THE NUCLEAR ELECTROMAGNETIC SHAPING ACCELERATOR REACTOR (NESAR)

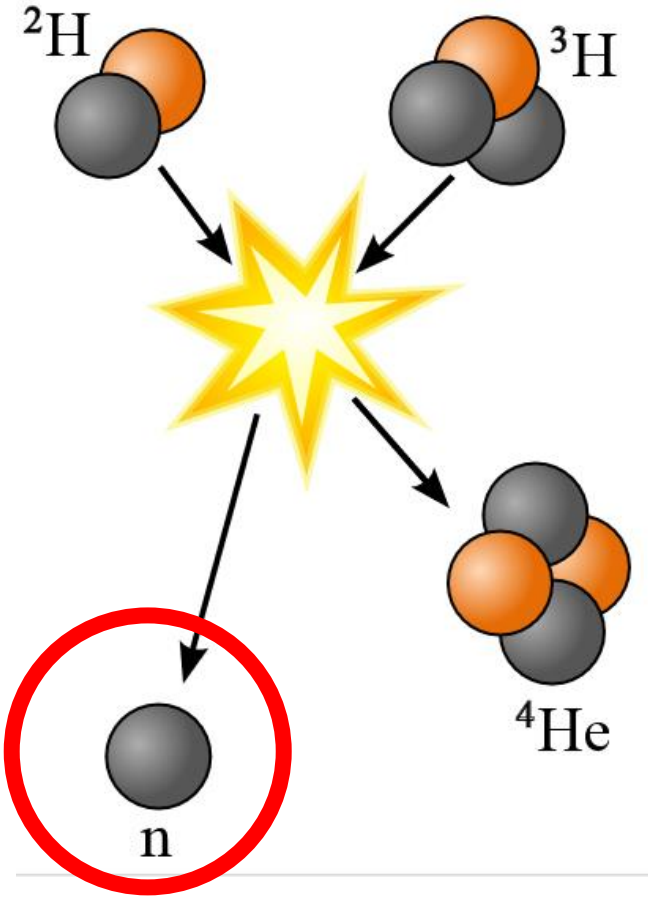
By Samuel Pierre Moss II

What is the NESAR

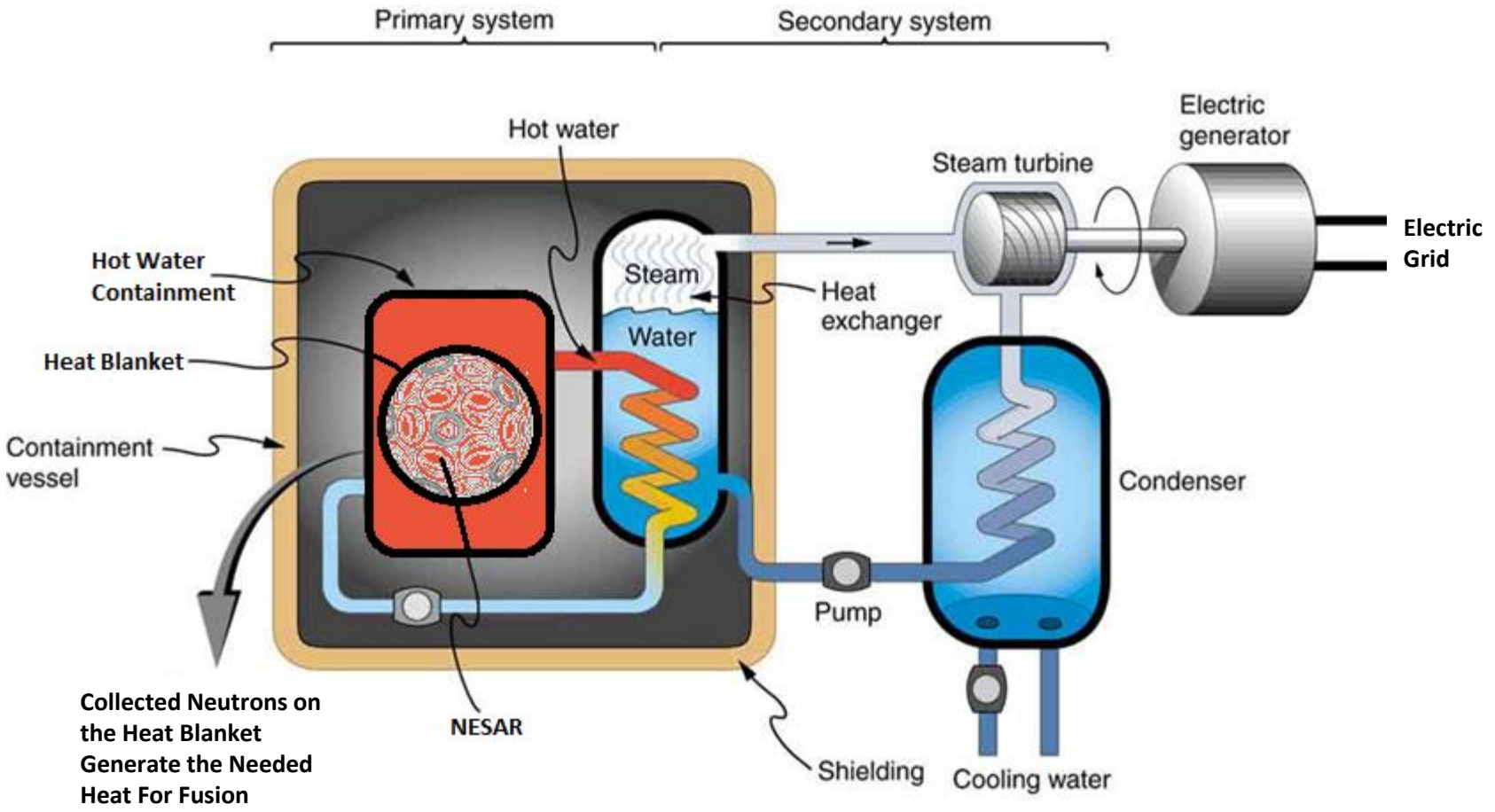
The NESAR is a patented magnetic confining device that is designed to truly simulate the capabilities of our own sun. This is the world's first Inertial Electrostatic Confinement fusion device that uses angled conductive magnetics to rotate and push charged particles past the magnetic cusps for an almost perfect confinement of electrons. These confined electrons are needed in creating a negative well potential with a single relative center for ions to accelerate towards. Having this single location for perpetuating ion collisions for fusion, maximizes the rate at which fusion occurs; which allows for a much smaller device to sustain effective fusion rates great enough to surpass the breakeven point.

