



Integrity Research Institute

Annual Report for 2025



featuring

**Summary of IRI Accomplishments
for 2025**

Best of
Future Energy eNews
for 2025

IRI Annual Financial Report for 2025

Thomas Valone, PhD, Editor

CREDITS

**Integrity Research Institute wishes to acknowledge the following for this
IRI Member's Annual Report**

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PRESIDENT'S LETTER

We are happy to communicate with you regularly on a quarterly basis when you renew your IRI Membership to rejoin our wonderful adventure pioneering new vistas in energy, propulsion, and bioenergy.

Our Annual Report this time consists mostly of the summary of our accomplishments, including samples of the many journal articles and book chapters that we released during the year, as well as one excerpt of each month of Future Energy eNews from 2025.

IRI Annual Report 2025 also has the best Highlights of the year's activities, all of which are posted on our IRI website. Many other nonprofit organizations are also transitioning to doing this as well with an electronic annual report.

Some of you may have previously received the original black KEY (Ver. 1), a 16 GB flash drive with portions of our twelve Conferences on Future Energy (COFE1-12). If there are some that would like to see more, please consider the upgraded version. The reason is that we have secured a deal for **64 GB Silver KEY flash drives** with *four times* more videos, documents, and proceedings from our conferences on them. You may use the discount code for IRI Members upon checkout too ("member"). IF that is still not enough discount to obtain the new, improved Silver KEY, please email me for a special offer to add this priceless Silver KEY library flash drive (which took six months to finish) to your emerging energy sciences library of the past quarter century.

Lastly, we have several new books in the works thanks to the KDP publishing service on Amazon. The climate topic is so important that we are continually sending review copies of the 2025 book, *Hothouse Earth Extinction* to nonprofits and climatologists. Thanks for joining and sustaining our efforts to save the world.

Sincerely,

Thomas Valone

Thomas Valone, PhD, PE
President

HIGHLIGHTS 2025

Our institute was fairly active in 2025 with many in-person presentations, social media appearances, and online presentations.

Social Media. Our YouTube channel (<https://tinyurl.com/IRI-U-Tube>) has grown tremendously with over 1,300 subscribers and many of our videos have had over 1,000 views. We are proud of our many outstanding futurists and blogs that are posted regularly on our website. Our **Facebook page and Instagram channel** have also grown with thousands of followers where we share our monthly eNews and also special posts.

IRI Programs. All of the IRI energy, propulsion, and bioenergy programs are easily accessible on our website, filled with videos of our lab, interviews of our President Dr. Valone, videos of our products and historical information contained in our many unique reports like Scalar Waves, Earthquake Prediction, Origin of Life Experiments, Papp Engine, T.T. Brown Electrogravitics Research, as well as from our conferences. The IRI Electronic Catalog online, hosted by Shopify, has continued to thrive and we have customers from all over the globe. We also highlight all our programs, IRI publications, products, and bioenergy devices on www.Integrity-Research.org.

The New KEY. In 2025, we were proud to have initiated work on the new, improved **64 GB Silver “KEY”** which holds four times as much data as the black KEY from last year. Ready for a March 2026 release, the 64 Gigabyte **Silver KEY at \$49** (discounted price) with all our COFE1-12 Proceedings, papers, audio recordings, and four times more videos in convenient MP3 and MP4 format is a real bargain library. It contains the entire Proceedings (slides and/or papers) of every COFE conference 1-12, **and lots of extra videos** as well as many articles and videos on health and wellness, energy, and propulsion.



Conferences, Presentations, Interviews.

This year Dr. Valone was interviewed for the popular Gaia show: **“Forbidden Science”**. There are several episodes that originated from his interview and are available now on **Gaia.com** on a subscription basis. Dr. Valone, also had many in-person and online presentations

this year, including EESI’s **Congressional Renewable Energy Efficiency Expo**, in downtown DC where he presented our latest book: **“Hothouse Earth”** to many exhibitors and Congressional staffers. He was again a special guest on the syndicated **“Coast to Coast Radio Show”** (CtoC) hosted by George Noory, a long-standing successful show with literally millions of subscribers. His presentation is available on their website along with all his other previous appearances in the past 20 years. Visit <https://tinyurl.com/ValoneCtoC> to see *the personal webpage* that CtoC has created for Dr. Valone. He also gave slide presentations online to several podcast channels

Including: *“Steve’s Place”*, *“The Ryan Files”* and *“SuperbCrew”*, all featured his discussions on our global environmental situation, addressing the climate and energy crises, with a view toward what the future of energy and global sustainability may be like.



Bioenergetics Program: The *EM Pulsar Model 78* has been a bestseller since its inception, with over 1,000 sold already. We are currently working on a new model, the *EM MiniPulsar*, a palm-sized device. We hope to have it available in 2027. Our line of

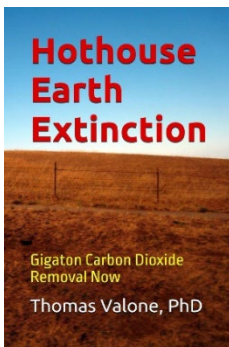
PREMIER electrotherapy devices, is unique as we are the only purveyors in the world. It includes the PREMIER 4000, which has been redesigned to run several minutes safely, the previous model had a maximum of 10 minutes, also known as the Premier 4000 *“Energy Chair,”* it has many therapeutic benefits and the favorite of health practitioners, chiropractors and integrative medicine physicians, as does the 250 kV Tesla coil **Lakhovsky Premier 2000**. Our line of OsteoPads, including the MiniMat and MaxiMat models, continue to be very popular and effective for bone and cartilage regeneration, with the journal PEMF references that also include NASA Press Releases on the same design as ours. We have improved their design that increases wear and durability, with practitioners ordering more than one to distribute to their patients.

Future Energy News Program:

Our decades-old and archived *“Future Energy eNews”* is sent via email, monthly, to over 5000 recipients worldwide, **free of charge** through



Constant Contact email service (sign up today from our homepage). This year marks 25 years of providing this free electronic newsletter that showcases all the latest emerging eco-friendly technologies that are being developed worldwide and published in journals, magazines, and newspapers. Also we published the quarterly *“Future Energy”* and mailed it to all members for free. This newsletter contains all the latest papers and articles relating to emerging energy technologies. Also, we continue to upload to our IRI website the latest information on emerging energy technologies, climate change, video uploads and press releases. Free newsletters, brochures, and reports, including latest news on energy developments, discoveries and research.



IRI Publications and Books: We had two books published this year: *Hothouse Earth Extinction* and *Hip, Knee, Joint Back Pain Relief Supplemented with Electrotherapy*. They are available at our online store and Amazon. We also had two journal papers and articles published this year (see below) including *“Fast Pulse Rise Time with LP rate to Counter inflammation”* in *Amer. J of Biomed. Sci. and Res.*, <https://biomedgrid.com/pdf/AJBSR.MS.ID.003595.pdf>.





Review Article

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Fast Pulse Rise Time Combined with a Low Pulse Rate Found to Counter Inflammation While Providing Pain Relief, Cardioprotection, And Even Cartilage Regeneration with a Portable Device as Confirmed by NASA

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Also, IRI also published this article last year **“Pulsed EMF Device Counters Inflammation, Cardio Stress Cartilage Loss and Promotes Tissue Repair”** in the *Biomedical Journal of Scientific and Technical Research*, September, 2025, <https://biomedres.us/pdfs/BJSTR.MS.ID.009881.pdf>.

Review Article



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Pulsed EMF Device Counters Inflammation, Cardio Stress, Cartilage Loss, and Promotes Tissue Repair

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ABSTRACT

A biomagnetic device meets the specified features of publicized NASA research, providing tissue repair, cardioprotection, and cartilage regeneration noninvasively. In addition, by activating the Heat Shock Protein (HSP 70) locally, it has been shown to provide rapid pain relief from inflammation caused by impact trauma, tissue injuries, organ malfunction, some diseases, and occasionally, even some chronic conditions.

