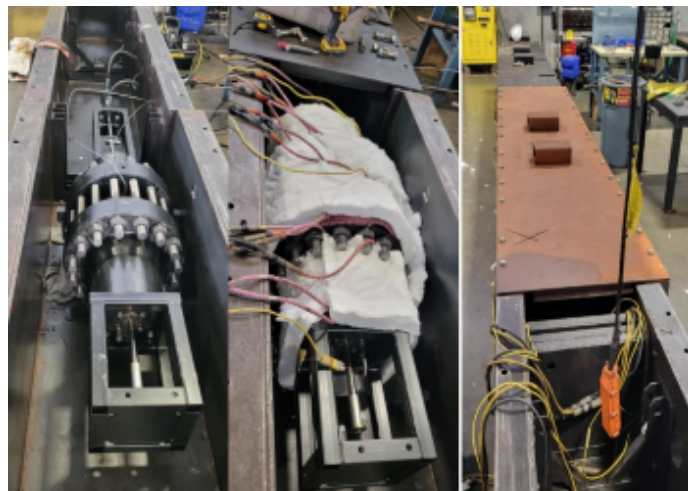




The hardest engineering problems don't get easier the closer you get to hardware, they get more specific. This month we're sharing a first-of-its-kind system deployment, three active federal programs, and a technical white paper with seven years of real system builds in the making. If any of it connects to what you're working on, we'd love to hear from you.



Czero & Quixik Support GTO Technologies' EGS Development

Geothermal energy delivers what many other renewables cannot: continuous, baseload, carbon-free power independent of weather or time of day. The next-generation geothermal sector is accelerating rapidly advances in drilling, reservoir stimulation, high-temperature downhole tools, and subsurface characterization are making it more

technically and commercially viable. Enhanced Geothermal Systems (EGS) take this further by engineering the subsurface heat exchanger directly. Rather than relying on naturally occurring hydrothermal reservoirs, EGS injects high-pressure fluids and proppant to develop a fracture network, enabling water to circulate and use the Earth as a downhole heat exchanger for power production at surface dramatically expanding where geothermal can be developed.

GTO Technologies, a Colorado School of Mines spinout founded by Dr. Will Fleckenstein and Patrick Mays, is developing a next-generation conformance control system for EGS that addresses a key limitation of conventional plug-and-perf methods: the lack of effective conformance control. Their system introduces a regulator that enables precise control of flow through each fracture, allowing for more uniform water distribution across the fracture network, essential for maximizing power production and extending system life. The design maintains full-bore flow to minimize wellbore friction and reduce parasitic losses, and incorporates a three-position sleeve with a pump-down actuator or 225°C tractor (also developed by GTO) to regulate flow between wells while reducing overall size, cost, and complexity compared to traditional approaches.

Czero and our in-house machining and fabrication team at [Quixik](#) are supporting GTO's Generation 2 sleeve development through design, analysis, manufacturing support, and testing. Our work focuses on developing a robust, field-ready architecture through rigorous modeling, detailed engineering, and validation.

"Czero has brought world-class engineering and problem-solving to the complex problems of flow control, seal design, and system manipulation in an extremely harsh operating environment." - Patrick Mays, Co-founder & COO, GTO Technologies

[Read Further](#)



THREE ACTIVE ARPA-E PROGRAMS

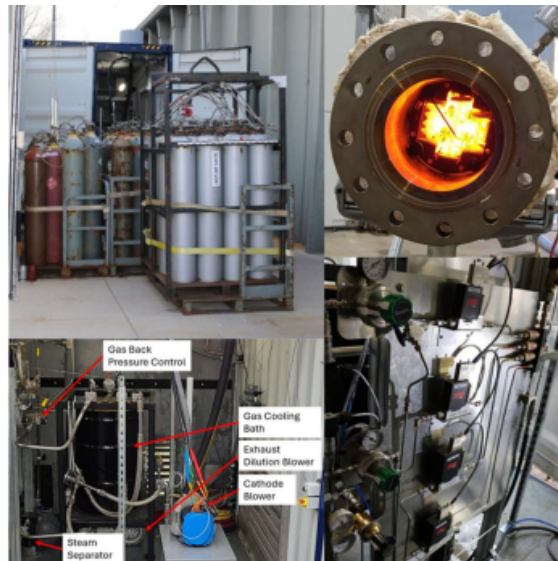
Czero is currently engaged as subawardee across three federally funded ARPA-E programs spanning energy storage, emissions reduction, and e-fuels synthesis.

The JOULES-1K program, led by Johns Hopkins University, is targeting energy storage systems with densities exceeding 1,000 Wh/kg — a 4x improvement over conventional batteries — using a Direct Liquid Fuel Cell operating on Liquid Organic Hydrogen Carriers. Phase I demonstrated the concept at lab scale; Phase II scales to a 1 kW demonstration system. Czero leads integration, build, and test. PI: Chao Wang, Johns Hopkins.