What is Nuclear Fusion

Fusion is the process that powers the sun and the stars. It is the reaction in which two atoms combine or fuse. During the process of atoms fusing; effective production and collection of the released energy,
in the neutrons, allows for this process to be used as a sustainable method of energy. In the possible commercial use of fusion, deuterium and tritium are the most suitable fuel combination for producing fusion reactions



How Nuclear Fusion is Utilized for Energy



Why Nuclear Fusion Over Fission

- **Sustainability:** Fusion fuels are widely available and nearly inexhaustible. Deuterium can be distilled from all forms of water, while tritium will be produced during the fusion reaction as fusion neutrons interact with lithium. (Terrestrial reserves of lithium would permit the operation of fusion power plants for more than 1,000 years, while sea-based reserves of lithium would fulfil needs for millions of years.)

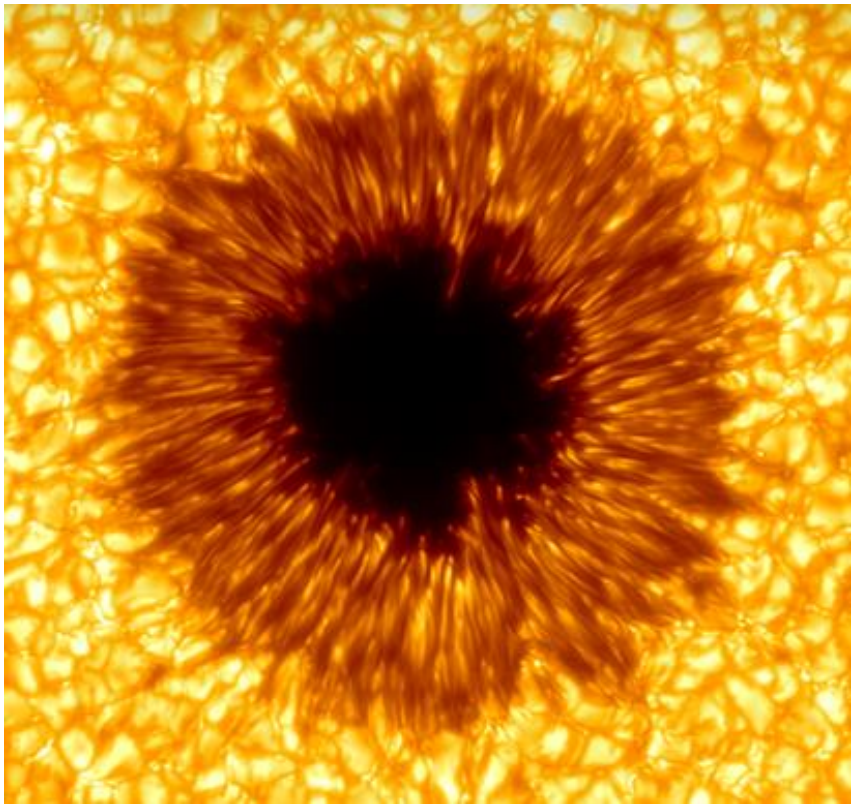
- **No CO_2:** Fusion doesn't emit harmful toxins like carbon dioxide or other greenhouse gases into the atmosphere. Its major by-product is helium: an inert, non-toxic gas.