Abbreviations: PEMF: Pulsed Electromagnetic Field; IRI: Integrity Research Institute; HSP: Heat Shock Protein; TNF: Tumor Necrosis Factor

Propulsion Program: The CMG Project or **Control Moment Gyro** continues as we are in the process of writing a journal paper by Dr. Valone and Mike Gamble, a retired aerospace engineer. For years, Inertial Propulsion has been built and installed by Boeing on satellites and the International Space Station. Since advocated by IRI we have now replicated a table-top model.



The purpose of this experiment is to show that levitation and thrust is possible by scissoring gyros.

Regarding our Spiral Magnetic Motor (**SMM**) project, we have had much advancement. Yes, a magnetic gradient has been implemented into a permanent magnet motoring cycle. Now we have built a proper choice of a magnetic switch (see photo on this page). We are in the process of acquiring further funding to continue this work. This Spiral

Magnetic Motor is designed to provide mechanical drive for electrical power. Peer-reviewed, online -<https://tinyurl.com/SMMslides> or <https://tinyurl.com/SMMpaper>

The rest of this **Annual Report 2025** contains some of the best reprints from the **Future Energy eNews** from 2025 and the Financial Report Summary for 2025. Subscribe to the monthly Future Energy eNews for free today from our homepage.

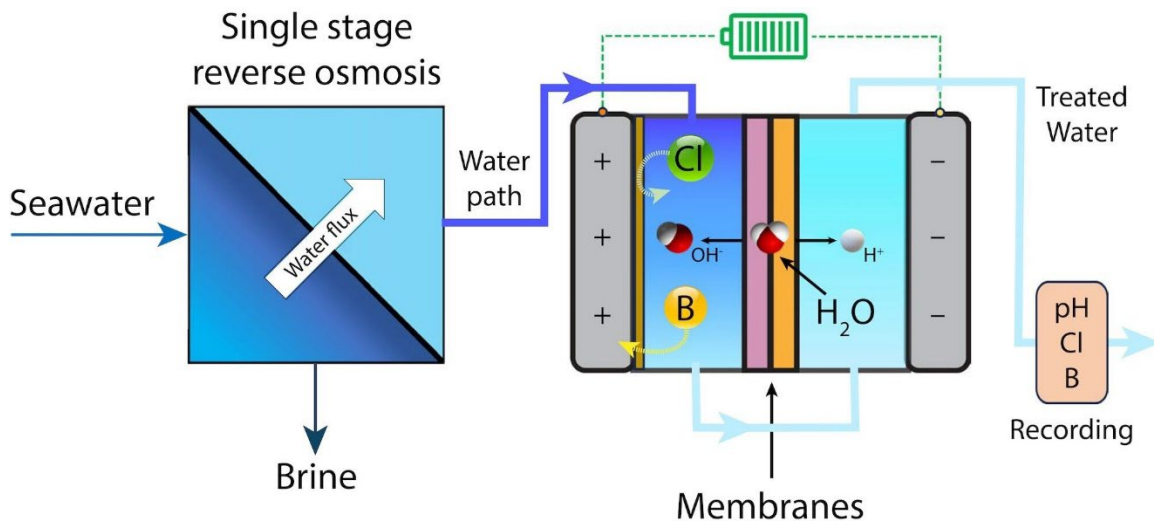
January 20, 2025

New water purification technology helps turn seawater into drinking water without tons of chemicals

by [University of Michigan](#), Prof. Jovan Kamcev

Water desalination plants could replace expensive chemicals with new carbon cloth electrodes that remove boron from seawater, an important step of turning seawater into safe drinking water. A study describing the new technology has been [published](#) in *Nature Water* by engineers at the University of Michigan and Rice University.

In seawater, boron exists as electrically neutral boric acid, so it passes through reverse osmosis membranes that typically remove salt by repelling electrically charged atoms and molecules called ions. To get around this problem, desalination plants normally add a base to their treated water, which causes boric acid to become negatively charged. Another stage of reverse osmosis removes the newly charged boron, and the base is neutralized afterward by adding acid. Those extra treatment steps can be costly.



The new electrodes remove boron by trapping it inside pores studded with oxygen-containing structures. These structures specifically bind with boron while letting other ions in seawater pass through, maximizing the amount of boron they can capture.

"Our device reduces the chemical and energy demands of seawater desalination, significantly enhancing [environmental sustainability](#) and cutting costs by up to 15 percent, or around 20 cents per cubic meter of treated water," said Weiyi Pan, a postdoctoral researcher at Rice University and a study co-first author. Given that global desalination capacity totaled [95 million cubic meters per day](#) in 2019, the new membranes could save around \$6.9 billion annually. Large [desalination plants](#)—such as San Diego's Claude "Bud" Lewis Carlsbad Desalination Plant—could save millions of dollars in a year.

Farms can install vertical solar panels without reducing crop yields

Adding rows of upright panels on farmland generates green power in the morning and evening while acting as a windbreak for crops

By [Madeleine Cuff](#), New Scientist, 21 January 2025



Rapid reductions in the price of solar panels mean they are starting to appear in unexpected places, from balconies to motorway embankments. Now, researchers say they could play the role of hedgerows in farm fields, with double-facing solar panels generating power while acting as windbreaks for crops and livestock.

Farmers are already installing solar panels, often positioning tilted arrays over crops or [allowing sheep to graze between panels](#). But such installations, known as agrovoltaics, can lead to excessive shading of plants or limit the land available for food production. [Marta Victoria](#) at Aarhus University in Denmark says one solution could be to place two-sided panels in vertical rows in fields. Placing panels vertically leaves maximum field space clear for farming, while allowing solar generation during the morning and evening if the panels face east and west. This orientation also avoids shading the plants when the sun is at its highest.

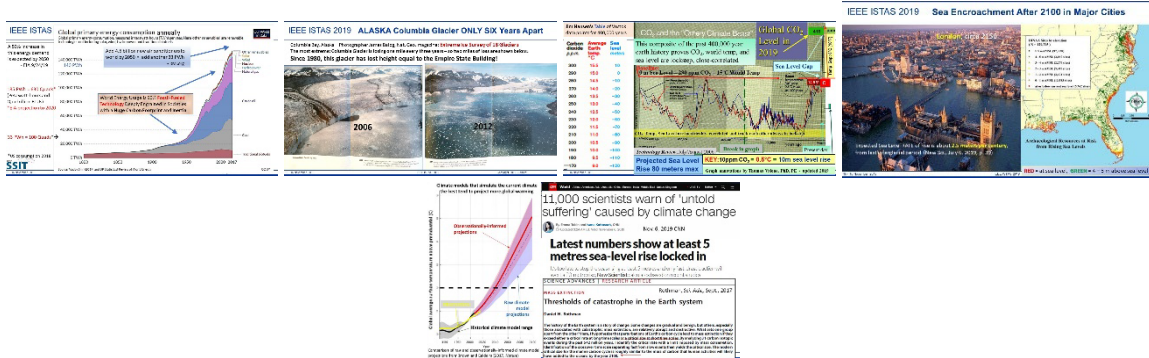
Together with colleagues, she conducted a year-long pilot study involving a 44.4-kilowatt system of double-facing solar panels in a field of winter wheat and grass clover, to assess the effect on crop yield. The panels had a 50-centimetre gap above the ground and rose to 3 metres in height. The team found the vertical panels reduced average wind speeds over the crop field by around 50 per cent compared with a control field with no panels. The panels also helped to maintain humidity in the field, compared with the control field, and there was no reduction on crop yield overall, says Victoria.

