



Integrity Research Institute Annual 2017



featuring

IRI Activity Highlights and Projects Review

Future Sustainable Energy Technology

IRI Annual Financial Report for 2017

Thomas Valone, PhD, PE Editor

Energy, Propulsion, Bioenergetics

CREDITS

**Integrity Research Institute wishes to acknowledge the following for this
IRI Annual Report 2017**

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PRESIDENT'S LETTER

This past year was very important for IRI programs in the energy, propulsion, and bioenergetics areas. With the announcement by MIT that **5°C is the most likely increase** in global temperature by 2100 (see p. 15-16), IRI is now advocating carbon-free energy and propulsion innovations for market displacement as well as **carbon capture and use (CCU)**, more than ever. We also pioneered a lasting collaboration for our conferences with Steve Elswick at TeslaTech, LLC with COFE9, which was successful in attracting high quality speakers and authors, with DVD creation to educate the public about discoveries in our program areas. The *Proceedings of COFE* has been modified to become *Selected Papers from COFE 1-10* with forty (40) papers for our IRS-mandated public education service. My 2017 retirement helps to make COFE10 even better.

After no response from the public even twelve years after the **Spiral Magnetic Motor (SMM)** journal paper 2006 publication with the Amer. Inst. of Physics, we are finally developing it in our IRI lab, after a successful crowdfunding campaign www.tinyurl.com/Indiegogo-SMM. It needs very little innovation to be self-sustaining and we will be looking for licensing opportunities once it is completed. It also is a low risk and high pay back project just requiring a *magnetic switch* at the commutation point using polymagnets.com for instance which offers programmed attraction and repulsion with slight movement of a pair of specially manufactured permanent magnets.

IRI also has intellectual property with the assigned rights to US patent #8,825,174 on **Antioxidant Therapeutic Electric Clothing** by Dr. Jacqueline Panting, the resident naturopathic doctor on our staff. We are planning meetings with sports companies for licensing. We also have been successful in producing an OsteoPad which was patterned after three medical doctors' research who I used to know in the 1980s but who never produced a commercial product for reversing osteoporosis, osteopenia, and cartilage loss, even though their patients benefitted from reduced healing time for bone knitting of fractures. Our clients have been obtaining Bone Density Scan tests before and three months after using the OsteoPad each night and their doctors are stating "statistically significant improvements" in bone density www.OsteoPad.org. We might also be interested in licensing the EM Pulser or EM PulsePad products that have been developed based on another doctor's work (Dr. Glen Gordon) who reversed his congestive heart failure and bicycled across the US afterwards with his prototype model (EMpulse) which obtained FDA approval for a time. www.BioenergyDevice.org

I may have mentioned in the past newsletters the IRI propulsion projects that were just started two years ago with Mike Gamble (Control Moment Gyro for electrically powered unidirectional force as Boeing has been doing for years on their satellites) and with Robert DeBiase (Casimir Force Generator for unidirectional force on a microscopic scale). Both have been presenters at our Conference on Future Energy in the past, so we have DVDs and papers and/or slideshows from them as well. Both projects are also progressing along very well and have continuing presentations at our COFE events www.futureenergy.org.

Lastly, this *IRI Annual Report 2017* is the most valuable and practical energy innovation ideas that can be packed into one report. It is online <http://www.integrityresearchinstitute.org/links.html> with previous IRI Annual Reports in **PDF**, in order to use any of the **hot links** which give you a glimpse of the source reference articles and websites that we referenced. This Report contains lots of investor-ready energy inventions. For more, see future energy in person...attend COFE10.