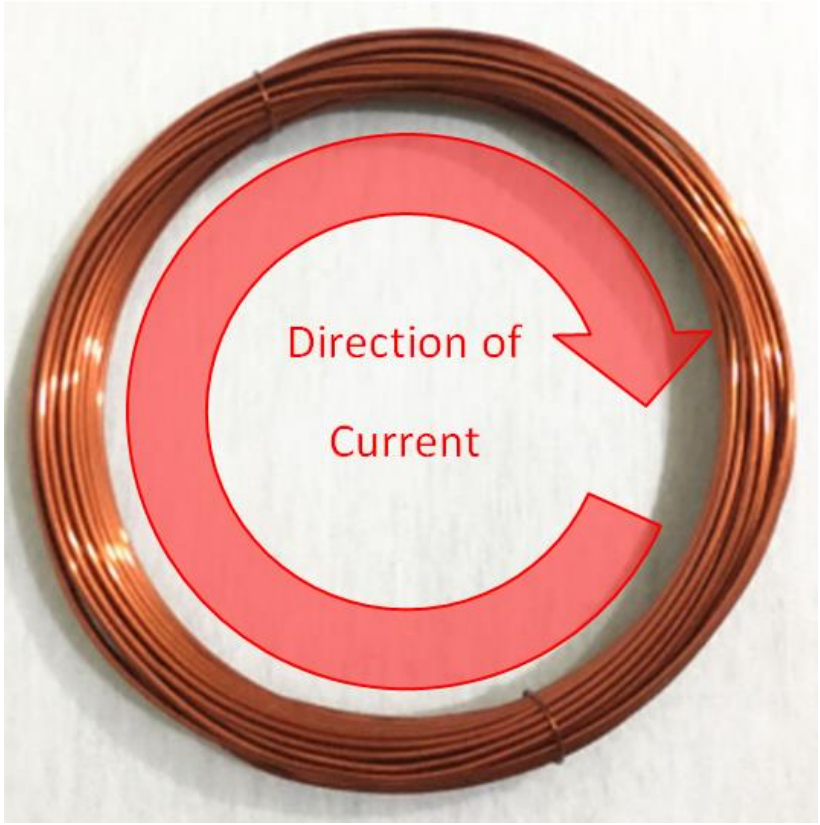
- **No long-lived radioactive waste:** Nuclear fusion reactors produce no high activity, long-lived nuclear waste. The activation of components in a fusion reactor is low enough for the materials to be recycled or reused within 100 years. Uranium fuel rods usually remain dangerously radioactive for 10,000 years.

- **Limited risk of proliferation:** Fusion doesn't employ fissile materials like uranium and plutonium. (Radioactive tritium is neither a fissile nor a fissionable material.) There are no enriched materials in a fusion reactor like ITER that could be exploited to make nuclear weapons.

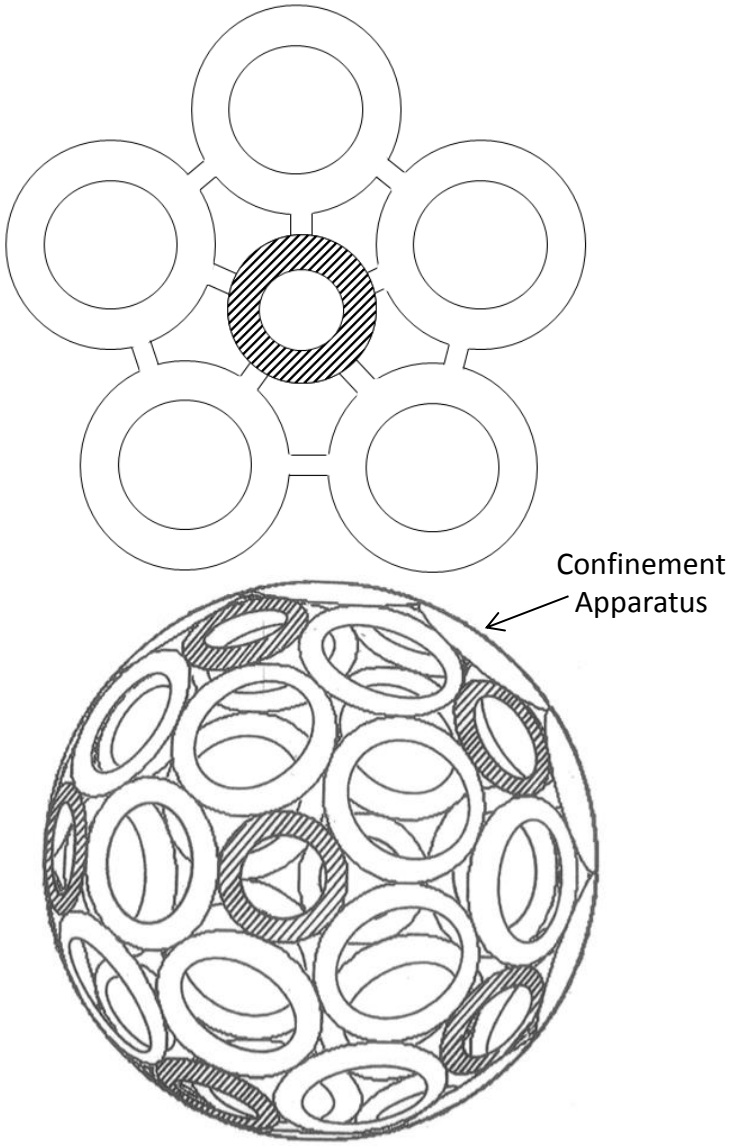
- **No risk of meltdown:** A Fukushima-type nuclear accident is not possible in a tokamak fusion device. It is difficult enough to reach and maintain the precise conditions necessary for fusion—if any disturbance occurs, the plasma cools within seconds and the reaction stops. The quantity of fuel present in the vessel at any one time is enough for a few seconds only and there is no risk of a chain reaction.