The panels generated much less electricity than a standard tilted array, but it was produced in mornings and evenings. “It matches better when there is high electricity demand in the system,” says Victoria.

Hothouse Earth Extinction: Gigaton Carbon Dioxide Removal

IRI Press Release, March 30, 2025, <https://www.integrityresearchinstitute.org/Climate.html>

“Including actual projected temperature, CO2 levels by 2100 and why the term *extinction* is justified”



Are you searching for a straightforward way to address the overwhelming threat of climate change and increasing global temperatures? Frustrated with the constant focus on renewables without comprehensive solutions for the excessive CO2 in the air? Have you ever wondered if there's a scientific, reliable approach to reversing global warming that doesn't feel unattainable? If "yes" resonates with any of these questions, you're not alone.

Hothouse Earth Extinction: Gigaton Carbon Dioxide Removal Now offers a refreshing take with grounded, scientifically backed strategies for a guaranteed climate change reversal focusing on gigaton carbon dioxide removal that attacks the source of the overheating of our earth. This book empowers you with evidence-based solutions that are innovative, effective, and accessible, with short-term feedback encouragement from the atmosphere.

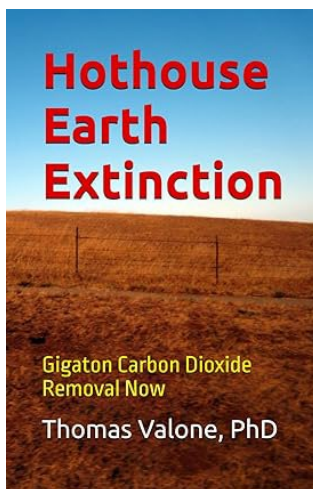
It is entirely based on Dr. Tom Valone's extensive, peer-reviewed journal articles, conference presentations, and videos, such as these few samples which are Open Access too:

["Predictive Connection for 2100 between Atmospheric Carbon, Global Warming and Ocean Height Based on Climate History", *Int. J. Env. and Climate Chg.*, Vol. 9, 2019-10-11](#)
["Study of a Possible Global Environmental Forecast and Roadmap Based on 420 kY of Paleoclimatology",](#) In book: *Modern Advances in Geography, Environment and Earth Sciences*, Vol. 5, 2021, B P International
["Linear Global Temperature Correlation to Carbon Dioxide Level, Sea Level, and Innovative Solutions to a Projected 6°C Warming by 2100"](#), in the *Journal of Geoscience and Environment Protection*, Vol.9 No.3, March 2021, which has received 5,000 downloads and almost 18,000 views to date.
["Gigatonne Carbon Dioxide Removal: Reversing Global Heating Trends"](#) Chapter 6 in *Research Advances in Environment, Geography and Earth Science*, Vol. 3, 2024

Also impressive and a major contributor to the value of gigaton CDR for this book is the very recent McKinsey Sustainability release called, ["Carbon Removals: How to scale a new gigaton industry"](#) Here's just a glimpse of what you'll discover inside:

1. The scientific backbone of Gigaton Carbon Dioxide Removal and how it could be our ace in reversing climate change.
2. How billionaires and influential stakeholders are investing in the planet's future with strategic carbon solutions
3. A behind-the-scenes look at emerging technologies that capture CO2 and how they fit into the bigger picture,

4. Ten practical steps for contributing to CO2 removal in your daily life - and why they matter more than ever;
5. Why relying solely on renewables isn't enough and what this means for long-term climate strategy;
6. 7 groundbreaking case studies of communities implementing effective CO2 removal techniques;
7. Predictive scenarios demonstrating the potential of achieving a cooling trend with current innovations; An exploration of how global perspectives and policies can synergize to bring monumental change,
8. How education plays a pivotal role in navigating systemic shifts in climate policies
9. Broaden your climate knowledge with interdisciplinary insights from science, economics, and beyond;
10. The ripple effect of individual actions in professional and personal spheres
11. Future predictions that chart the course towards a carbon-zero world;
12. Understanding the financial implications of large-scale carbon capture and how they empower economies;
13. 5 myths about carbon dioxide removal debunked to clear up widespread misconceptions with facts; about unabated temperature prediction for 2100;
14. Discover how we can reverse global warming in mere decades with gigaton Carbon Dioxide Removal (CDR), even if you're skeptical of past climate solutions, which have always been too complicated and slow to adopt;
15. Practical steps for personal advocacy: Engage effectively with policymakers using facts gained from this book and influence local community initiatives with adaptive measures that will help people stay cool in a warming world as gigaton CDR comes onboard.
...and so much more!



Apprehensive about yet another theoretical solution? Rest assured. *Hothouse Earth Extinction: Gigaton Carbon Dioxide Removal Now* is unlike anything you've encountered before. It's packed with achievable steps and the unwavering support of influential global figures making real-world efforts toward monumental change. This isn't just a guide for students or science enthusiasts. This book creates a bridge between knowledge and action, motivating you to inspire others and enact meaningful change.

Researchers at ETH Zurich have found that "To slow the pace of global warming, we need to drastically reduce greenhouse gas emissions. Among other things, we need to do without fossil fuels and use more energy efficient technologies, the researchers say. However, reducing emissions alone won't do enough to meet the climate targets. Large quantities of carbon dioxide must be captured from the atmosphere and either stored permanently underground or used as a carbon neutral feed stock in industry. Unfortunately, the carbon capture technologies available today require a lot of energy and are correspondingly expensive. which is why the researchers at ETH Zurich are developing a new method that uses light. In the future, the energy required for

carbon capture using this process will come from the sun." [CleanTechnica.com Dec. 2023](#)
In another development, recently, [IEA published a guide book for Direct Air Capture \(DAC\) or CDR](#) which directly pertains to the reality and urgency of the climate situation.

If you're excited to be part of a climate transformation and reverse global warming effectively, click the "Add to Cart" button now!

[Buy the paperback from Amazon \\$18](#)

[Get the hardcover edition from Amazon for \\$33](#)

[Buy a Kindle edition with great color illustrations, only \\$9 \(but FREE during promo: April 1-5, 2025\)](#)

[Or you may want just the Audiobook for \\$7.](#)

This is the ONLY climate book on the market, updated for 2025, that also includes planetary paleoclimatology so you can discover how the earth's temperature behaved in the past when CO2 levels varied to the levels we see today.

Those who learn from the past are not bound to repeat it.

Chinese automaker stuns industry with new electric car breakthrough: 'Elevating the game to another dimension'

"This could mark the beginning of a new wave of model rollouts," one analyst said.

by Jamie Speka, The Cool Down, April 30, 2025

BYD Co., a [Chinese carmaker](#), unveiled a groundbreaking fleet of [electric vehicles](#). The EVs could change the game in the industry, as they can be recharged in the same amount of time as it takes to refill gas-powered vehicles. The [company began selling these EVs](#) this month, and they are "capable of providing around 400 kilometers (249 miles) of range in five minutes in tests on its new Han L sedan," as [Bloomberg explained](#).



Lei Xing, an independent China auto analyst, told Bloomberg that the release of these vehicles means [BYD](#) is "elevating the game to another dimension."

Analysts believe the company is looking to leverage its [technologies](#) to stand out in the competitive automobile industry.

China [emits the largest amount of planet-warming carbon](#) in the world, which reached 11,903 million metric tons in 2023. Most of this comes from the burning of coal; however, it has said it will reduce pollution in large cities by utilizing electric and nuclear technologies. The country promotes the purchase of EVs through subsidies and infrastructure investments, which have grown sales by [40% year-on-year](#). These subsidies have been responsible for significant savings among consumers, and the absence of gas and maintenance costs means they can save even more.

"This could mark the beginning of a new wave of model rollouts, propelling BYD's battery-electric vehicle sales to catch up with hybrids after they fell behind in 2024," Joanna Chen, a China auto analyst with Bloomberg Intelligence, said. In other words, more EVs are bound to hit the market — and reduce global car pollution.