Thomas Valone, PhD, PE
President

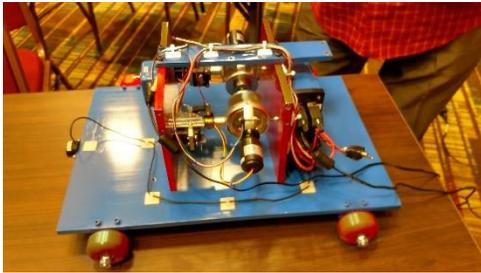
INTEGRITY RESEARCH INSTITUTE

HIGHLIGHTS 2017

Conferences and Appearances. We held our 9th Conference on Future Energy (COFE9) on July 28-29, at the Embassy Suites in Albuquerque NM. It featured 14 speakers including: Carolyn McMakin, Dr Glen Rein, James Purvis, Professor Nirmala Khandam, Robert DeBiase, among many others who presented on a wide array of new-energy technologies, emerging renewables, advanced future energy concepts, advanced propulsion concepts and the latest on bioelectromagnetics. This conference was included government, military, academic delegates as well as energy scientists, entrepreneurs and inventors from all over the world. Dr Valone also presented four (4) different lectures on Mindfulness and Meditation at the United States Patent and Trademark Office to benefit the working examiners. Dr Valone appeared on 3 radio shows this year: 1. THE UBN Radio Show from Hollywood California, The Richard Hoagland “Other Side of Midnight” Radio Show and The AuroraTek Radio Show. Also Dr. Valone attended the 20th Annual Renewable Energy Conference at the Rayburn House Office Building at Capitol Hill, Washington DC on July 11, 2017, as well as the Union of Concerned Scientists Presentation “When Rising Seas Hit Home” on July 24th. Dr. Valone was also filmed at the IRI Laboratory and interviewed by the **History Channel** on September 10th for an upcoming Tesla science show.

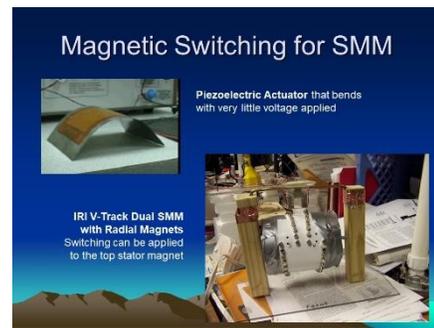


The 2017 COFE9: Clockwise from Top Left: Dr Valone, followed by Dr Panting at IRI COFE booth, Dr McMakin at her booth, latest CMG model by Mike Gamble debuted at COFE9, Dr Rein presenting.

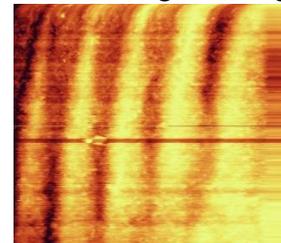
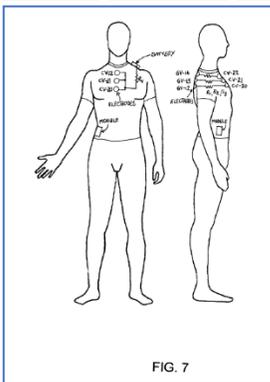


Propulsion Program. The **Control Moment Gyro Project** successfully produced a tabletop prototype by Mike Gamble (see left), the retired Boeing Engineer who is the Chief Engineer on the project. For years, Inertial Propulsion has been advocated by IRI and now we have replicated a table-top model. The purpose of this experiment is to show that forward thrust and propulsion is possible by scissoring gyros, as Boeing proved with its satellite maneuvering. Initial funding has been provided by our Institute. Mike Gamble presented at COFE9 where his measured results and data with a load cell matched the theoretical predictions: Peak forces were 0.43 lb. theory and 0.4 lb. experiment while the average forces were 0.13 lb. theory and 0.10 lb. experiment, which is an extraordinary achievement for the first attempt by any engineer but Mike is no ordinary engineer!

Energy Program. For the first time, IRI did a crowdfunding through Indiegogo in December 2017 to raise funds toward our **Spiral Magnetic Motor**, (SMM). We are happy to report that we got close to our goal, thanks to the generous donations of many members and new generous supporters. The campaign ended in January 2018. The development will continue for one year through 2018. Instead of gasoline, coal, or natural gas to power any motor, imagine a Magnetic Microturbine onboard to charge an electric vehicle, with no external connection. Yes, a **magnetic gradient** has been implemented into a permanent magnet motoring cycle. Now we add a proper choice of a magnetic switch. This Spiral Magnetic Motor is designed to provide mechanical drive for electrical power using only **permanent magnets**. The crowdfunded Indiegogo campaign raised around \$15,000 for the project, which was more than half of the requested amount and sufficient to move forward with the one-year development of a *self-sustaining permanent magnet motor*.