How the Sun Inspired the NESAR Design



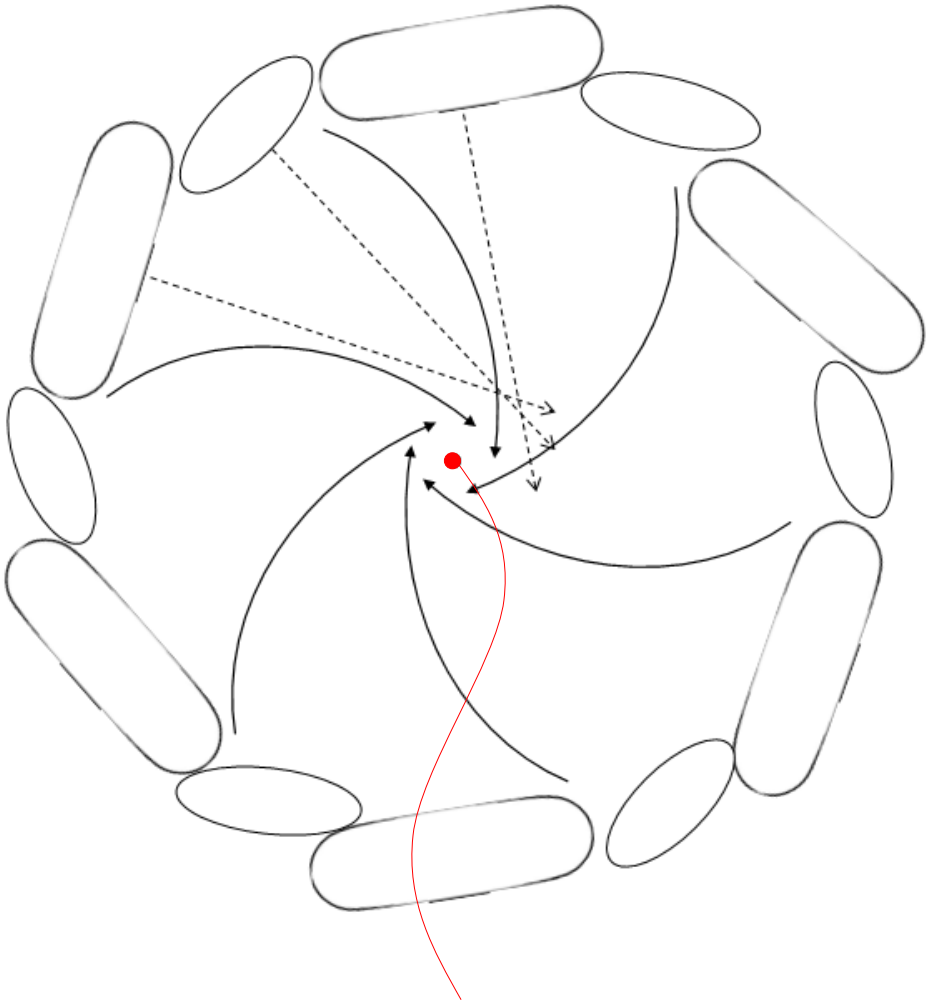


NESAR Fusion Principles



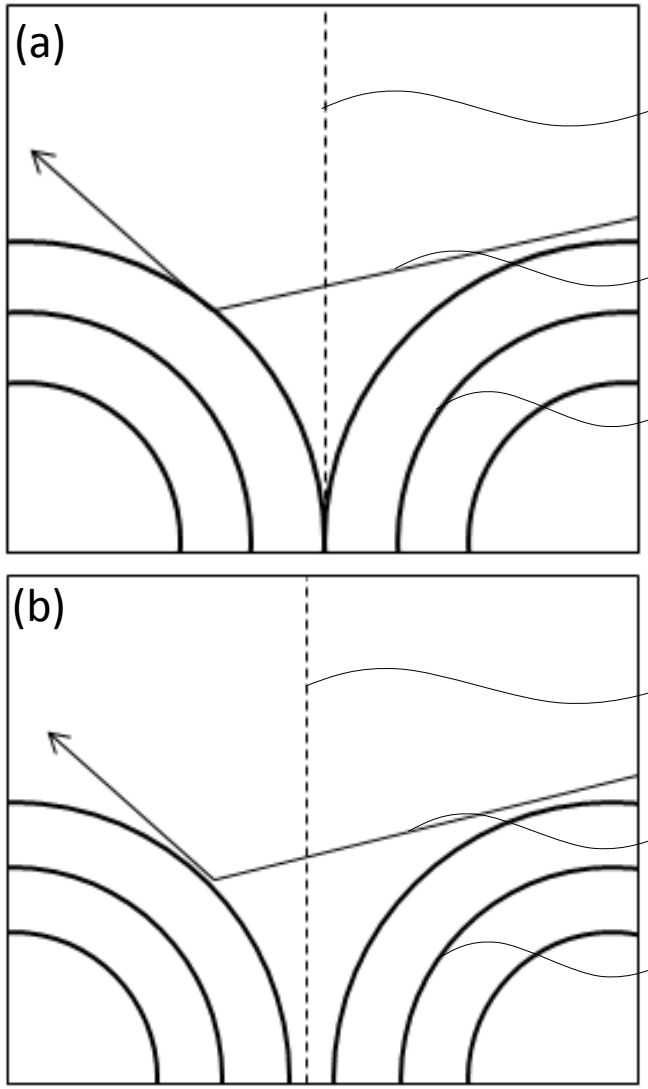
- The NESAR is a spherically shaped magnetic confinement apparatus mainly comprising of angled conductive coils within a vacuum chamber.
- The angled conductive coils are directed offset to the Single Relative Center Point. These angled conductive coils are directed to generate a general rotational motion to the confined charged particles. These charged particles are initially electrons. Initially the NESAR creates a rotating negative well potential made of electrons.
- Once a strong negative well potential is established; ions are then injected within the NESAR confines to accelerate towards the relative center point to collide and fuse.