<https://www.byd.com/us>

<https://metaverse-assets.meetkai.io/pdfs/specs-han-en.pdf>

German experiment proved that simple concrete spheres make fantastic batteries

California plans to submerge a 9-meter diameter sphere in the ocean and is already planning versions of 30 meters.

Rose Dixon, Farmingdale-Observer, 05/10/2025

Storing renewable energy sustainably and efficiently is one of the major challenges of our time. A team of German researchers is proposing a revolutionary solution: concrete spheres immersed in the ocean floor. Their potential is such that California is preparing to test a large-scale prototype. The project, called **StEnSea** (Stored Energy in the Sea), was developed by the Fraunhofer IEE (Institute for Energy Economics and Energy Systems Technology). The idea is relatively simple: hollow concrete spheres are installed at a depth of several hundred metres. Each sphere is fitted with a pump-turbine and a valve system.

Here's how it works:

- To store energy, excess electricity is used to pump water out of the sphere, creating a relative vacuum.
- To release energy, we open the valve: the water, pushed by the external pressure, rushes into the sphere and turns the turbine, producing electricity.

The concept has already been successfully validated in a pilot test in Lake Constance, Germany, using spheres three metres in diameter. Building on this success, the researchers are now looking to scale up.

In 2026, a sphere nine metres in diameter and weighing 400 tonnes will be submerged off the coast of California at a depth of 500 to 600 metres. It will have a storage capacity of 0.4 megawatt hours (400 kWh), enough energy to power an average household for several weeks. Eventually, the aim is to create even larger spheres, up to 30 metres in diameter, deployed in 'fields' on the seabed around the world.

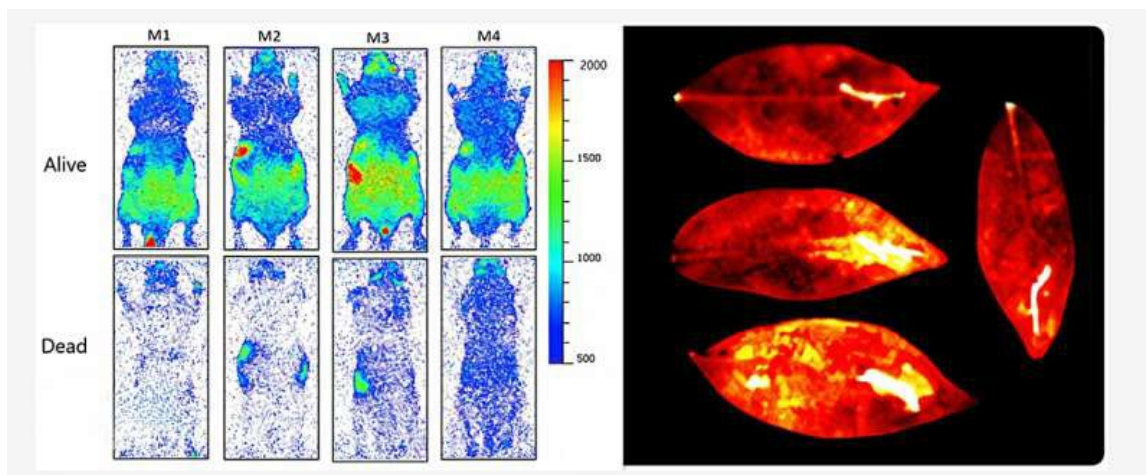
An environmentally friendly alternative to hydroelectric dams Compared with traditional hydroelectric power stations – often criticised for their environmental impact – underwater spheres offer a number of advantages:

- High expansion potential: The seabed offers vast, little-exploited areas.
- High social acceptability: Installed far from inhabited areas, these facilities arouse less opposition.

According to Dr. Bernhard Ernst of the Fraunhofer IEE, energy storage via these spheres could become an essential part of the world's energy future, particularly to support the massive development of renewable energies. This promising innovation shows that sometimes, solutions to modern challenges can come from concepts as simple as a sphere... made of concrete, at the bottom of the ocean. Each sphere has an estimated lifespan of between 50 and 60 years, with partial replacement of components every 20 years or so.

Living beings emit a faint light that extinguishes upon death, according to a new study

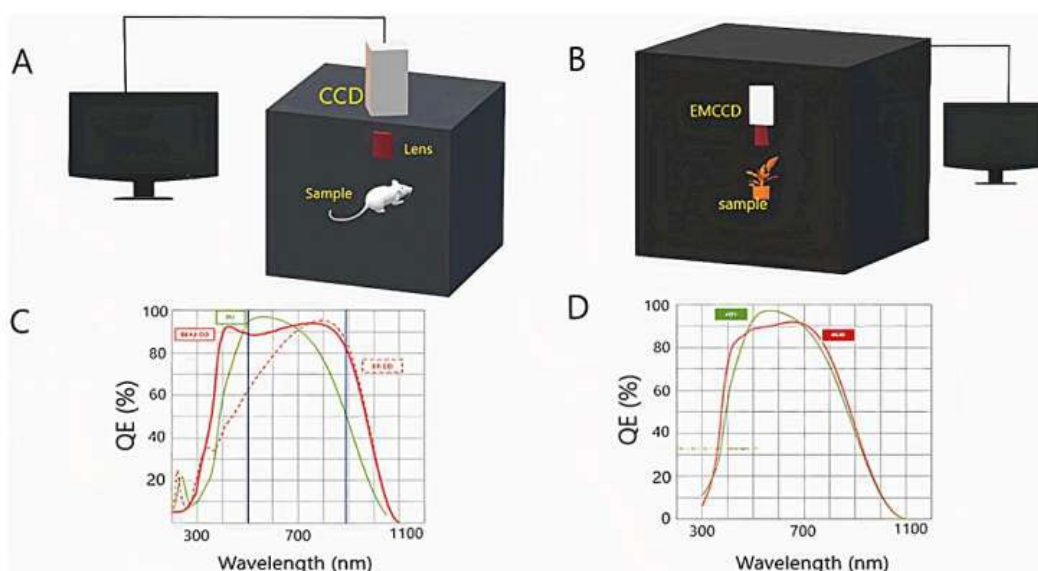
by [Sanjukta Mondal](#), [Phys.org](#), 2025, [JPCL](#) DOI.org 10.1021/acs.jpcllett.4c03546



Credit: *The Journal of Physical Chemistry Letters* (2025).

The light of someone's life might not be just another person, but light in the literal sense. According to a recent study by researchers from University of Calgary, every living system emits light without requiring external excitation due to a biological phenomenon known as **ultraweak photon emission (UPE)**. (Also called “biophotons” – Ed. Note)

In [mice](#), UPE was linked to vitality as live mice emitted significantly higher UPE intensity compared to recently dead mice. In plants, however, UPE varied depending on exposure to stress factors like temperature changes, injury and chemical treatments, as [reported](#) in *The Journal of Physical Chemistry Letters*.



High-sensitivity EMCCD and CCD cameras for imaging UPE in dark, controlled environments.

Living organisms are compact biochemical labs where complex chemical reactions keep the system up and running. Cellular metabolism, a series of chemical reactions that fuel life-sustaining processes, produces a group of highly reactive oxygen-containing molecules produced as a natural byproduct called [reactive oxygen species](#) or ROS.

Studies suggest that ROS plays a central role in UPE. When organisms encounter stress, they activate biochemical pathways that generate ROS, which act as signaling molecules in the [cellular stress response](#). However, excessive ROS production can lead to [oxidative stress](#), overwhelming the cell's antioxidant defenses. This oxidative stress can induce electron excitation and transfer processes, ultimately resulting in UPE.

