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In-Stream Hydropower Generation System

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Category
Engineering & Physical Sciences/Sustainable Technology

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Clean Electricity from Renewable Sources

The E^2-Wheel designed at St. Anthony Falls Laboratory (SAFL) is a vertical axis in-stream hydropower generation system that generates clean electricity from renewable sources with minimal impact on the environment. The hydrokinetic energy technology, designed specifically for small to medium sized open channel systems in both warm and cold-weather regions, focuses on single thread (meandering) river channels common to the upper Midwest. The horizontal wheel extends into the flowing river and converts the river's kinetic energy into mechanical and electrical energy. The E^2-Wheel's blades are only partially exposed to the flow, and the gear box and generator are enclosed in a protective structure (e.g., a concrete side bank). The partial exposure of the turbine blades guarantees that each blade produces torque during the half revolution, while the remainder stays protected within the side-wall during the second half revolution (when it would otherwise oppose to the flow-induced torque). The E^2-Wheel is designed to be neutrally buoyant to reduce bearing wear-out, frictional loads and increase power efficiency. It is also designed to mitigate environmental problems by protecting the bank from downstream erosion by limiting the stream velocity in the wake of the E^2-Wheel.

MN-IP Try and Buy

Try

- $5,000 for a twelve month trial
- Trial fee is waived for MN companies or if sponsoring $50,000+ research with the University
- No US patent costs during trial

Buy

- $10,000 conversion fee (TRY to BUY)
- Royalty rate of 3% (2% for MN company)
- Royalty free for first $1M in sales

Hydropower from Midwest Rivers

Existing utility scale technologies can generate hundreds of kilowatts of energy but they require large channels and flow volumes. Vertical axis wind turbines are prone to maintenance problems, horizontal axis river turbines require greater depths, and vertical axis devices anchored to the river bottom reduce flow velocity and expose the turbine to sediment transport. The vertical axis E^2-Wheel can be placed at a prescribed depth in order to avoid both sediment and floating items such as ice and debris. It can also operate under varying flow depth and discharge, which classic water wheels cannot do. Furthermore, its water- sealed aluminum frame construction ensures neutral buoyancy when deployed in water, providing minimal frictional damping and weight loads and maximal bearing lifetime.

BENEFITS AND FEATURES:

- Generates clean electricity from renewable sources
- Minimal impact on the environment
- Flexible vertical positioning in the river
- Protects banks from erosion
- Operates under varying flow depth and discharge
- Less maintenance than vertical axis wind turbines
- Can generate electricity for illumination (e.g., for nearby construction)
- Can provide electricity, wireless communication, and water filtration technology (in national or state parks or remote rural communities in under-developed countries or pristine environments)

APPLICATIONS:

- Hydropower generation
- Warm and Cold weather regions
- Slow flowing rivers
- Small rivers

Phase of Development - Concept only (proposal, sketches and general design strategy)

Researchers

Michele Guala, PhD
Associate Professor of Civil, Environmental and Geo-engineering (UMN); Saint Anthony Falls Lab (SAFL)
External Link (www.cege.umn.edu)
Jeff Marr
Associate Director for Engineering and Facilities, Saint Anthony Falls Lab (SAFL)
External Link (www.cts.umn.edu)
Lian Shen, PhD
Director, Saint Anthony Falls Lab (SAFL); Professor of Mechanical Engineering (UMN)
External Link (safl.umn.edu)