NESAR Fusion Principles (con't)



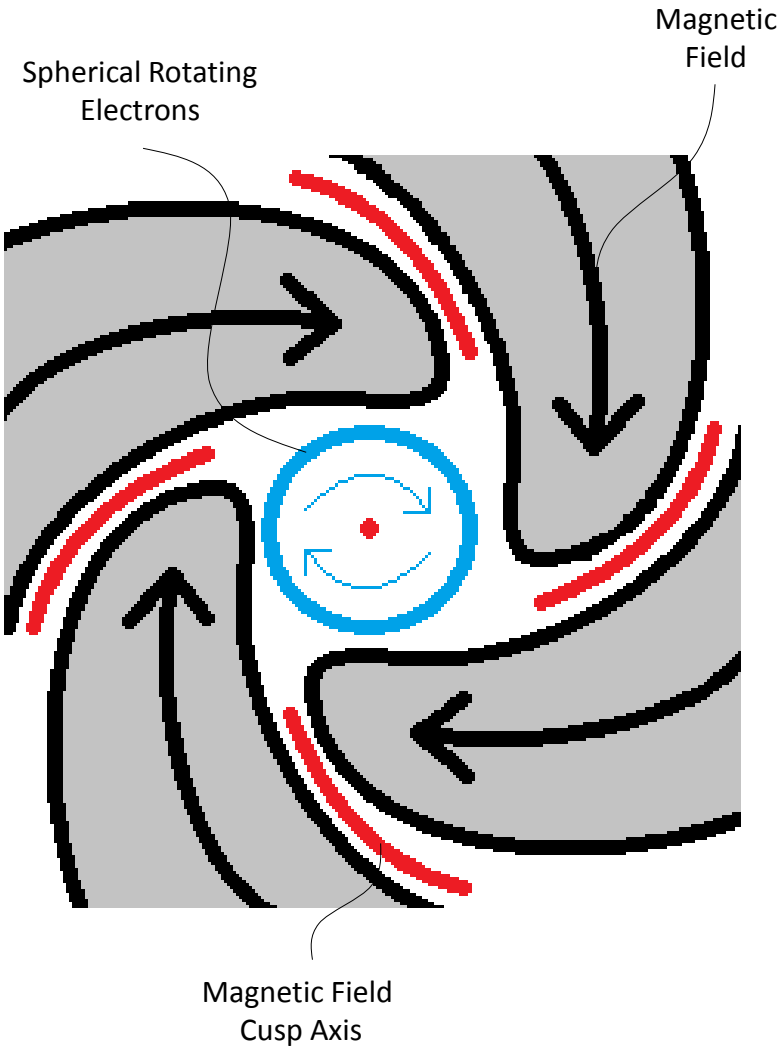
Depicted is a top view cross-section of the confinement apparatus. This cross-section depicts the angled conductive coils promoting a rotational pattern to the particles within the confines of the NESAR relative to a single center reference point. Below are the two different confinement options for the NESAR.

Confinement With Angled Coils



- The NESAR pushes confined electrons in a trajectory that is curved and perpendicular relative to the magnetic cusps. NESAR confinement is depicted in (a) and (b).
- Depicted in (a). When the pressure of electrons interacting with the cusps is low; electrons can easily be redirected back into the confines of the NESAR.
- Depicted in (b). When the pressure of electrons interacting with the cusps increases due to the increased confinement of electrons; the integrity of the NESAR confinement still confines and restricts the electrons from escaping even with widening distances between the cusps. This is in direct result to near perpendicular electron trajectories relative to the magnetic cusps.
- In addition, more perpendicular interactions between the confined electrons and the cusps; reduces the amount of direct force from the electrons upon the cusps to allow for the greater confinement of electrons at a much lower magnetic confining current.