Unlike bioluminescence, which produces high-intensity light visible to the naked eye, UPE, also known as biophoton emission, is a spontaneous release of extremely low-intensity light that is invisible to the human eye and falls within the spectral range of 200–1,000 nm. This faint light has been detected in a wide range of life forms—from [single-celled organisms](#) and bacteria to plants, animals, and even humans.

Despite being so widely observed, not much is known about the impact of mortality and stress factors on UPE. Furthermore, the ability to monitor UPE in response to stress factors and injuries could be a powerful, non-invasive tool for diagnostics and medical research. The researchers used advanced imaging techniques to explore the biological significance of UPE by directly comparing emissions in living versus dead animals, while also systematically visualizing the effects of temperature, injury, and chemical treatments on UPE in plants.

To carry out the experiments, the researchers designed ultradark enclosures to eliminate environmental light interference. They then used an Electron-Multiplying Charge-Coupled Device (EMCCD) camera for imaging plants and a Charge-Coupled Device (CCD) camera with IVIS system to image UPE changes in mice.

The results revealed that despite both groups having the same body temperature of 37°C, the live mice showed robust emissions, whereas the UPE from the euthanized mice was nearly extinguished. In plants, an increase in temperature and injuries led to an increase in UPE intensity. Injured sites were consistently brighter than uninjured parts—a change in the former was observed once the site received any chemical treatment.

This study establishes that UPE can act as a sensitive indicator of vitality in animals and of stress responses in plants. The researchers suggest that these findings could catalyze the application of UPE imaging as a non-invasive technique for both basic biological research and clinical diagnostics.

Common Morning Habit May Support Healthy Aging, New Study Says

By [Michele Laufik](#), June 6, 2025, [MarthaStewart.com](#)

- A 30-year study shows that women who drank caffeinated coffee in midlife were more likely to [age healthily](#), with better mental and physical function later in life.
- Tea, decaf coffee, and soda did not show the same benefits, and soda was linked to worse aging outcomes.
- The study suggests that while moderate coffee intake may offer protective benefits, it should be part of an overall healthy lifestyle.

Women who drank caffeinated coffee in midlife were more likely to age healthily in this 30-year study. Your morning cup of coffee might be doing more for you than just helping you stay awake. A [recent study](#) suggests that it could also help you stay healthier longer. The study included almost 50,000 women who were followed for 30 years starting in 1984 and found that women who drank caffeinated coffee in midlife were more likely to exhibit [healthy aging](#).



A 30-Year Study Links Coffee to Longevity

The study tracked the participants' consumption of various drinks, including regular coffee, tea, decaffeinated coffee, and soda. Tea and decaf coffee drinkers did not experience the same results, while drinking more soda, even though it contains caffeine, was tied to a significantly lower chance of healthy aging. "While past studies have linked coffee to individual health outcomes, our study is the first to assess coffee's impact across multiple domains of aging over three decades," says [Sara Mahdavi, BSc, HBSc, RD, MSc, PhD](#), an adjunct professor at the University of Toronto who led the research study. "The findings suggest that caffeinated coffee—not tea or decaf—may uniquely support aging trajectories that preserve both mental and physical function." The findings, which have not yet been peer reviewed or published, were presented during the annual meeting of the American Society for Nutrition held earlier this month in Orlando.

How Much Coffee Did the Participants Consume?

The women in midlife, ages 45-60, typically consumed an average of 315 milligrams of caffeine per day—roughly the amount in three small cups of coffee or one and a half large cups. Among these women, each extra cup of coffee per day was linked to a 2 to 5 percent higher chance of doing well later in life, up to five small cups per day or about 2.5 cups. The study did not account for how the coffee was prepared, such as including cream or sugar.

Why Coffee Might Help Aging

The [beneficial effects of coffee](#) have been attributed to certain bioactive compounds that could support better mental and physical function. But it's not a magic potion for healthy living. "Moderate coffee intake may offer some protective benefits when combined with other healthy behaviors such as regular exercise, a healthy diet, and avoiding smoking," Mahdavi says. "While this study adds to prior evidence suggesting coffee intake may be linked with healthy aging, the benefits from coffee are relatively modest compared to the impact of overall healthy lifestyle habits and warrant further investigation." It's important to note that drinking coffee may not benefit everyone. [In another study](#), Mahdavi showed that genetic variation can influence the relationship between caffeine intake and health outcomes, so more caffeine isn't always better, particularly for people with lower caffeine tolerance or specific genetic susceptibility.

Underwater turbine spinning for 6 years off Scotland's coast is a breakthrough for tidal energy

[JENNIFER McDERMOTT](#), AP News, July 2025



In this October 2018 photo provided by MeyGen, tidal turbines are visible at the MeyGen tidal site located in the Inner Sound of the Pentland Firth, a narrow channel of water between the Scottish mainland and Stroma Island. (Fraser Johnson/MeyGen, via AP)

Submerged in about 40 meters (44 yards) of water off Scotland's coast, a turbine has been spinning for more than six years to harness the power of ocean tides for electricity — a durability mark that demonstrates the technology's commercial viability.

Keeping a large, or grid-scale, turbine in place in the harsh sea environment that long is a record that helps pave the way for bigger tidal energy farms and makes it far more appealing to investors, according to the trade association Ocean Energy Europe. Tidal energy projects would be prohibitively expensive if the turbines had to be taken out of the water for maintenance every couple of years.

Tidal energy technologies are still in the early days of their commercial development, but their [potential for generating clean energy is big](#). According to the National Renewable Energy Laboratory, marine energy, a term researchers use to refer to power generated from tides, currents, waves or temperature changes, is the world's largest untapped renewable energy resource.

The MeyGen tidal energy project off the coast of Scotland has four turbines producing 1.5 megawatts each, enough electricity collectively to power up to 7,000 homes annually. On Thursday, the Swedish company SKF announced that its bearings and seals on one of the turbines had passed the 6 1/2-year mark without needing unplanned or disruptive maintenance. It has been working closely with the industry for a decade on design and testing.

Achieving six years in the water with constant operations is a “very significant milestone” that bodes well for the future of tidal energy, said Rémi Gruet, CEO of Ocean Energy Europe.

Scotland and the United Kingdom are global leaders in tidal energy. The MeyGen site, operated by SAE Renewables, has been sending electricity to the grid for about eight years.

“There are very few tidal energy projects generating electricity continuously. Most have been tests and demonstrations,” said Andrea Copping, an expert in marine renewable energy development. Copping said there are still large hurdles to overcome before tidal energy can be adopted more widely, such as dealing with regulatory issues, potential environmental effects and conflicts with other ocean users. The four turbines are in the Inner Sound of the Pentland Firth, a narrow channel between the Scottish mainland and Stroma Island known for strong tidal currents.

Vagus Nerve Stimulation Proves Effective in Refractory Rheumatoid Arthritis

[Lucy Hicks](#), Medscape, November 21, 2024, reprinted in FE eNews August, 2025

Ed. Note: This has been reprinted for our IRI Members since the EM Pulser 78 can be held against the side of the neck to reach the vagus nerve without invasive surgery, for even more than one minute each week, as needed, to obtain similar results.

WASHINGTON — An implantable vagus nerve stimulation (VNS) device effectively treats moderate to severe rheumatoid arthritis (RA) in patients who had previously failed at least one biologic or targeted synthetic disease-modifying antirheumatic drug (b/tsDMARD), according to results from a phase 3 trial.

Of the 242 patients in the RESET-RA study, all received the VNS device implant but were blinded as to whether the device was turned on. At 12 weeks, 35.2% of patients receiving daily stimulation achieved 20% improvement in American College of Rheumatology response criteria (ACR20) compared with 24.2% of those with an inactive device. The response was more pronounced among patients with exposure to only one prior b/tsDMARD. A greater proportion of patients in the overall treatment group also reached low disease activity or remission compared with those who did not receive stimulation. .

