



SOLUTION BRIEF



PEAK FOR FUSION ENERGY



# 2-4X MORE ENERGY THAN INDUSTRY STANDARD

## NANOPLEX FOR FUSION ENERGY

- NanoPlex is 100% US-engineered and manufactured - no reliance on China.
- NanoPlex based capacitors can store up to 2-4X more energy than industry standard BOPP-based capacitors.
- NanoPlex based capacitors can offer higher energy density, resulting in 50% reduction in capacitor size versus traditional BOPP capacitors.
- NanoPlex-based capacitors can enable smaller devices with lowered inductance, making laser based fusion reactors more efficient.
- NanoPlex based capacitors can last up to 3-5 longer than industry standard BOPP, reducing the TCO of fusion energy generation systems.
- NanoPlex based capacitors can be rated up to 135 degrees C, which is over 35 degrees C better than conventional capacitors, resulting in longer operational lifetimes..



## PEAK NANOPLEX™ FILMS FOR FUSION ENERGY

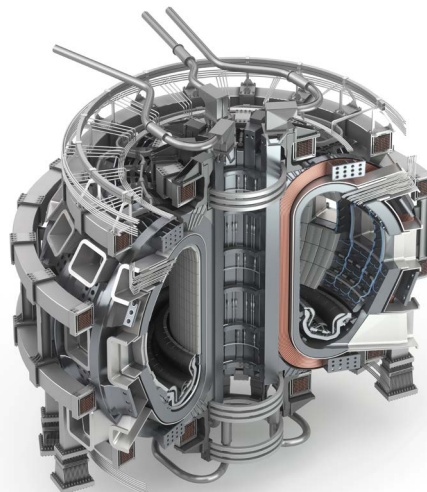
### NanoPlex Optimizes Fusion Energy

Fusion energy powers our sun and all the stars in the universe. The process is theoretically simple. Hydrogen atoms can be superheated, fusing together, producing helium and clean energy. The implementation is a bit more complicated and requires hundreds of high-powered lasers or magnets to recreate the fusion process in a controlled manner. Peak's NanoPlex films are being incorporated into next-generation high-performance capacitors to provide the massive bursts of power required to power those lasers and magnets, increasing fusion effectiveness, efficiency, operational lifecycles, and production readiness.

### 4 Ways NanoPlex Helps Fusion Energy

Fusion energy has the potential to provide nearly unlimited amounts of clean energy. Reaching the mass market for fusion energy requires reactors to be cost-effective, with lower operating costs, and deliver a stable and predictable energy source to become a viable replacement for the current power plants. At Peak, we see four ways NanoPlex based capacitors can achieve these objectives:

- 1 Improving Fusion Power Generation** - NanoPlex based capacitors will enable fusion power plants to improve their power generation efficiency ratio (power required to generate fusion vs the power multiple produced for consumption), which drives/lowers the cost per kilojoule.
- 2 Stronger Power Bursts** - NanoPlex based capacitors can store up to 2-4x more energy than industry standard Biaxially Oriented Polypropylene (BOPP) capacitors, enabling fusion reactors to be smaller and more efficient.
- 3 Optimize Reactor Up-Time** - NanoPlex based capacitors will have up to 3-5x longer lifetimes than BOPP capacitors based on improve temperature ratings.
- 4 Lower Operational Cost** - NanoPlex based capacitors will lower the cost of operating and maintaining fusion power plants, increasing power generation, improving uptime, and reducing the power plant's footprint to house pulsed power capacitors.





## NanoPlex Optimizes Fusion Energy

Fusion energy has the potential to provide nearly unlimited amounts of clean energy. The process is simple: hydrogen nuclei are super-heated, causing them to fuse and release significant amounts of energy. Implementing this to be self-sustaining and generate usable power is a little more complex. Two of the leading technologies for utilizing nuclear fusion to generate electrical power are:

- 1 | **Pulsed Laser Inertial Confinement:** Sandia's Z-Machine leverages lasers to heat and compress a hydrogen fuel pellet, causing fusion. The energy release is captured for the utility grid.
- 2 | **Pulsed Magnetic Compression:** A super heated plasma is contained within an hourglass-shaped magnetic container. The magnetic field strength is increased at either end of the hourglass to rapidly compress the superheated fuel, resulting in fusion and power for the utility grid.

## Peak is The Leader in Nanotechnology Metamaterials

Peak's NanoPlex is a new generation of metamaterial that can be programmed and optimized for various applications. Our researchers, scientists, and engineers develop solutions based on our NanoPlex metamaterial. NanoPlex provides three core capabilities that change how we can control and manage light, power, and structural strength.

- 1 | **Optimized Power Storage** – Capacitors based on NanoPlex can be used for electric vehicles, Electromagnetic Aircraft Launch Systems (EMALS), fusion energy, and scaling and stabilizing power grids.
- 2 | **HawkAI Optics** – Our Layered Gradient Refractive Index (LGRIN) lenses, made from NanoPlex, improve the field of vision (FOV), color clarity and distance of optics, for night vision goggles, fire control systems, and UAS reconnaissance.
- 3 | **Environment and Light Management** – NanoPlex films can manage and reduce radiation and thermal cooling to protect equipment and stabilize operating temperatures in sensitive applications like satellites and aerospace applications.

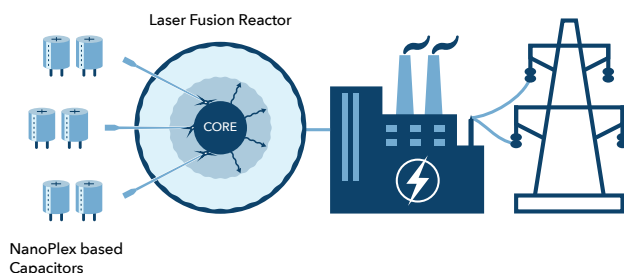
**Fusion reactors will require “Warehouses of Capacitors.”**

Randy Curry | Director of Fusion Energy | Sandia National Laboratories

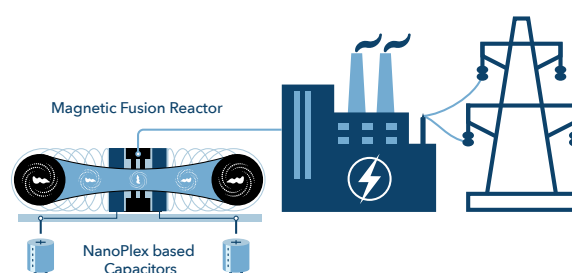


Sandia  
National  
Laboratories

### Pulsed Laser Inertial Confinement



### Pulsed Magnetic Confinement



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