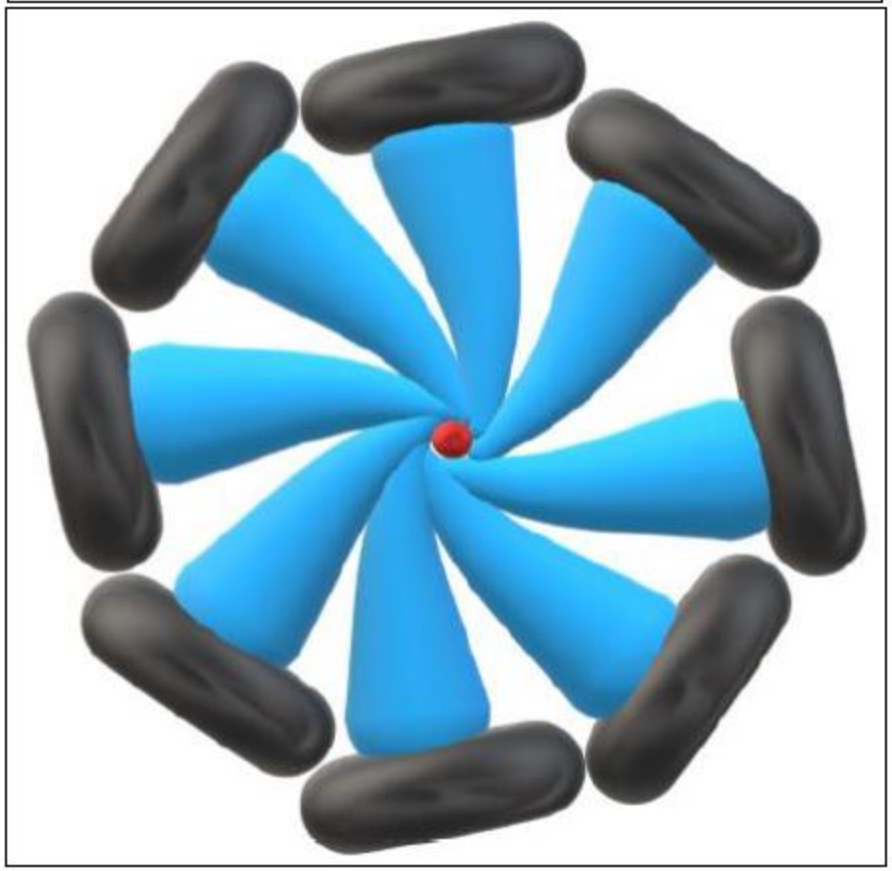
Confinement With Angled Coils



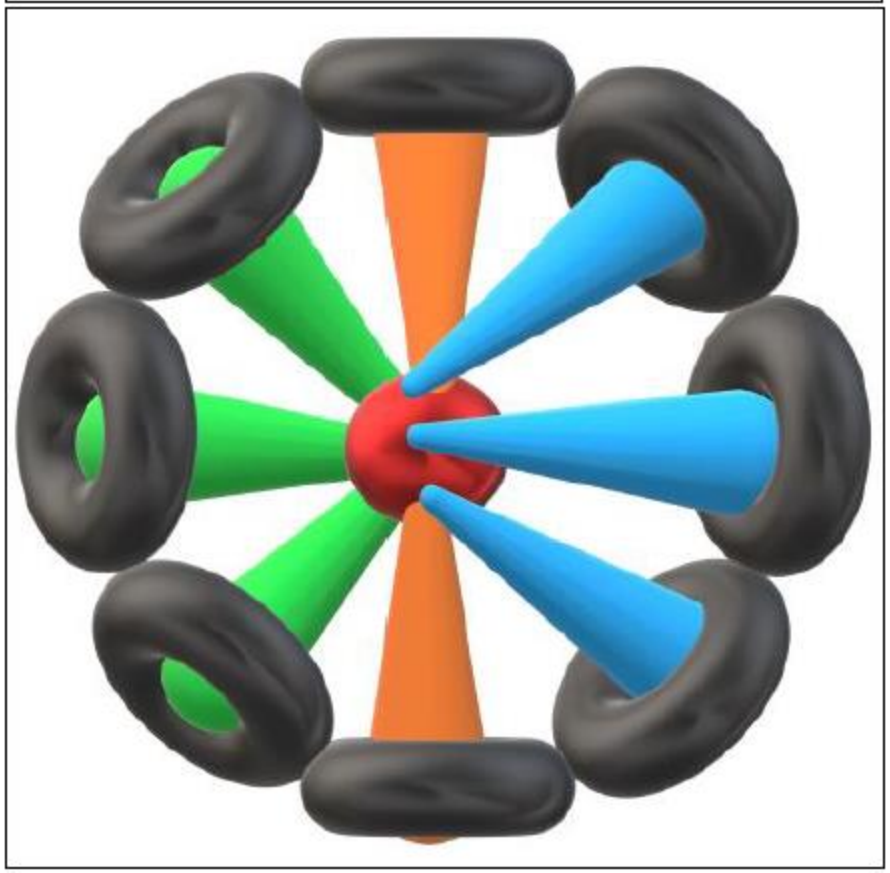
Once a spherical rotation pattern is established with the confined electrons; electron escape is almost impossible through the Magnetic Field Cusp Axis. To allow for any of the electrons to escape; the collective direction of the confined Spherical Rotating Electrons would have to be fully reversed in direction in order to allow for any electron leakage through the Magnetic Field Cusp Axis. The ineffective confinement of electrons is the main reason previous methods of magnetic cusp confinement has failed. The NESAR is the world's first magnetic confining method of fusion that attempts to correct the electrons losses from previous attempts by spherically rotating the confines about a relative magnetic center.

B Field Cross-Section View (All Angled)

