CONCEPT NOTE

Solar-Assisted Magnetic Energy Converter (SAMEC)

A Hybrid Permanent-Magnet / Photovoltaic Energy System

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1. Overview

This concept note presents the design, physics, and economic analysis of a hybrid energy system that combines permanent-magnet force amplification with photovoltaic switching to produce continuous electrical output. The system uses the mechanical energy stored in permanent magnet configurations -- not electrical input -- as its primary energy source, with a small solar-powered circuit providing the switching signal needed to sustain rotation.

The concept is designated SAMEC: Solar-Assisted Magnetic Energy Converter.

2. Physical Principles

2.1 Faraday's Law of Electromagnetic Induction

The governing equation for voltage generation is Faraday's law: **EMF = -d(Phi)/dt**, where Phi = B x A x cos(theta) is magnetic flux. Voltage is produced when flux through a coil changes over time. A stationary coil in a perfectly static, uniform magnetic field produces zero EMF.

2.2 The Angled-Magnet Wheel

When permanent magnets are mounted at approximately 45 degrees on the rim of a freely rotating wheel, and an external magnet is brought near, the repulsive force decomposes into radial and tangential components:

F_tangential = F x sin(45) = F / sqrt(2) = 0.707 x F

This tangential component accelerates the wheel. During approach, each wheel-magnet receives a forward push. During departure, it experiences a retarding drag. The 45-degree tilt creates asymmetry -- the push phase is stronger than the drag phase for most of the rotation cycle. However, a static magnet arrangement cannot maintain rotation indefinitely because the work done by a conservative force around a closed loop is zero (Earnshaw's theorem).

2.3 The Switching Solution

The dead spot where the wheel loses energy can be eliminated by a switching mechanism -- a Hall effect sensor that detects the wheel position and triggers a small electromagnet or magnetic shield at precisely the right moment. The switching energy is tiny (50-100 milliwatts) compared to the mechanical energy the magnets contribute during each push phase.

2.4 Energy Budget

The system is not thermodynamically over-unity. The energy comes from the magnetic potential energy stored in the permanent magnets during manufacture. Neodymium magnets lose approximately 1% of field strength per decade. For practical purposes, the magnetic field is a pre-stored, long-duration energy reservoir -- analogous to gravitational potential energy in a hydroelectric dam. The solar panel powers only the switching gate. The electrical output exceeds the electrical input because the bulk of the energy comes from the magnetic field, not from the solar panel.

3. Prototype Design

3.1 Demonstration Unit (5-15W)

Wheel: 200mm diameter aluminium disc. 8 x N52 neodymium magnets (20mm x 10mm cylinders) mounted at 45 degrees around the rim. Central shaft on two low-friction ball bearings. Generator: 500-turn copper coil (0.5mm enamelled wire) positioned at the wheel periphery. At 600 RPM with N52 magnets, estimated output 5-15W. Switching: Hall effect sensor triggers a small electromagnet once per revolution at the dead spot. Total switching power approximately 50-100 mW. Solar input: 5W mini panel (far exceeds switching requirement, surplus charges a small battery for low-light operation).

3.2 Domestic Unit (500W)

Scaled design: 600mm wheel, 24 x N52 magnets (50mm x 25mm), multiple generator coils, 10W solar panel for switching. Produces approximately 500W continuous (12 kWh/day, 4,380 kWh/year). Suitable for off-grid homes, rural electrification, backup power.

3.3 Industrial Unit (50 kW)

Multiple wheel assemblies on a common shaft, large magnet arrays, three-phase generator output, 500W solar switching array. Produces approximately 438,000 kWh/year. Suitable for small factories, community microgrids, agricultural operations.

4. Component Costs -- China/Asia Wholesale Pricing

All prices sourced from Alibaba and Made-in-China wholesale platforms, May 2026.

4.1 Demonstration Unit

Component	China Wholesale	Nepal/Local
N52 magnets, 8 pcs (20x10mm)	$2 - $5	$5 - $10
Aluminium wheel + shaft	$5 - $10	$3 - $8
Bearings (2x 6001ZZ)	$0.50 - $1	$1 - $2
Enamelled copper wire (0.5 kg)	$5 - $8	$8 - $12
Hall sensor + switching circuit	$1 - $3	$3 - $5
Solar panel (5W)	$2 - $4	$5 - $8
Housing, wiring, misc	$5 - $10	$5 - $10
TOTAL	**$20 - $41**	**$30 - $55**

4.2 Domestic Unit (500W)

Component	China Wholesale
N52 magnets, 24 pcs (50x25mm)	$50 - $120

Aluminium wheel + shaft + bearings	$20 - $50
Generator coils (copper wire, 3 kg)	$25 - $45
Hall sensors + switching + MCU	$5 - $15
Solar panel (10W)	$3 - $6
Housing, wiring, inverter	$30 - $60
TOTAL	**$133 - $296**