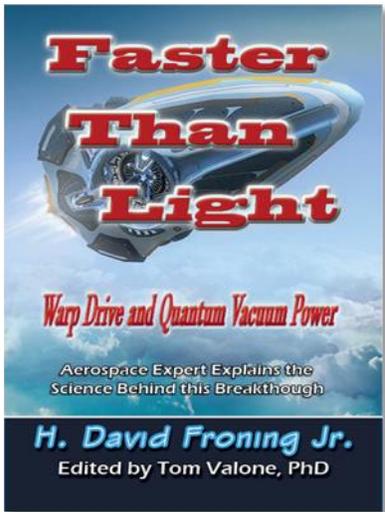


Bioenergetics Program. We are truly busy with this program that includes research on equipment, therapy machines and providers of electrotherapy. The **Antioxidant Microcurrent Electrotherapy Clothes Project** is moving forward since IRI has the US Patent # 8825174 issued in 2014. We are partnering with Dr. Warren Jasper of the University of North Carolina Textile Engineering School working to develop several prototypes. We are experimenting on different textiles and power sources that withstand use and washing. Also our line of PREMIER electrotherapy devices as well as EM Pulsers, EmPulsePad, OsteoPads and Maximat continue to be improved and sold. We also are reviewing licensing opportunities for them as well. IRI has plans to develop a commercial version of our Energy Chair prototype, which has many high voltage electrotherapeutic benefits and much public appeal.



Zero Point Energy Program. The research continues on the possibility of tapping zero point energy through a new project with Robert DeBiase and in partnership with Veden Akademie named: **“Quantum Fire Project”**. It was started shortly

after DeBiase's COFE8 presentation because the Casimir forces are ultimately the result of quantum effects which can be manipulated. If asymmetric forces are observed, it would unleash the most disruptive technology ever seen since humans first harnessed fire. Of course, it might not work but the Casimir equations are very convincing. IRI received some funding this year and preliminary data and tests with suitable polymers have been produced. We are also currently working with several students who are designing ways to harvest energy with zero bias diodes and the IRI DEAC design. Much research is still being done for this separate project and completion is slated for 2020.



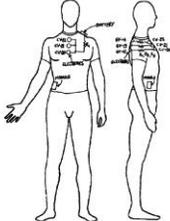
IRI Publications and Books. We are happy to report that a new book is in the works for 2018. Retired Aerospace Engineer and past COFE Award Speaker, H. Dave Froning has donated the copyrights to IRI of his book, which is entitled: “**Faster Than Light: Warp drive and Quantum Vacuum Power**” The book is being edited by Dr. Valone and when finished will be published by Adventures Unlimited Press. More than 300 pages, full of aerospace anecdotes and futuristic aerospace designs this book will be a great resource. Along with many personal memories of the author and invaluable insights into the aerospace world history. The “Integrity Research Institute Annual 2016” was published and mailed free to our membership. It included our latest papers on Energy, including Zero Point Energy, Electrogravitics, Energy generation, Bioelectromagnetics, as well as the IRI

Annual Report and financials. We continue to upgrade our IRI website including more information on emerging energy technologies, climate change, and video uploads and press releases. Our latest initiative is to add “Electronic Version” with a fulfillment service called “Shopify” to all of our printed books, reports, and video products online, thereby allowing instant gratification for purchase downloads! Try buying a PDF copy of one of our books or reports. It is easy and quick.

Product Development and Energy Advocacy. The following sections of this **Annual Report 2017** include a few of IRI accomplishments, the IRI Universe of Products and Projects, as well as excerpts from recent slideshows on “Future Energy Breakthrough Technologies.” After producing “Energy Policy Recommendations” for the Obama Administration, which IRI mailed a few hundred copies to government and Congressional offices, the contents still contain valuable energy breakthroughs that have not been fully implemented commercially. Therefore, the best and most promising energy discoveries from both sources are included in the rest of this IRI Annual Report 2017 in order to make this volume a valuable resource and practical reference for future energy. IRI looks for the robust nature of the inventions, whether they can handle megawatt levels of output power, and how much capital expense is needed upfront to put the inventions into production as a percentage of the retail value. The winners from this detailed evaluation are the future energy examples chosen for this Annual Report 2017.