Top Cross-Section View

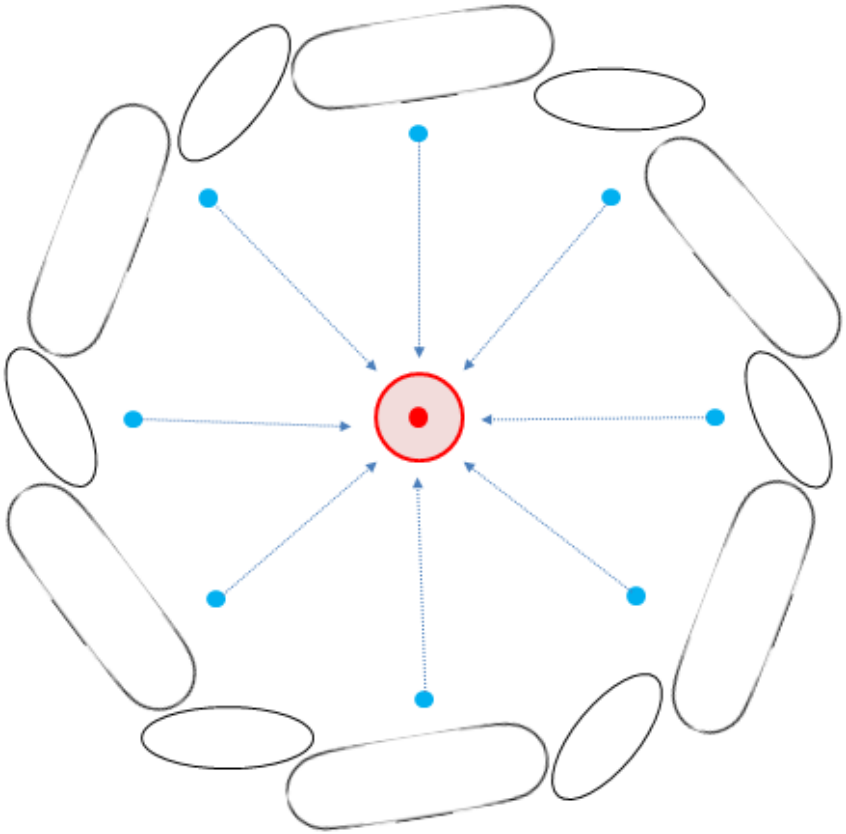


Side Cross-Section View



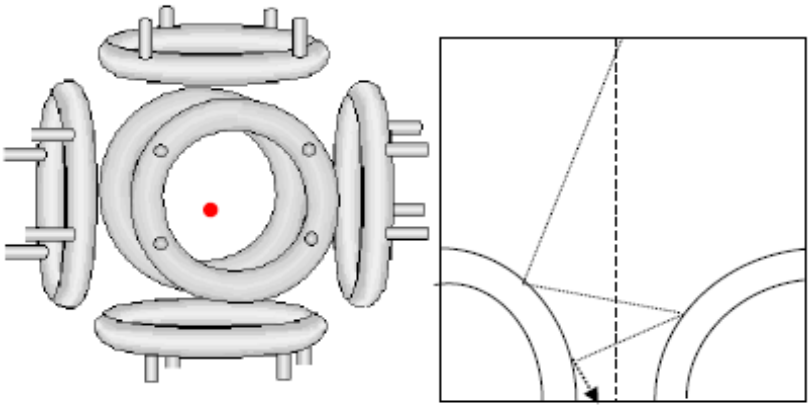
Negative Well Potential Fusion

Once the confines of the NESAR establishes a symmetrical spherical rotating collective of electrons; a negative well potential with a relative single point of fusion is created. Upon creating this relative center for fusion, positively charged ion fuel for fusion is able to be injected within the confines of the NESAR to then be electrostatically accelerated and heated towards a single location for maximum efficiency in fusion collisions. Having a relative single point for perpetuating fusion maximizes the rate of fusion; which allows for the NESAR to produce sustainable fusion energy at a much smaller size than other fusion reactors.



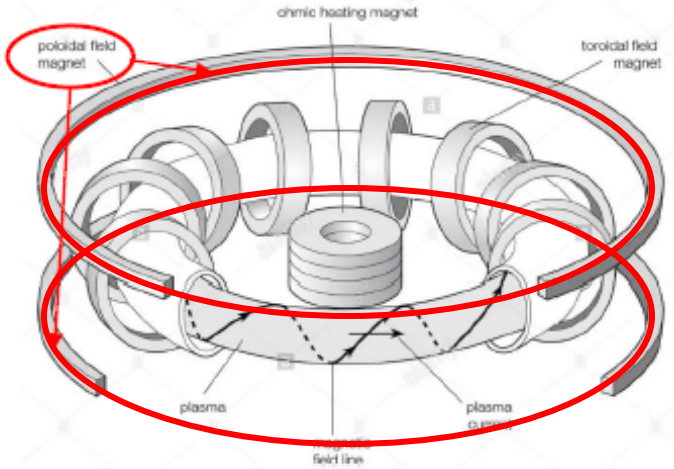
Why Polywells and Tokamaks Will Never Provide Sustainable Fusion

POLYWELL



Polywells will never meet the breakeven point of fusion for the simple reason that not rotating the confined electrons allows for more parallel interactions between electrons and the confining magnetic cusps. Once the confinement pressures increase to a certain level, the widening cusps allows for an escape for the confined electrons.

TOKAMAK



Tokamaks will never be sustainable because the confined plasma/charged particles' current travels parallel to the poloidal field magnets. These parallel trajectories causes the confined plasma to attract toward the confinement wall and poloidal field magnets; which results in the parallel currents pinching the magnetic fields of the toroidal field magnets. This type of magnet alignment results in Magnetic Reconnection.

Improved Net Power With NESAR

Net Power = (Fusion Rate - Conduction - Radiation) X Efficiency

Fusion Rate – **Increased**, Ions are accelerated to the Single Relative Center Point.

