

Fire-and-Iron Kinetic Generator System (FIKGS)

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Type: Self-powered hybrid thermomechanical-electrical generator system

Core Idea

This system converts waste heat or fire energy into mechanical motion, stores it using a gear and spring system,

and then transforms it into electrical power using a generator, inverter, and power controller.

It is designed to be off-grid, modular, and efficient, making it ideal for remote use, emergency preparedness, and sustainable energy applications.

How the System Works (End-to-End)

1. Energy Source: Heat or Manual Motion

- Powered by a heat source (campfire, stove, industrial waste heat) or a manual crank, pedal, or kinetic source.

2. Thermal Expansion (Fire & Iron Mechanism)

- A metal rod or bar is heated and expands in one direction, pushing with force.
- The force is captured by a lever-arm or piston, which begins a mechanical cycle.

3. Mechanical Energy Capture & Storage

- The lever transfers energy to a staged gear system.
- A spring or flywheel stores the energy temporarily.
- Stored motion can be released immediately, delayed, or combined with manual winding.

4. Conversion to Electricity (Kinetic Generator)

- The spring unwinds and spins a BLDC motor or dynamo, acting as a generator.
- Mechanical rotation is converted to electrical energy (AC).

5. Electrical Conditioning (Inverter & Controller)

- A bridge rectifier converts AC to DC.
- A smart power controller regulates the energy.
- Optional storage in batteries or capacitors.
- DC-AC inverter powers devices or connects to the grid.

6. Energy Output

- Final output delivered to: AC inverter, USB/DC ports, or grid.

Key Innovations

- Fire-to-Electricity: Uses waste heat directly - no combustion or fluids.
- Mechanical Storage: Spring + gear stage offers buffer before generation.
- Kinetic Generator: Modular input from pedals, cranks, fire, or vibration.
- Smart Regulation: MPPT or logic controller maximizes output quality.
- Modular Output: USB, 12V DC, 120V AC, or battery charging.

Use Case Scenarios

- Campfire Survival Unit
- Bike + Fire Hybrid Power Kit
- Industrial Waste Heat Recovery
- Emergency or Remote Village Grid

System Efficiency

Stage	Efficiency Range
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Thermal to Mechanical	40-80%
Mechanical to Spring	90-95%
Gearing & Generator Output	70-90%
Inverter + Controller	80-95%
Net Output Efficiency	25-60%

System as a Functional Whole

The Fire-and-Iron Kinetic Generator System is a closed-loop hybrid energy platform. It takes low-grade energy inputs-

heat and motion-and turns them into regulated, reliable power through a blend of solid-state thermomechanics and modern electrical control. Its minimal-maintenance design, modularity, and adaptability make it a revolutionary off-grid power solution for both developed and developing environments.