“This is a particularly tough-to-treat patient population, since the patients enrolled were considered refractory to biologic therapy,” said Elena Schioppa, MD, professor of medicine in the Division of Rheumatology and director of clinical trials at the Medical College of Georgia at Augusta University. More than one third of patients in the study had tried three or more b/tsDMARDs prior to the study. “I’m pretty excited about these results,” she added. Schioppa was a RESET-RA institutional principal investigator and enrolled two patients in the trial.

These positive results are a first for VNS treatment in rheumatic diseases. Previous studies demonstrating the potential therapeutic effect of this implant approach have largely been open-label, proof-of-concept, or pilot studies. Noninvasive, wearable stimulation devices have also shown promise in open-label studies; however, a sham-controlled trial published in 2023 showed that transcutaneous vagus nerve stimulation on the ear was [no more effective than placebo](#).

But How Does It Work?

Developed by SetPoint Medical in Valencia, California, the device is about the size of a multivitamin and implanted in an outpatient setting. During the 45-minute procedure, surgeons isolate the vagus nerve on the left side of the neck and place the nerve stimulator with a silicone positioning pod to hold it in place. The device is programmed to **deliver stimulation for 1 minute every day** and needs charging for only 10 minutes once a week, which is done remotely with a necklace. The device takes advantage of the vagus nerve’s anti-inflammatory properties, stimulating the nerve to help regulate an overactive immune system of someone with RA, explained David Chernoff, MD, Setpoint Medical’s chief medical officer. “We’re recapitulating what nature has developed over millions of years, which is the nexus between the brain and the immune system, which happens to be mediated by the vagus nerve,” he told *Medscape Medical News*.

Innovative Membrane Technology Promises Access to Clean Water

New technology developed by California-based Active Membranes can separate salts and other contaminants from brackish water to expand freshwater supply

August 13, 2025 | [Green Design & Manufacturing](#), NASA Tech Briefs

The good news is that there's a technology — desalination — to put that brackish water to good use. The bad news is that modern desalination is limited in its adoption due to cost, footprint, and sustainability concerns. The other good news is that a new technology developed by California-based company Active Membranes could ameliorate the desalination process and greatly enhance the world's supply of freshwater. See a [two minute video with CEO Arian Edalat](#).

“Our goal is to make desalination cost-effective, less complex, and easier to adopt so that every community, big or small, can afford and sustainably benefit from it,” said Arian Edalat, Co-Founder and CEO, Active Membranes. A widely used method to remove dissolved salts and other contaminants from water is reverse osmosis (RO), which uses ultra-thin membranes that enable water under pressure to pass through the membrane while blocking salt and other contaminants. Scaling and fouling — the buildup of salts and organic matter, respectively, on the membrane — are two common problems with such purification, though. To avoid scaling, RO membranes must be frequently backwashed and cleaned, which is neither time- nor cost-efficient.

So, Active Membranes has developed a novel approach to keep membranes clean. By applying an ultra-thin, electrically conductive coating on top of the membrane and then charging the surface with low voltage, the salt ions and other charged species in the water are pushed away from the membrane surface, reducing scaling and fouling. Edalat noted that the trick is, much like painting a car, the coating must be highly uniform and free from holes and defects.

“The active membrane is coated with a conductive material,” said Peter Fiske, Executive Director, National Alliance for Water Innovation. “Once the membrane is rolled into a spiral-wound module, the membrane itself is electrically activated. Not only does the electric charge on the membrane surface improve the flow characteristics of water through the membrane, but it also helps reduce the accumulation of materials that can block the surface. And the electrical signal itself gives information about the health of the membrane. **Conventional RO membranes are completely passive; this one is active and informative.**”

Indeed. In a recent field pilot in Ventura County, which tested the electrically active membranes against conventional membranes, the former demonstrated a 20- to 30-percent improvement in water production. This is an important advancement: According to U.S. Geological Survey estimates, the amount of brackish groundwater in the U.S. is more than 800 times the amount of fresh groundwater pumped from all other sources every year. This new membrane technology could be quite the boon for access to clean agricultural and industrial water. The original work was Federally funded and performed at UCLA to demonstrate the potential for coating RO membranes and electrically charging them. But the key breakthrough, Fiske said, came when the Active Membranes team realized some of the key benefits of this process and adapted the technology to a commercial system.

Unlikely alliance builds cleaner geothermal energy network in Massachusetts community

[Miles O'Brien](#), Oct 10, 2025 6:35 PM EDT, PBS.org

An unlikely partnership between a utility company and climate activists managed to convert a community to geothermal heating and cooling. Science correspondent Miles O'Brien reports on this project for our energy and climate series, Tipping Point.

Geoff Bennett:

Now the story of an unlikely partnership between a utility company and climate activists and how they worked together to help one community switch its heating and cooling to a cleaner source. Science correspondent Miles O'Brien has the story, part of our Tipping Point coverage on energy and climate.

Miles O'Brien:

Retired schoolteacher Carol Canova has lived in this tiny little house in Framingham, Massachusetts for 30 years. From this humble perch, she has experienced firsthand a historic energy transition. She started with an oil-burning furnace, then switched to gas, and now heats and cools with an electric heat pump attached to a geothermal well.

Carol Canova, Framingham, Massachusetts, Resident:

I was told it would be even heat. I was told it would be efficient and so forth. But seeing is believing. I'd never been in a house that every place in the house was the same temperature.

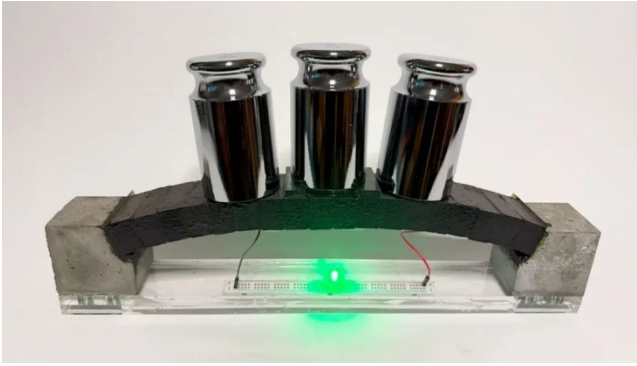
Miles O'Brien:

Canova is part of a first-in-the-nation pilot by utility giant Eversource. It's a one-mile network of underground pipes connecting three dozen homes and municipal buildings to a shared geothermal well. It's called networked geothermal, and if it works here, it could be a blueprint for utilities nationwide.

Heat pumps live up to their name. They move heat. In the summer, they pump heat out of your home. In the winter, they bring it in. How hard they have to work and how much electricity they use depends on the temperature difference between inside and outside. The greater the gap, the more energy they need. Shallow geothermal wells tap into the earth's steady underground temperature, about 55 degrees year-round. Water with antifreeze circulates through buried pipes, absorbing or releasing heat at that consistent temperature. A heat pump paired with a geothermal well has less work to do and is far more efficient no matter the weather above. The catch? Drilling a geothermal well is very expensive, but none of the volunteers in this project paid a dime for either the well or the heat pump. The idea was born of an unlikely partnership between utility executives and climate activists, among them, Zeybeb Magavi, the executive director of the nonprofit HEET, the Home Energy Efficiency Team. It's a grassroots group that started out by banding together to insulate their homes. They were looking for a way to make a bigger dent.

THE CONCRETE BATTERY REVOLUTION: WHEN WALLS BECOME POWER PLANTS

By Futurist Thomas Frey, ImpactLab, October 2025



Imagine driving past a building and not just seeing its windows, doors, and facade—but glimpsing the stored energy humming inside its very walls. In a radical shift from mere structure to **energy infrastructure**, MIT researchers have developed a new form of concrete—**electron-conducting carbon concrete (ec³)**—that stores and discharges electricity, elevating walls, sidewalks, and foundations into living batteries. Their latest prototype improves

energy density **ten-fold** over prior versions. This is more than a clever trick. It's a tectonic redefinition of how we build, live, and power the future.