Conduction – **Reduced**, loss of electrons reduced due to improved cusp confinement

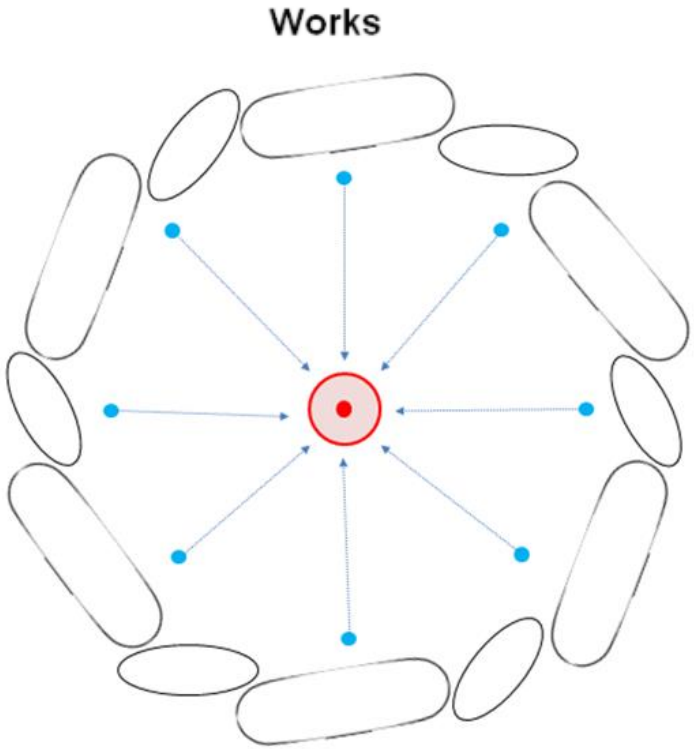
Radiation – **Reduced**, denser confined plasma is confined for reabsorption of radiation

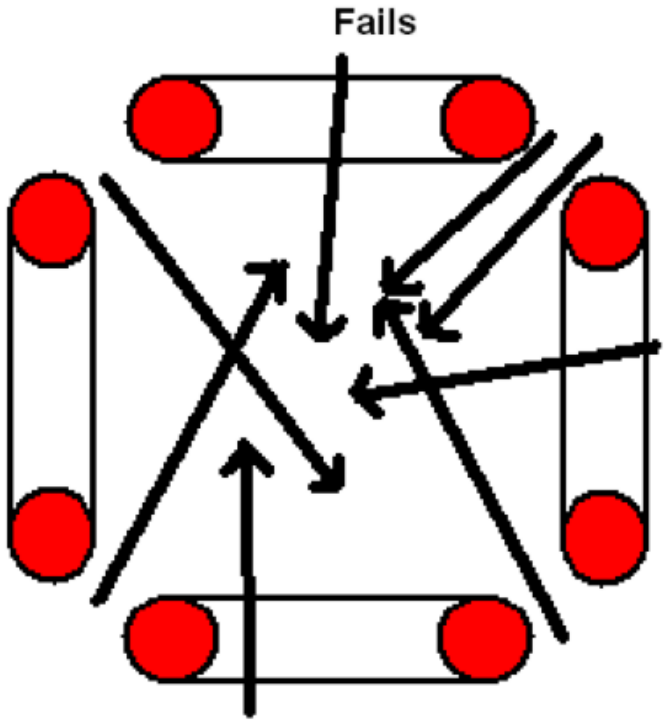
Efficiency – **Same**, by using Ions from hydrogen isotopes as fuel for method of fusion

Net Power – Overall Improved

Ion Focus

One of the major issues with the Polywell is that its ion focus is low. This means that the ions that are accelerated for collision to perpetuate the fusion process are drawn to more random areas within the confines, which reduces the system's fusion rates. Polywell ion focus is depicted in the picture on the right. Since the NESAR will creates a symmetrical rotating sphere electrons within the confines, a single relative location where the well is maximized is created for ions to accelerate towards. The NESAR ion focus is depicted in the picture to the left.





Why the NESAR is Better Than the Polywell and other IECs

The NESAR addresses and corrects almost all of the issues Dr. Todd Rider had with previous methods of magnetic confinement devices. Below are a list of his main concerns and how they are alleviated with the NESAR:

- **Ion-Formation** - The NESAR's confined electrons spherically rotating about the Single Relative Center Point, causes injected and accelerated ions for fusion to approach the same single relative point instead of an ambiguous location within a blob of confined electrons. Accelerating ions to a single relative location improves ion collisions and heat yields for fusion. Thus improving fusion rate.
- **Structure** – The NESAR is a rotating sphere
- **Re-Circulation** - The NESAR spherically rotating the confined charged particles alleviates the Re-Circulation issues.
- **Energy Distribution** - The NESAR driving the electrons to rotate in a spherical shape evens out the electron distributions, which reduces instabilities.
- **Arcing** - The issues with Paschen arcing are greatly alleviated due to complete uniformity of the confines within the NESAR.
- **Trapping** - The electrons interacting perpendicularly at the magnetic cusps have the possibility to fully eliminate electron losses.

3D Simulation and Prototype Variables to Consider

- Off-center angle of confining magnetic coils. Possible range: 1 to 30 degrees.
- Diameter of each confining magnets coil. 3 to 6 inches.
- Diameter of the confining apparatus. 8 to 30 inches.
- Field strength of each confining magnet. Weaker than WB-8 at 0.8 Tesla.
- Design of confining magnets on confining apparatus. All same size diameter vs different diameters.
- Total Number of confining magnetic coils. Minimum of 12. The more confining magnetic coils on the confining apparatus, the greater reduction in electron escape.

Conclusion

The NESAR Fusion Reactor is an IEC device that has addressed and corrected all of failure issues that previous researchers had with previous IEC devices. With the NESAR's vast improvements upon previous models coupled with the possible overwhelming financial and environmental benefits; it is extremely logical to pursue the capabilities of this very novel method of fusion. If the NESAR is proven to work, the World may be forever changed for the better.