

ABSTRACT

The so-called Cold Fusion process provides a source of inexpensive and safe nuclear energy using isotopes of hydrogen as the fuel without the need to apply high energy. Complex and expensive machines, such as are required to cause conventional fusion, are not used. Instead, the fusion reaction can be made to occur spontaneously in certain ordinary materials after suitable treatment. The history and consequences of this important discovery are examined.

I. INTRODUCTION

Thirty-six years ago, a groundbreaking source of energy was discovered that could replace most others now used by industry. Two professors working at the University of Utah, Martin Fleischmann and Stanley Pons,[1] found that nuclear energy could be generated using electrolysis when deuterium, an isotope of hydrogen extracted from ordinary water, was reacted with palladium. This energy was later found to result from the formation of helium.[2] This process, commonly known as cold fusion or low energy nuclear reaction (LENR), is now understood to occur simply by heating certain materials to D_2 gas after they have been subjected to special treatment.[3-6] Initially, the claim was met with great interest because it offered a potential solution to the energy shortages in many countries and would allow the elimination of dangerous and expensive sources of energy.[7] However, skeptics were unable to replicate the claimed resulted, leading to the cessation of further work in the U.S. and a belief that the claim was not valid. Huizenga[8] has described the scientific reasons behind this rejection, while Krivit[9] has detailed the political factors that contributed to this process.

This paper will address a series of critical questions, beginning with: Why should anyone take an interest in cold fusion and its troubled past? The answer is urgent and vital: we are faced with one of the greatest challenges of our time. For humanity's survival, we must urgently innovate and develop technologies that do not produce additional greenhouse gases, which are significantly contributing to the alarming rise in global temperatures.

II. DISCUSSION

Hundreds of studies listed in the library at LENR.org have demonstrated that energy can be produced by the cold fusion reaction without creating harmful radiation or radioactive waste, with helium being produced as the main nuclear product. In addition, this source of energy could be made available at low cost anywhere using hydrogen in ordinary water as the fuel. So, why isn't this ideal energy source being embraced with enthusiasm?

A. The Problems

Two major problems stand in the way.

First, the ability to create fusion without the application of external energy was long considered impossible by conventional science. Some people even believe the reported energy is due to error or fraudulent claims. However, this belief is increasingly unjustified. Numerous studies conducted by various laboratories in many countries have observed similar results, with power levels occasionally reported in the kilowatt range. Many of these laboratories can now produce this effect with ease, but not at commercial levels. Moreover, the amount of helium generated corresponds with the energy released based on the mass change caused by a fusion reaction involving deuterium.[2] Other nuclear products, such as tritium[10] and transmutation products[11], are observed to form. This large and growing experience forces the acceptance of the claims even though the nuclear process seems impossible. A proposed process is described in more detail later in the paper.

Second, if this very inexpensive and readily available energy were to become widely accessible, many existing sources of energy could be abandoned, leading to chaos in the energy markets. For example, certain countries, especially China, Japan, and countries in the EU would benefit from this energy by reducing their dependency on costly oil and natural gas imports. Additionally, the reliance on expensive and hazardous fission power could also be eliminated. Such a shift could lead to economic losses for countries that supply these fuels, diminishing their political influence.

On the other hand, if we do not curtail the burning of coal, natural gas, and oil, the resulting impact on the climate could threaten the very survival of civilization.[12] Thus, we are faced with a difficult choice. So, what can be done to reduce this fate?

To maintain economic stability, it is essential for all countries to have access to the means of producing this ideal energy, but this must occur on pace that allows for the necessary economic adjustments. The future of civilization will depend on whether countries can collaborate to develop and implement this new form of energy without causing economic disruption. Unfortunately, history does not offer much hope that this goal can be achieved.

B. The Solution

To produce useful power, it is essential to have the correct understanding of how cold fusion works. Currently, many conflicting and competing explanations have been proposed.[13] These conflicts need to be resolved. The first requirement is to correctly apply the principles that influence a chemical environment. A nuclear reaction is likely an accidental outcome of conventional conditions, rather than a result of a unique mechanism specifically created to initiate a nuclear process.