Bioenergy Device Electrotherapy Program

(12) United States Patent Panting	(10) Patent No.: US 8,825,174 B2 (45) Date of Patent: Sep. 2, 2014
(54) THERAPEUTIC ELECTRIC ANTI-OXIDANT CLOTHING: APPARATUS AND METHOD	(56) References Cited
(75) Inventor: Jacqueline Panting, College Park, MD (US)	U.S. PATENT DOCUMENTS
(73) Assignee: Integrity Research Institute, Beltsville, MD (US)	3,014,818 A 12/1961 Campbell
(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 96 days.	3,071,366 A 7/1976 Matsuyama
(21) Appl. No.: 13/135,140	4,364,739 A 12/1982 Tombe
(22) Filed: Jun. 27, 2011	4,416,913 A 10/1981 Tombe
(65) Prior Publication Data	4,993,413 A 7/1991 McLeod
US 2012/0016446 A1 Jun. 19, 2012	4,996,957 A 7/1991 Petrovsky
Related U.S. Application Data	5,697,461 A 7/1997 Lathrop
(60) Provisional application No. 61/258,916, filed on Jan. 27, 2010.	6,013,398 A 7/2000 Tald
(51) Int. Cl.	6,217,664 B1 4/2001 Azare
A61N 1/00 (2006.01)	6,473,808 B2 10/2001 Dugan
A61B 5/04 (2006.01)	6,751,506 B2 6/2004 Shealy
A61N 1/20 (2006.01)	2004/0087229 A1* 5/2004 Van Herten et al. 442/4
A61N 1/04 (2006.01)	* cited by examiner
A61N 1/32 (2006.01)	Primary Examiner —Nicole F Lavert
(52) U.S. CL.	(57) ABSTRACT
A61N 1/05 (2013.01); A61N 1/04 (2013.01); A61N 1/32 (2013.01)	A process for introducing therapeutic doses of electric antioxidants to the human skin with conductive portions in clothing for electrically contacting the skin, for applying direct current, pulsed direct current, or alternating current electricity of various voltage and current levels, for conductive wiring fiber interwoven in clothing, and for electronically controlling the doses of electric antioxidants to microcurrent doses applied percutaneously or transcutaneously to the human skin. A preferred embodiment includes the process for applying clothing that is skin tight, with or without a control module embedded in the clothing or optionally, a wireless and remote control module for administering the therapeutic doses of electric antioxidants to the skin of the head, feet, legs, hips, or upper torso.
(53) CPC	
A61N 1/05 (2013.01); A61N 1/04 (2013.01)	
(58) Field of Classification Search	
USPC 607/62; 600/386; 600/388	
See application file for complete search history.	



Dr. Jacqueline Panting ND was granted U.S. Patent #8,825,174 on September 2, 2014 and assigned to IRI. We were working in 2017 with Dr. Warren Jasper from NC State College of Textiles to produce a working prototype that is durable and washable, using the latest conductive fibers and piezoelectric or Flexsolar cell microcurrent generators. Soon sports competitors and Olympians will be wearing our product since it will quench the free radicals developed by “exhaustive exertion” and allow the performer to fight fatigue much more easily since “Electrons are antioxidants” as discovered by Dr. Valone and Dr. Oschman.¹

In keeping with the Bioenergetics Program that includes the **EM Pulser**, **OsteoPad**, and the latest **EM PulsePad** products, the development of **Therapeutic Electric Antioxidant Clothing** will be licensed soon, with one of three sports apparel companies who have shown serious interest in the rights to our invention, mainly for

athletes who compete professionally. Speaking of the EM Pulser, PulsePad, and OsteoPad, all inspired by former IRI Advisory Board Member, Glen Gordon, MD, we have maintained the original essential design ingredient, being the nanosecond rise time of the pulsed magnetic field (PEMF), which attracts a heat shock protein (HSP70) to start healing inflammatory illnesses at the site where it is applied. Numerous testimonials now appear on our active webpage, www.BioenergyDevice.org which attest to Dr. Gordon’s genius. A one hour video lecture of Dr. Gordon, providing complete instructions on their use, is provided with each EM Pulser and PulsePad product. The OsteoPad has been an outgrowth of the same circuit design but applied with pancake coils distributed over a 14”x20” pad or a 20”x 60” pad (MaxiMat). The **Premier** line of products, designed around high voltage electrotherapy that boosts the cellular TMP and antioxidants, has also been selling well.

Other patent filings are also in the works, on behalf of Integrity Research Institute, for forthcoming health restoration products, such as the ATP Turbo, a 670 nm with 850 nm near-infrared LED handheld product, that is being designed to provide a stimulating frequency combination shown to activate ATP energy production.