The AMPLIFY program, led by Marquette University, focuses on reducing methane slip from natural gas-fired lean-burn engines using a novel non-premixed, prechamber-enabled combustion process. Phase I proved the concept on a single-cylinder Caterpillar engine; Phase II targets a large-bore 2-stroke engine widely used in natural gas transport. Program partners include Cooper Machinery Services, Dumarey, and the University of Wisconsin-Madison. PI: Adam Dempsey, Marquette.

The OFF GRID program, led by Nexceris, aims to transform stranded renewable energy into hydrocarbon-rich liquids for fuels and chemicals via a novel methanol synthesis approach. A key innovation is the integration of catalyst packaging with a water-separating membrane that overcomes conventional equilibrium limits and enables single-pass conversions exceeding 90%. Partners include Heatpath Solutions, Tonkomo, Molecule Works, and Washington State University.

[Read More Here](#)



WHITE PAPER: SOFC/GT HYBRID POWER SYSTEM

This white paper documents what a 50 kWe Solid Oxide Fuel Cell/Gas Turbine hybrid power system actually takes to build, integrate, and test developed under ARPA-E's INTEGRATE Phase II program alongside Nexceris and Brayton Energy. The architecture produces electricity from natural gas at substantially higher efficiency than conventional turbines alone, and at scale is a strong candidate for powering data centers without relying on grid interconnects.

The system integrates a pressurized SOFC with a Brayton cycle gas turbine, targeting 70%+ fuel-to-electrical efficiency. Key design parameters include 850°C SOFC operation, 930°C turbine operation, and 90,000 rpm turbomachinery, with high-temperature anode recirculation, partial on-anode reforming, and dilute combustion of anode tailgas for secondary power generation.

Czero led system modeling, architecture design, detailed mechanical design, fabrication, controls development, and testing across the program. Our methodology included high-fidelity dynamic modeling in MATLAB/Simulink, FEA and CFD to support and iterate on mechanical design decisions, and Software-in-the-Loop testing to evaluate startup and shutdown transients and fault scenarios before hardware commissioning.

[Download the Whitepaper](#)

NEW: STARTUP ONE PAGER

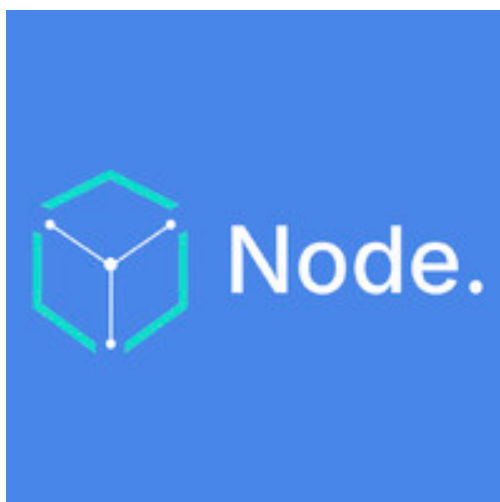
We've been in the room with a lot of early-stage teams this month at NLR IGF, the ARPA-E Summit, and CERA Week, and the same question keeps coming up: how does working with Czero actually look? We put together a one-pager that spells it out, from a short initial call to assess fit through detailed scope development, disciplined execution, and proposal support for government-funded programs. In almost all cases, IP developed is assigned to our clients.

With 450+ projects completed, 50+ subawards, and a 16,000 ft² facility with in-house build and test capabilities, we're built to act as an extension of your team taking on as much or as little of the work scope as needed, and scaling on the fly. If you're a startup or innovation team navigating a hard engineering problem, reply to this email and we'll tell you honestly whether we're a fit.

[Read Our One-Pager](#)

[Schedule a Meeting with Us](#)

NODE CLIMATE PARTNERSHIP



Node Climate is accelerating the deployment of first-of-a-kind climate infrastructure by connecting project financiers, EPCs, and offtakers in one collaborative space with a clear mission to increase the pace and success rate of FOAK climate projects. We've joined as a

trusted engineering service provider. FOAK projects require deep technical expertise and collaborative problem-solving, and it's an area where Czero has been contributing for years.

[Learn More About Node](#)

Upcoming Events: Let's Connect

We're thrilled to share our progress and connect with the community at several upcoming events. If you'll be attending any of these or in the area, we would love to connect!

[Boston - Boston Climate Week & Climatech - May 3 - 10](#)

[Las Vegas - ACT - May 4 - May 7](#)

We're Hiring

Our team is growing! If you thrive on clarity, ownership, and seeing complex systems work—not just in slides, but in hardware—we should talk.

Controls
Engineer - Full
Time

Mechanical
Engineer - Full
Time

Mechanical
Engineer - Part
Time

Czero

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