Furthermore, every condition that would affect the nuclear process would also influence any potential chemical change in the structure. It is important to remember that the local energy in a chemical structure is typically less than a fraction of an electron volt (eV) while a nuclear process involves energy levels greater than many kilo electron volts (keV), both as a cause and a result. These factors greatly limit the mechanisms capable of facilitating a nuclear process within a chemical environment. Fortunately, after 36 years of study, a clear path addressing this problem has emerged.[14]

The cold fusion process is now known not to use local energy to overcome the Coulomb barrier between the fusing nuclei. Instead, electrons offset the positive charge that keeps the hydrogen nuclei apart. These electrons are assembled in unknown ways in a special physical environment in a solid material. The generation of the power required for a practical energy source requires the correct identification of and the creation of these unique and rare sites. We now know that these sites can be created by conventional mechanisms consistent with normal chemical behavior and that they are observed to form only in certain locations. We need only to identify and create these sites on a large scale with total control. Nothing stands in the way of achieving this goal.

These sites are crucial because the electrons present reduce the Coulomb barrier between hydrogen nuclei, allowing their nuclear energy states to interact and potentially form a new element. However, because this critical electron environment is small and rare, identifying it poses significant challenges. As a result, the relationship between cause and effect is often based on speculation. Additionally, since this process occurs within a chemical structure, certain unique rules of this environment are frequently overlooked, leading to explanations that lack connection to accepted physical laws. Consequently, a large and conflicting array of explanations can distract from an effective search for the truth, making it difficult to justify the reality of the claimed energy to skeptics. How can we discover and gain acceptance for the correct explanation?

The environment necessary for fusion to occur is a normal chemical condition that can form at a low concentration in any material due to well-understood physical processes. I refer to this condition as the Nuclear Active Environment (NAE). The consequences of this ordinary process become detectable only when there is a significant concentration of the NAE in the material, hydrogen nuclei are present in the NAE, and the produced energy and nuclear products are measured using sensitive methods.

The challenge now is to increase the amount of this environment on purpose. Nothing else is required to make energy at useful levels. Increased temperature[15-18] and a current caused to pass though the material [3, 19-21] can be used to further increase the amount of power after some NAE has formed. Laser radiation applied to a surface will also amplify the nuclear process.[22-25] Each of these conditions is proposed to increase the local diffusion rate of the hydrogen nuclei, which would make them more accessible to the NAE. In short, the answer to the question asked above is very simple, without the need to propose complex mechanisms justified by complex equations.

The nature of the nuclear process itself remains a mystery, leading to several important questions. How can electrons be assembled in a physical void? How can they lower the Coulomb barrier? How is momentum conserved when only one nuclear product, helium, seems to be formed? The answers are expected to reveal an understanding about electron behavior that is new to science.

While finding answers to these questions is crucial for scientific understanding, they are not necessary for designing an effective energy generator. This is because the nuclear process occurs spontaneously after the NAE has formed and populated with two hydrogen nuclei. The amount of power generated depends solely on the number of NAE present in the material and the rate at which hydrogen nuclei can diffuse from their normal positions within the crystal structure to enter the NAE.

III. SUMMARY

The cold fusion effect has been demonstrated numerous times as a potential source of nuclear energy. This process involves applying a specific treatment to a material during which unique conditions are formed where fusion can occur when isotopes of hydrogen are present. The hydrogen nuclei can be made available using methods such as electrolysis, low-voltage gas discharge, or direct reaction with gas.

Increasing the temperature, passing an electric current through the material, or exposing the surface to laser radiation can enhance the power output. Various nuclear reactions can be triggered, leading to the production of ^{4}He, tritium, and transmutation products, depending on the hydrogen isotopes present in the material. Some of these nuclear products have significant economic value. Practical power generation can be achieved when the concentration of nuclear-active sites is sufficiently high. Heat energy is released without producing harmful radiation or dangerous nuclear byproducts. Additionally, energetic electrons are emitted, which could potentially be harnessed to directly generate useful electrical energy.[26]

Success in creating a practical source of energy using this very inexpensive and easily available fuel has significant political and economic consequences that need to be considered. Detailed information about the observed behavior can be found at the LENR.org.

ACKNOWLEDGEMENTS

The author is grateful to Prof. David Nagel, Ruby Carat, and Carol Storms for their help in making the text easier to understand.

AUTHOR DECLARATIONS

The author has no conflict of interest.

