Steps in Advanced Development for Cold Fusion Generator Prototype

Basic Research.
The last 30 years has involved Basic Research and experimentation of cold fusion technology. Many of the technical reports describing this research are available on the web in a publication library provided by the International Society for Condensed Matter Nuclear Science [click on https://iscmns.org/] and also through the LENR-CANR site [click on https://lenr-canr.org].

Design of the Mk12.31 Cold Fusion Generator.
A small group of scientists in Fairfax, Virginia combined the best scientific principles from its study of these and other technical resources over the last 25 years into the Mk12.31 cold fusion generator design discussed on this website. The design includes the following important advances:
(a) utilizes pressurized hydrogen and deuterium gas and proton-deuteron (p-d) reactions that should occur more easily in a cold fusion environment than other types of nuclear reactions.
(b) it is designed to produce 200 kilowatts (kW) of heat, which can be converted into mechanical horsepower sufficient to run an automobile or power homes in a community. Each p-d fusion will produce an atom of helium-3 and 5.5 MeV of energy from gamma radiation. About 2.3×10^{17} reactions per second will produce 200 kW.
(c) operates continually for longer periods than systems producing energy by transmutation or d-d fusion where their cathodes would be degraded more rapidly.
(d) gamma radiation energy is low enough to be absorbed and contained by the system's physical components.
(e) energy produced by each p-d fusion reaction is greater than the energy which could be produced by averaging types of d-d fusion. Less deuterium will be needed.
(f) deuterium and hydrogen are provided to the reaction in small, high pressure gas puffs that contain only a millionth of the quantity of gas ordinarily dealt with in conventional power systems.
(g) reactant gas (helium-3) is extracted and temporarily stored, enabling addition of deuterium/hydrogen gas for long period operations.

Three physical methods - high gas pressure, electric fields and thermal diffusion - are used to load the generator's cathode where cold fusion reactions occur. Thermal diffusion is supported by a quick-response heat exchanger/boiler with spray nozzles to cool the outer surface of the generator's reaction vessel. The design includes four gas manifolds consisting of pipes, fast-acting gas valves, gas measurement containers, and electronic temperature and pressure sensors to control gas flow. The design also includes a sophisticated electronic subsystem to monitor and control system operation. Patent application US2018/0087165 A1 provides additional detail. Readers who would like a list of references used should send a note to New Energy Power Systems LLC, P.O. Box 3825, Fairfax, VA 22038.

This system was designed to bridge the gaps between laboratory research systems and a commercially useful cold fusion device, and to ensure it can be manufactured and supported by industry. This design has a practical application as the prime power source in community-based power plants, and would be used along with solar, wind and geothermal power as alternative energy solutions to hydrocarbon fuel. Due to climate change, this innovation is urgent for homeowners, communities, and national governments.

Advanced Development.
This field of technology appears to be moving slowly from Basic Research into the next step of Advanced Development. Related physics and chemistry understandings are being consolidated, and several designs of cold fusion generators have been developed to produce measurable excess heat and reaction products indicative of cold fusion.

Advanced Development is expected to take significant industrial resources, time and money. Scientists and engineers in companies involved in Advanced Development of these systems will need an in-depth understanding of cold fusion processes and positive results obtained to date; and, work to investigate the different types of cold fusion reactions (fusion and transmutation) will need to be continued. Concepts to mitigate undesirable reactions, such as neutron formation, will need to be devised. Due to deuterium in the system, some tritium can be expected to be produced by the interaction of neutrons with deuterons. Steps will need to be taken to ensure that the tritium is contained. Detailed computer modeling of thermal and electrical system parameters will be required to simulate generator operation and to validate operational parameters for generator designs. The COMSOL Multi-physics simulation series of computer codes [click on https://www.comsol.com] is an example of modeling software that can be used in this process since it contains many types of supporting scientific data. Modeling results are expected to be used to refine and improve the system's various physical and electrical components. These data can also be used to refine steps in computer software needed for automatic system operation. During Advanced Development, all system components are required to be assembled into an improved prototype which is tested repeatedly to work out operational problems that could arise.

All components and parts of the Mk12.31 can be manufactured using standard production methods. The cathode can be made by high-pressure, metal powder consolidation and, thus, inherently contains a greatly increased number of individual reaction sites compared with cathodes made by other methods. The reaction chamber is designed to contain high gas pressures and temperatures during operation and also to be opened and closed for maintenance. Successful manufacturing of a prototype cathode, anode, reaction chamber and helium measurement system has been demonstrated. A prototype feedthrough assembly is shown in the above picture.