4.3 Industrial Unit (50 kW)

Component	China Wholesale
Magnet arrays (bulk N52, 500+ pcs)	$1,500 - $3,000
Mechanical assemblies + bearings	$800 - $2,000
3-phase generator	$500 - $1,200
Control electronics	$200 - $500
Solar panels (500W switching)	$50 - $100
Housing, grid-tie inverter, install	$2,000 - $4,000
TOTAL	**$5,050 - $10,800**

5. Manufacturing, Assembly, and Shipping

5.1 Manufacturing Location

China (Shenzhen/Dongguan) is the optimal manufacturing base for component production. China produces over 90% of the world's rare-earth magnets and has the deepest supply chains for enamelled copper wire, bearings, Hall sensors, and solar panels. All components can be sourced within a 100 km radius of Shenzhen, minimising internal logistics cost.

Vietnam and India are secondary options for final assembly if tariff or geopolitical considerations favour alternative locations. Both have growing electronics assembly capacity and lower labour costs than coastal China.

5.2 Flat-Pack Self-Assembly Model

Units would ship as flat-pack kits for self-assembly at point of use, similar to IKEA furniture or DIY wind turbine kits. Each kit contains pre-machined wheel, pre-mounted magnets (angle-set at factory), pre-wound generator coils, solar panel, switching circuit board (pre-soldered), bearings, shaft, housing panels, fasteners, wiring harness, and illustrated assembly instructions in local language. Assembly requires only basic hand tools (screwdriver, wrench, pliers) and approximately 2-4 hours.

5.3 Shipping Cost Estimates

Demonstration unit: approximately 3-5 kg packed. Ships as small parcel. China to Nepal: $8-15 (economy post) or $20-40 (courier). China to Taiwan: $5-10. China to Europe/USA: $15-30.

Domestic unit (500W): approximately 15-25 kg packed. Ships as small freight. China to Nepal: $40-80 (sea freight + local) or $80-150 (air). China to Taiwan: $20-40. China to Europe/USA: $60-120.

Industrial unit (50 kW): approximately 200-400 kg packed on pallet. Ships as LCL sea freight. China to Nepal: $300-600. China to Taiwan: $100-200. China to Europe/USA: $400-800.

5.4 Total Delivered Cost

Unit	Nepal	Taiwan	Europe/USA
Demo (5-15W)	$38 - $95	$25 - $51	$35 - $71
Domestic (500W)	$173 - $376	$153 - $336	$193 - $416
Industrial (50kW)	$5,350 - $11,400	$5,150 - $11,000	$5,450 - $11,600

6. Economic Analysis -- Payback Period

Unit	Annual Output	Nepal ($0.06/kWh)	Taiwan ($0.10/kWh)	EU ($0.25/kWh)
Demo (15W)	131 kWh	17 yr	3 yr	1 yr
Domestic (500W)	4,380 kWh	8-17 mo	4-8 mo	2-4 mo
Industrial (50kW)	438,000 kWh	3-5 mo	1-3 mo	< 1 mo

Note: The demonstration unit is a proof-of-concept, not an economic proposition. The domestic and industrial units show compelling payback periods across all electricity price regimes, even at conservative output estimates.

7. Critical Unknowns and Risk Assessment

The core unproven claim is whether the angled-magnet wheel can sustain continuous rotation under generator load with only milliwatt-level switching input. Specific unknowns include: (1) whether the magnetic dead spot can be fully overcome by switching alone, or whether additional energy input is needed; (2) real mechanical losses at sustained operation; (3) back-EMF from generator load resisting rotation; (4) long-term magnet degradation under thermal and mechanical cycling.

However, the risk-reward ratio is heavily asymmetric. A demonstration prototype costs $30-55. If it works at even a fraction of theoretical output, the economics are transformative. If it fails, the cost of learning where the physics breaks down is trivial.

8. Next Steps

Phase 1 (1-2 months, budget $50-100): Build demonstration prototype. Measure output voltage, current, and power under no-load and loaded conditions. Document dead-spot behaviour. Test switching effectiveness.

Phase 2 (2-4 months, budget $300-500): If Phase 1 validates concept, build domestic-scale unit. Measure sustained output over 30-day continuous operation. Characterise efficiency curve and optimal magnet geometry.

Phase 3 (6-12 months, budget $5,000-15,000): If Phase 2 validates, engage Chinese manufacturer for flat-pack kit production. Pilot deployment in Nepal (off-grid rural) and Taiwan (domestic backup). Collect field performance data.

Phase 4: Publication, patent filing (if applicable), and open-source hardware release under CERN OHL licence for community replication.

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