REFERENCES

[1] M. Fleischmann, S. Pons, M. Hawkins, Electrochemically induced nuclear fusion of deuterium, J. Electroanal. Chem. 261 (1989) 301-8 and errata in Vol. 263, 187-8.
[2] E.K. Storms, The status of cold fusion (2010), Naturwissenschaften 97 (2010) 861.
[3] E. Storms, Cold Fusion Explained, JCMNS 39 (2025) 249-85.
[4] E. Storms, The Nature of Cold Fusion (Cold Fusion Made Simple), JCMNS 38 (2024) 130-46.
[5] Y. Iwamura, J. Kasagi, T. Itoh, T. Takahashi, M. Saito, Y. Shibasaki, S. Murakami, Progress in Energy Generation Research Using Nano-Metal With Hydrogen/Deuterium Gas, JCMNS 36 (2022) 285-301.
[6] A. Takahashi, T. Yokose, Y. Mori, A. Taniike, Y. Furuyama, H. Ido, A. Hattori, R. Seto, J. Hachisuka, Enhancement of Excess Thermal Power in Interaction of Nano-Metal and H(D)-Gas, JCF20, 2020.
[7] I. Amato, Cold Fusion:Wanted Dead And Alive., Science News, 1990, pp. 14.
[8] J.R. Huizenga, Cold fusion: The scientific fiasco of the century, second ed., Oxford University Press, New York, 1993.

[9] S.B. Krivit, Fusion Fiasco, Explorations in Nuclear Research, Vol. 2-The behind-the-scenes story of the 1989-1990 fusion fiasco, Pacific Oaks Press, San Rafael, CA, 2016.
[10] E.K. Storms, The science of low energy nuclear reaction, World Scientific, Singapore, 2007.
[11] D. Nagel, Potential Correlations between Apparent Peaks in LENR Transmutation Data and Deuteron Fusion Screening Data, JCMNS 39 (2025) 2095-321.
[12] N. Rich, Losing Earth: A Recent History, Farrar, Straus and Giroux, NY, USA, 2019.
[13] E.K. Storms, The explanation of low energy nuclear reaction, Infinite Energy Press, Concord, NH, 2014.
[14] E. Storms, A New and Improved Understanding of Cold Fusion Based on the Observed Behavior, ICCF26, Morioka City, Japan, 2025.
[15] E. Storms, The Nature of the D+D Fusion Reaction in Palladium and Nickel, JCMNS 36 (2022) 377-94.
[16] G. Mengoli, M. Bernardini, C. Manduchi, G. Zannoni, Calorimetry close to the boiling temperature of the D_2O/Pd electrolytic system, J. Electroanal. Chem. 444 (1998) 155.
[17] G. Lonchampt, J.-P. Biberian, L. Bonnetain, J. Delepine, Excess heat measurement with Pons and Fleischmann Type cells, in: F. Jaeger (Ed) The Seventh International Conference on Cold Fusion, ENECO, Inc., Salt Lake City, UT, Vancouver, Canada, 1998, pp. 202.
[18] E.K. Storms, Use of a very sensitive Seebeck calorimeter to study the Pons-Fleischmann and Letts effects, in: P.L. Hagelstein, S.R. Chubb (Eds), Tenth International Conference on Cold Fusion, World Scientific Publishing Co., Cambridge, MA, 2003, pp. 183-97.
[19] F. Celani, O.M. Calamai, A. Spallone, A. Nuvoli, V. Andreassi, B. Ortenzi, F. Piastra, E. Righi, G. Trenta, E. Marano, P. Marini, V. di Stefano, M. Nakamura, E. Purchi, Development of a high temperature hybrid CMNS reactor, J. Cond. Matter Nucl. Sci. 6 (2012) 24-33.
[20] F. Tanzella, R. George, R.E. Godes, Nanosecond Pulse Stimulation in the Ni–H2 System, J. Cond. Matter. Nucl. Sci. 29 (2019) 202-10.
[21] M.R. Staker, How to achieve the Fleischmann-Pons heat effect, J. Hydrogen Energy www.sciencedirect.com (2022).
[22] J.P. Biberian, L.P. Forsley, P.A. Mosier-Boss, Transmutation of Palladium Induced by Laser Irradiation, JCMNS 37 (2023) 9-22.
[23] D. Letts, Highly reproducible LENR experiments using dual laser stimulation, Current Science 108 (2015) 559-61.
[24] D. Letts, D. Cravens, Laser stimulation of deuterated palladium, Infinite Energy 9 (2003) 10.
[25] J. Tian, L.H. Jin, B.J. Shen, Z.K. Weng, X. Lu, Excess heat triggering by 532 nm laser in a D/Pd gas loading system, in: D.L. Nagel, M.E. Melich (Eds), ICCF-14 International Conference on Condensed Matter Nuclear Science, www.LENR.org, Washington, DC, 2008, pp. 328-32.
[26] F.E. Gordon, H.J. Whitehouse, Progress in Understanding and Scaling Up the Lattice Energy Converter (LEC), JCMNS 39 (2025) 14-35.