¹ Oschman, James. *Energy Medicine: The Scientific Basis*, Churchill Livingstone, 2000

COST

\$250K+

\$100K+

\$10K

\$5K

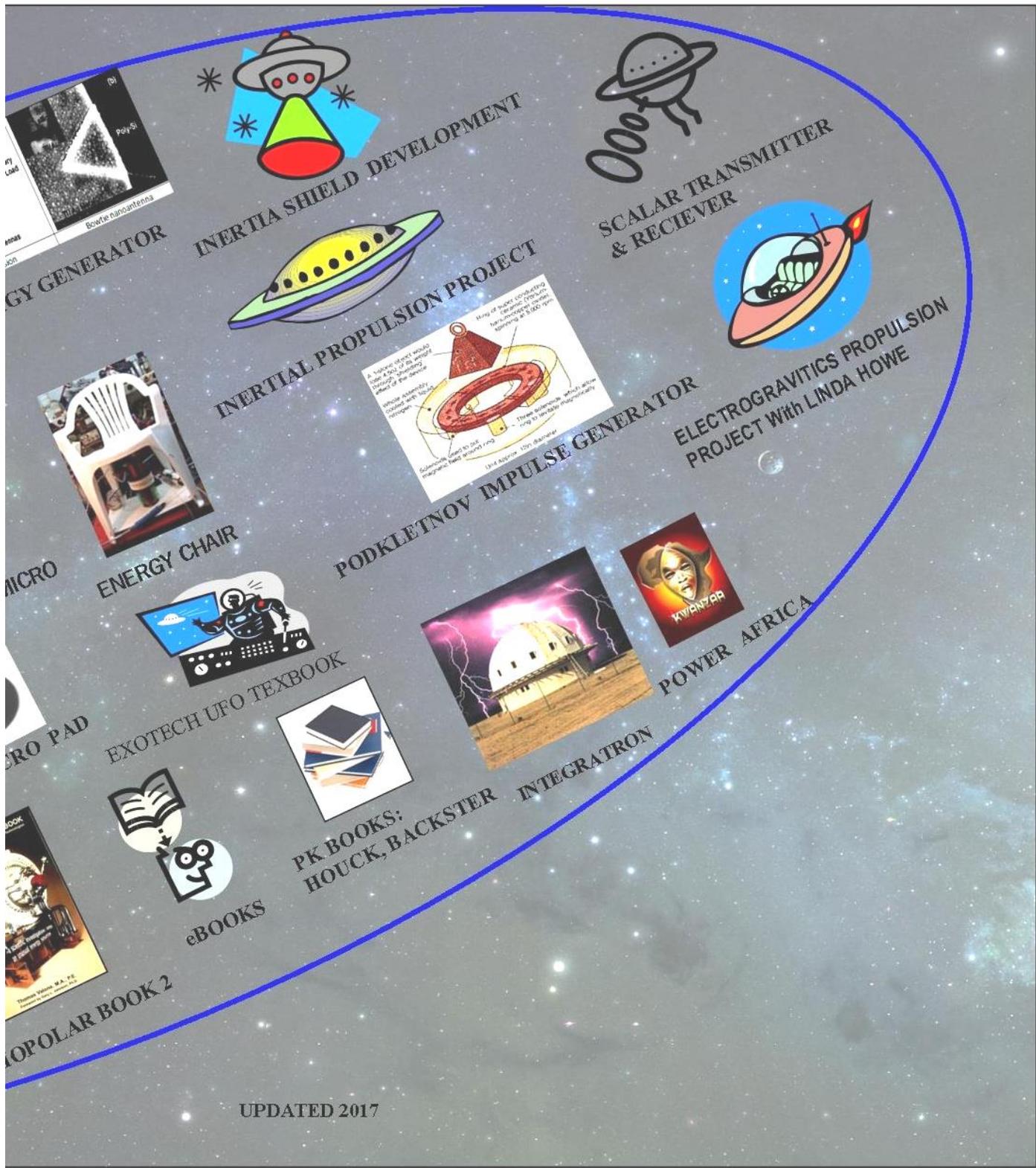
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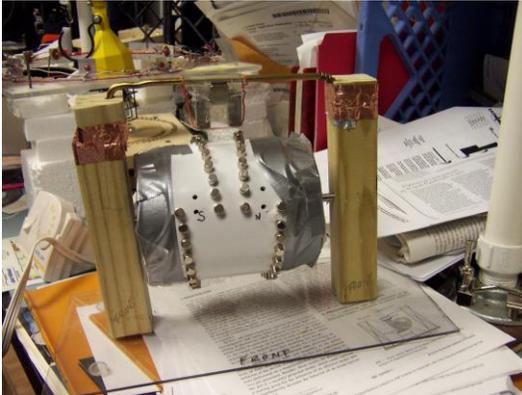
DEVELOP