Concrete is the world's most ubiquitous building material. For centuries, it's carried weight, resisted weather, and stretched over horizons of cities. But it has never stored energy—until now.

The ec³ innovation combines cement, water, ultra-fine carbon black, and electrolytes to form a conductive nanonetwork inside the concrete matrix. That network enables the material to act as a **supercapacitor**, with the ability to absorb, hold, and release charge over several hours—not just milliseconds. Thanks to optimized electrolytes and nanostructure imaging, the team cut the required volume for everyday energy storage dramatically. In earlier designs, a home's daily energy demand might require **45 cubic meters** of energy-storing concrete. Now, that shrinks to about **5 cubic meters**—a volume comparable to a basement wall.

To put that in perspective: each cubic meter can store over **2 kWh** — enough to run a refrigerator for a day. The economics shift: selling energy becomes selling “**storage infrastructure as material.**” Construction firms become power utilities. Architects become energy strategists. Real estate incorporates kilowatt-hours, not square feet, as a metric of value. While 2 kWh per cubic meter is remarkable, it still trails chemical batteries. For large-scale storage, the scale-up challenge remains steep.

If all of this falls into line by mid-century, the map of cities might be redrawn:

- Buildings supply themselves, not just via rooftop solar, but via the concrete frames themselves.
- Infrastructure (roads, bridges) becomes active, storing energy from passing electric vehicles, solar rails, or ambient generation.
- Microgrids, once niche, become default. Decentralization turns from ideal into baseline.
- The need for massive external battery factories shrinks, as every structure becomes a participant.
- Energy equity widens. Communities previously considered “behind the grid” gain internal storage capacity without massive capital outlays.

Chip-scale solar thermal electrical power generation

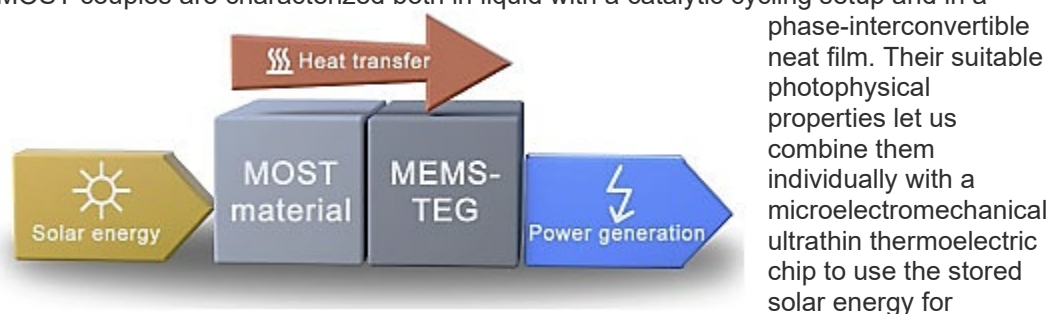
Zhihang Wang¹ et al., Cell Reports Physical Science, Vol. 3, Issue 3, 2022

Highlights

- Solar energy storage and conversion to electrical power generation is demonstrated
- Continuous power output can be generated from the combined device
- Photophysical properties of two photoswitches are fully characterized
- A microelectromechanical ultrathin thermoelectric chip is designed and fabricated

Summary

There is an urgent need for alternative compact technologies that can derive and store energy from the sun, especially the large amount of solar heat that is not effectively used for power generation. Here, we report a combination of solution- and neat-film-based molecular solar thermal (MOST) systems, where solar energy can be stored as chemical energy and released as heat, with microfabricated thermoelectric generators to produce electricity when solar radiation is not available. The photophysical properties of two MOST couples are characterized both in liquid with a catalytic cycling setup and in a



electrical power generation. The generator can produce, as a proof of concept, a power output of up to 0.1 nW (power output per unit volume up to 1.3 W m^{-3}). Our results demonstrate that such a molecular thermal power generation system has a high potential to store and transfer solar power into electricity and is thus potentially independent of geographical restrictions.

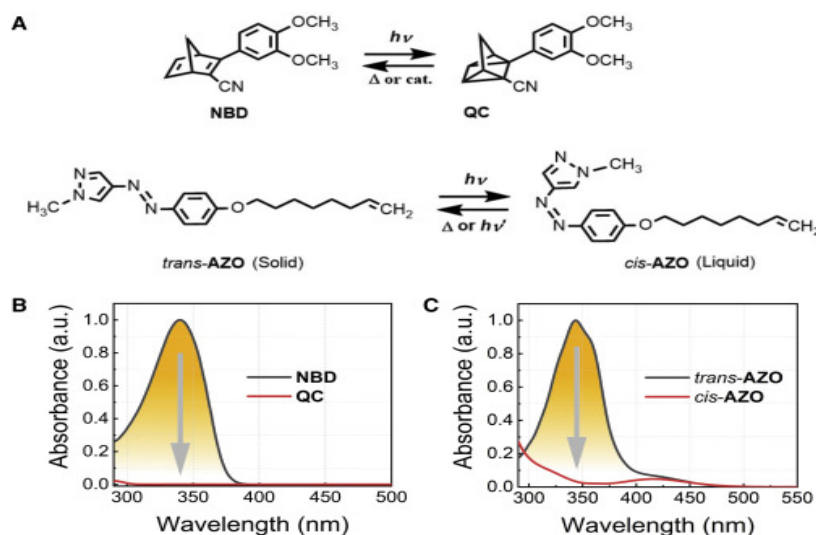
To explore ways to store solar energy, we are investigating a class of materials that can capture sunlight via reversible photochemical reactions and later release this stored energy on demand. These materials operate in a closed cycle, and they use photochromic chemical compounds to form the basis of molecular solar thermal (MOST) energy storage systems.^{15–18} Upon exposure to sunlight, a suitable MOST material (in the parent state) can photoisomerize to a high-energy metastable photoisomer that can be stored for extended periods of time. Depending on the photochrome used, the back-conversion reaction releasing heat energy can be triggered through different processes, including thermal,^{19,20} catalytic,^{21,22} electrocatalytic,^{23,24} and photoinduced conversion.^{25–27} It has been previously estimated that, for an ideal liquid MOST device, up to 21% of the solar energy can be stored as chemical energy for later heat production.²⁸ Such heat produced can be delivered locally and on demand, unlike other thermal storage technologies. The temperatures accessible by the energy release reaction of the MOST are, at the current stage of development, less than 100°C , which is not high enough to be utilized for electrical power generation by traditional means. Therefore, it is necessary to match the MOST systems with high-efficiency and sensitive TE devices to effectively utilize this relatively low-grade thermal energy.

Here, we design a compact, chip-based device that combines two different MOST systems operating either in the liquid or in the solid state with a novel designed MEMS-TEG to demonstrate the storage of solar energy to the release of heat energy and the

cascading energy flow to the harvester that is finally used to generate power (see Scheme 1). Two molecular photoswitches with suitable properties—a norbornadiene derivative (NBD) investigated as a solution and a phase-interconvertible arylazopyrazole derivative (AZO) measured as a neat film—are selected for their potential to produce heat energy for electrical generation. The ultrathin MEMS-TEG with 572 TE modules is designed and fabricated, in which the TE films are only 1 μm thick. We characterize and couple each of these photoswitches individually with the MEMS-TEG chip (effective thermoelectricity area 10 \times 6 mm), demonstrating that chemical energy stored in MOST systems (in Sweden) can successfully generate electrical power (in China) through the process of solar energy storage, heat release, and TE conversion, thus affirming that solar energy can generate electrical power independent of time and geographical restrictions.

