Introducing TerraPower™

The Need for Innovation in Energy

The world faces an urgent need for sources of electricity. Many initiatives seek options that are cleaner than fossil fuels, more reliable and independent of geography than wind and solar power, and safer and less expensive than the large international system that supports existing nuclear plants. Encouraging advances in technologies have been made in recent years. Science and engineering efforts have produced new ways to generate electricity, to use energy more efficiently, and to capture greenhouse gas emissions and prevent their entry into the atmosphere. Although the magnitude of the global energy challenge is enormous, nuclear energy can be an important part of the solution.

Intellectual Ventures'™ investments in energy inventions have evolved to become TerraPower, an expert team that is investigating innovative ways to address energy needs. TerraPower's most advanced work centers on radically improving ways to make electricity using nuclear reactors.

TerraPower's innovative reactor designs could avoid the well-known limitations of current plants, nearly all of which employ nuclear reactor technology that dates back to the 1950s. Today's reactor designs require rare, enriched uranium fuel, but can extract only a small fraction of the energy in that fuel. As a result, these reactors produce too much waste, consume too much of our dwindling and increasingly costly uranium resources, and require frequent and expensive refueling.

The TerraPower initiative is advancing a comprehensive program to improve the technology of reliable nuclear plants. Its business approach presents an important alternative to create a financially and socially attractive emission-free energy that is safe and sustainable.

TerraPower™ Investing in Invention

Invention Labs

Bringing together expert staff and individual consultants from some of the most prestigious nuclear laboratories and energy companies in the world

Public

Academic

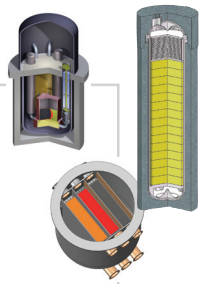
Private

Solution Set

Exploring important improvements to nuclear power by using openly shared information, state-of-the-art computational capabilities, and expanded data

Invention Research & Development

Fine-tuning ideas for energy-producing reactions and finding new ways to apply the nuclear physics



Market Enablement

Meeting industry demand for electricity and nuclear energy with better solutions to waste and proliferation concerns

Physics Enables a Class of Nuclear Reactors

Led by John Gilleland, the TerraPower team relies on effective partnerships with leading experts in nuclear science, engineering, and industry who share a common vision. Gilleland's past experience with a variety of energy technologies supports TerraPower's multi-disciplinary approach to solving problems.

Based on recent advances in applied nuclear physics and technology made by pioneering American national laboratories and international academic groups, TerraPower recognizes that self-sustaining and self-limiting nuclear reactions are feasible in unenriched fuels. Extensive computer simulations and engineering studies underway at Intellectual Ventures have produced encouraging evidence that a wave of fission moving slowly through a fuel core could generate a billion watts of electricity continuously for well over 50 to 100 years without refueling. This new class of reactors, known as traveling-wave reactors (TWRs), could enable nations to simplify the nuclear infrastructure dramatically. TWRs could reduce the amount of nuclear waste by using existing stockpiles of depleted uranium as fuel. By extracting centuries worth of energy from waste at enrichment plants, the TWRs would turn a social and financial liability into an asset.

COMPARING REACTOR TECHNOLOGIES

GENERATION III	GENERATION IV	TRAVELING-WAVE REACTOR
- Currently operating technology	- Fast breeder reactors	- Fast-neutron reactor that breeds its own fuel
- Water-cooled thermal reactors	- Closed fuel cycle	- Once-through fuel cycle
- Once-through fuel cycle in the United States	- Multiple recycling processes used to increase burn-up	- 20% burn-up rate
- 5% burn-up rate		- One pass in one place

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