50%
DEVELOPMENT

Spiral Magnetic Motor – The Primary IRI Research Project Designed for a Clean Energy Future with Magnets and Creativity



Most people may not realize that spinning electrons are the cause of magnetism. Some physicists remind us on science documentaries that electrons in the mountains have been spinning for millions of years. Yet, the key to unlocking zero-point energy and the negative energy of the quantum vacuum is the low hanging fruit called the “**Magnetic Gradient.**” While we use the voltage gradients, thermal gradients, and even gravity gradients all of the time to perform useful work, our world has not

mastered the magnetic gradient (a change in magnetic field intensity over a distance of space). The Spiral Magnetic Motor (SMM) is just the kind of magnetic gradient motor which is ripe for scientific research today because the practice of energy harvesting is gaining a wide range of possible options. Capitalizing on an ambient source of energy, such as a passing magnet causing a voltage spike with Wiegand wires, will lead to a viable method of magnetic switching for the SMM rotor so that the cycle can be repeated. This is very exciting for the serious inventor since IRI has shown that 90% of the cycle is already powered by permanent magnets in an SMM. IRI has built many SMM models and published the results in peer-reviewed journals.²The next phase of research will be to contract with a custom magnet designer for the commutation, with an energy harvester. Peer-reviewed paper and crowdfund video online: www.tinyurl.com/IndiegogoSMM or

<https://tinyurl.com/SMMpaper>. IRI has funded materials for the Spiral Magnetic Motor Research Project, up until now with the volunteer labor of engineer, Thomas Valone, whose SMM paper has already received popular achievement award notification on ResearchGate, from research done with multiple test models of the axial design pictured on the next page. The exciting part is that we now have all of the statistics necessary to predict angular momentum, torque, power, and energy production. This helps tremendously for considering energy harvesting for any electronic motion sensor, speedometer, piezoelectric switching controls, etc.

YOUR RESEARCH IS IN THE SPOTLIGHT

Permanent Magnet Spiral Motor for Magnetic Gradient Energy
Utilization: Axial Magnetic Field



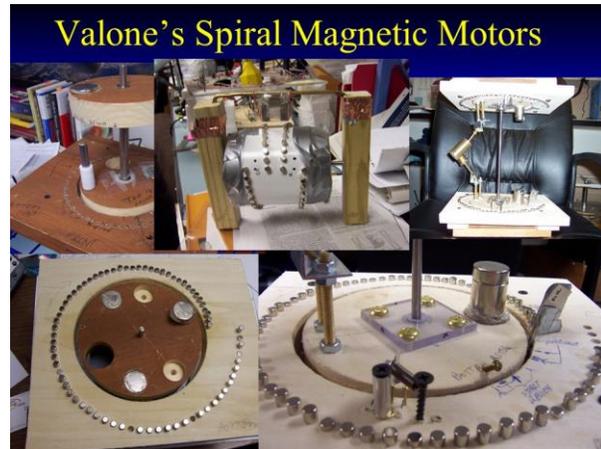
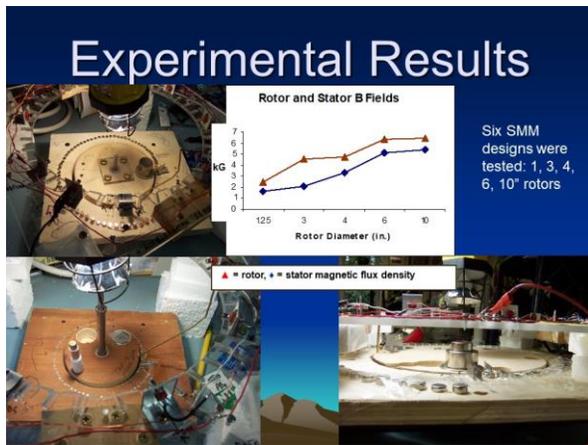
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<https://www.researchgate.net>