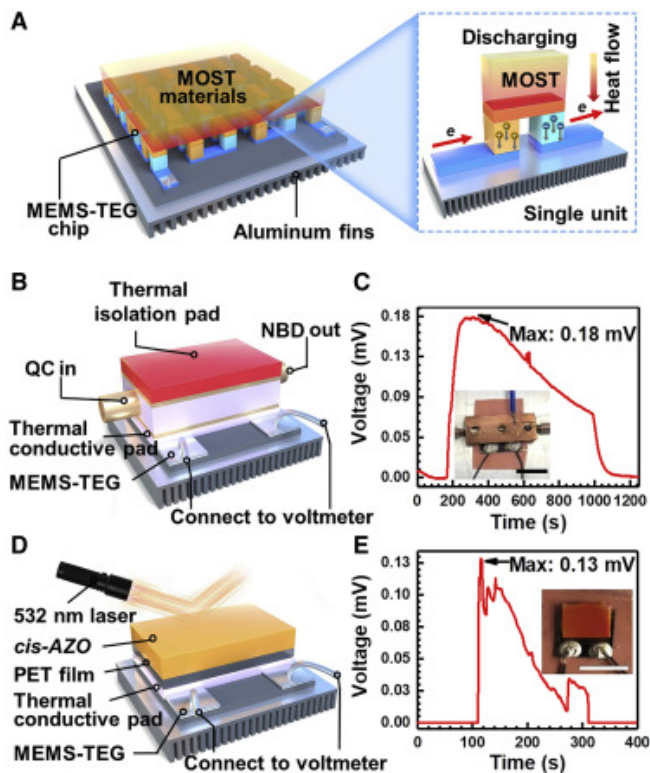
Results and discussion: Solar energy storage properties

MOST systems can function in both liquid and film forms, which can be tailored toward different applications.^{21,38–45} In liquid form, MOST systems can transport stored energy, meaning that energy can be stored and released in two different locations, whereas in film form, MOST systems can be used in smart windows and other device integrations.^{43,46} In this study, we selected and tested two systems: an NBD in liquid form (in toluene solution, which can provide a low specific-heat capacity of ca. 1.6 J g⁻¹·°C⁻¹) and a neat AZO in thin films with suitable energy capture and storage functionality. The molecular structures of both photoswitch couples are shown in Figure 1A. The photoconversion of NBD proceeds via a [2 + 2 π] cycloaddition reaction to its corresponding photoisomer quadricyclane derivative (QC). Thus, the energy storage density $\Delta H_{\text{storage}}$ was experimentally determined to be 93 kJ mol⁻¹ (0.37 MJ kg⁻¹). Meanwhile, QC has a thermal back conversion half-life of 1 month at room temperature, demonstrating the possibility for long-term storage in toluene. Spectroscopically, we previously showed that norbornadiene with a push-pull system has a spectral red-shifting effect on the absorption.²¹ Hence, this NBD with dimethoxy donor units exhibits an absorption feature around 340 nm with a maximum absorptivity of $\epsilon_{\text{max}@340\text{ nm}} = 1.4 \times 10^4 \text{ M}^{-1} \text{ cm}^{-1}$. In contrast, the absorption profile of QC is virtually negligible above 300 nm, leaving a transparent optical window of around 85 nm between both forms due to the selected push-pull substituents (see Figure 1B). This significant spectral difference enables near-quantitative photoconversion, even in concentrated solutions. In addition, the photoisomerization quantum yield was 68% in toluene. Considering the above-mentioned MOST properties, solar energy storage efficiency of the system could exceed 0.70%³⁸



- (A) Molecular structures of NBD-QC couple (top) and trans/cis-AZO photoswitch couple (bottom). A thermal (Δ) or catalytic (cat.) route can facilitate the back conversion of QC \rightarrow NBD. The back conversion of cis- \rightarrow trans-AZO can be achieved by a thermal or light-induced activation.
- (B) Absorption profile of NBD before and after irradiation with 340-nm light (in toluene).
- (C) Absorption profile of AZO photoswitch before and after irradiation with 365-nm light (in acetonitrile).

Photoconversion in the device under various exposure times and complete interconversion through multiple cycles are important tests for photoswitch viability in a MOST system. These experimental factors have previously been reported for AZO46 but not for NBD. Therefore, additional experiments were necessary to determine the compatibility of the NBD photoswitch. A custom-made 400-mm² microfluidic reactor was used for this photoconversion experiment (see Note S2 and Figure S1 for details). A solution of 0.1 M NBD (25 g L⁻¹) in toluene-d₈ was pumped through the microfluidic reactor with residence times from 34 to 343 s. The degree of photoconversion was monitored immediately afterward by 1H NMR spectroscopy. For an ideal MOST system, where the absorption of the photoisomer (QC) does not compete with the absorption of the parent (NBD), the energy storage efficiency, η_{MOST} , should remain approximately unchanged prior to full conversion.^{40,45,56} Here, we observed a decrease in solar energy storage efficiency from $\approx 0.5\%$ at short residence times to 0.25% at full conversion. While not ideal, it is normal for efficiency to lower progressively during the conversion process. In this context, this system is better than our previous attempts at flow conversion.²¹



- (A) Schematic concept of MOST to power generation.
- (B) NBD couple-based solar energy storage for power-generation experimental setup.
- (C) Heat release monitoring by thermocouple and voltage generated from MEMS-TEG chip over time. The inset is a photo of the device. Scale bar, 1 cm.
- (D) Schematic experimental setup of AZO film-based solar energy for power generation.
- (E) Net voltage generated from MEMS-TEG chip over time. The inset is a photo of the device. Scale bar, 1 cm.

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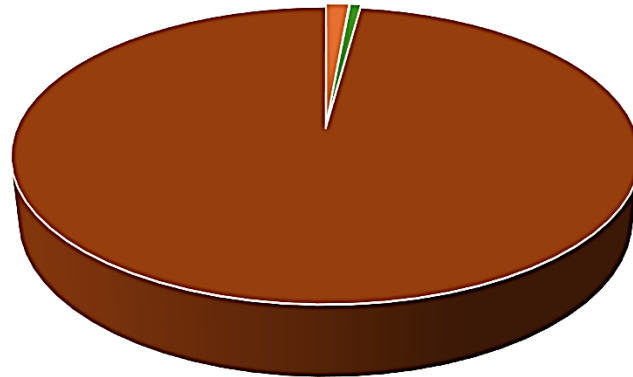
Photochemical phase transitions enable coharvesting of photon energy and ambient heat for energetic molecular solar thermal batteries that upgrade thermal energy

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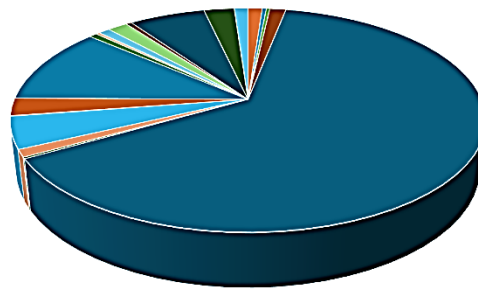
IRI FINANCIAL REPORT 2025

IRI Income for 2025 - Total = \$161,603



■ Direct Public Support ■ Membership Dues Revenue ■ Retail Sales ■ Sales

IRI Expenses 2025 = \$155,611



■ Advertising & Marketing ■ Bank Charges & Fees ■ Contractors
■ Gifts for members and Volunteers ■ Grants for Projects ■ Insurance
■ Legal & Professional Services ■ Meals & Entertainment ■ Memberships & Dues
■ Office Supplies & Software ■ Rent & Lease ■ Repairs & Maintenance
■ Repairs & Maintenance Office ■ Software Expense ■ Subscriptions & Dues
■ Taxes & Licenses ■ Telephone & Communications ■ Travel
■ Uncategorized Expense ■ Web Site & Internet Expense



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