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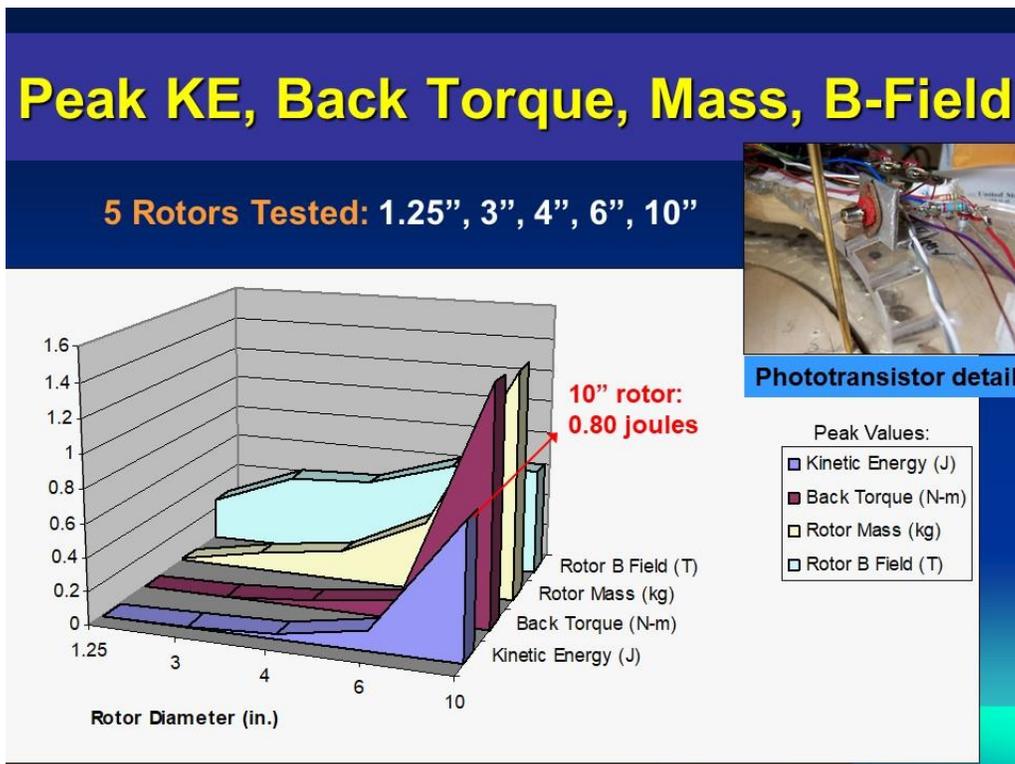
² E.g., “Permanent Magnet Spiral Motor for Magnetic Gradient Energy Utilization: Axial Magnetic Field” Presented to the Space, Propulsion & Energy Sciences International Forum (SPESIF), February 23-26, 2010, Applied Physics Laboratory – Johns Hopkins University, sponsored by the American Institute of Physics



The development objectives for this spiral magnetic motor (SMM) and generator project, with Phase I completion in 2018, fall into two basic categories but others may be discovered as the project proceeds:

1. The first is a self-sustaining, spiral permanent magnet generator for electrical power, replacing fossil fuel-based generation, for a **Magnetic Microturbine** that can be (a) stationary for single user, community-based distributed use or (b) portable for electricity generation inside land, sea, or air electric vehicles (EVs).
2. The second is a **Magnetic Motor** of similar design as above but optimized with weight to power ratio for production of torque in automobile and airplane engines supplying basic transportation with a revolutionary no-fuel motor.

Both applications utilize an increasing magnetic field strength (gradient) surprisingly present in 90% of the spiral magnetic cycle. The Magnetic Microturbine will free all the countries of the world from dependence on coal and natural gas, while the Magnetic Motor will supplant oil usage for vehicles, thus raising the standard of living for everyone with long-lasting, clean energy.



Phototransistor detail

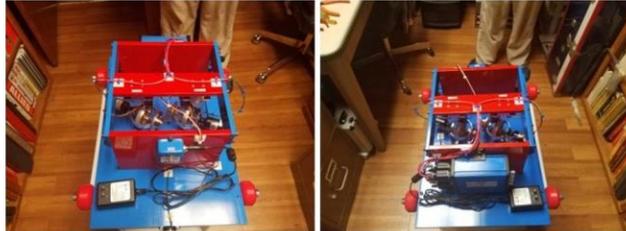
Control Moment Gyroscope – Secondary IRI Project Designed to Duplicate Boeing CMG for Commercial Transportation with Inertial Propulsion



Project Engineer Mike Gamble shows the Boeing CMG that he worked on for their satellite maneuvering to keep them in orbit. IRI contracted with him to reproduce the basic design with only two gyros in a tabletop version. At COFE9, Mike reported that his calculated prediction and measured load cell forces match each other within 10% accuracy, producing about 0.4 lb. of peak force. Reducing noise is the next step.

COFE9 Conference On Future Energy

TEST ARTICLE END VIEW



FRONT

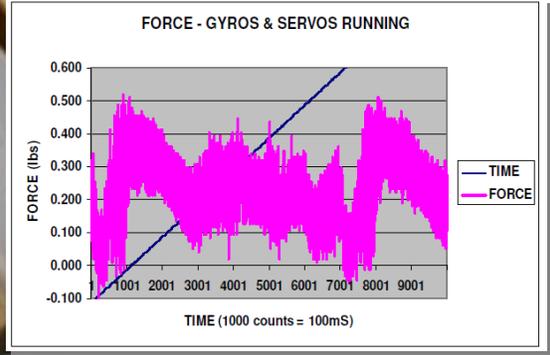
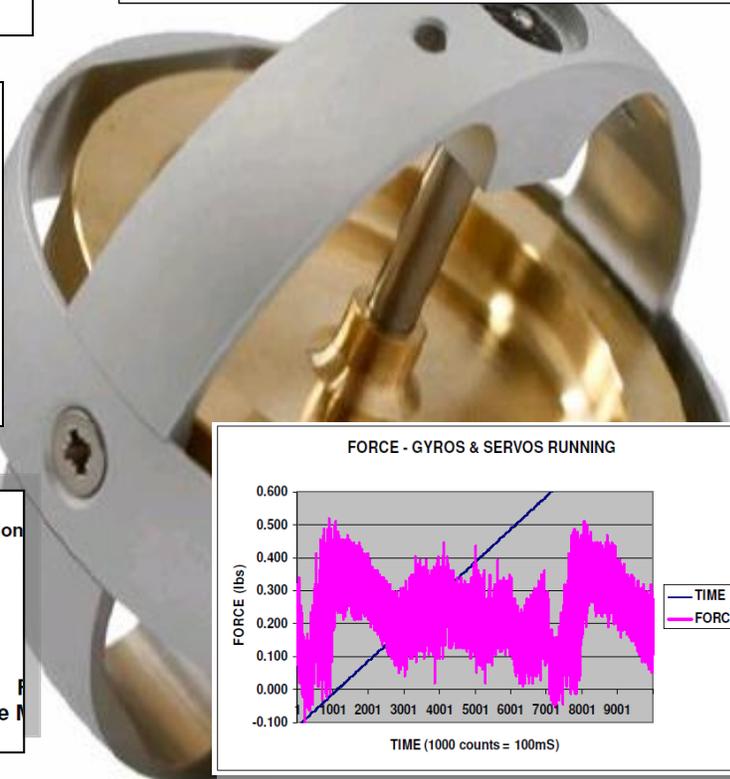
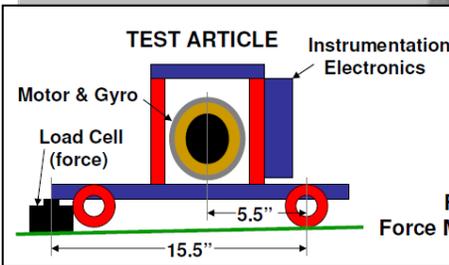
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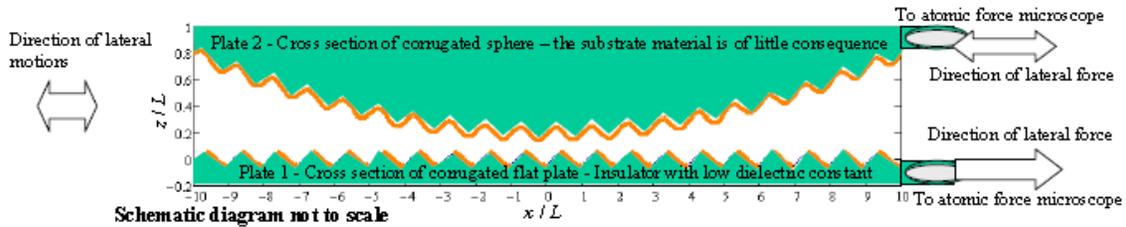
FORCE(max) EQUATION

$$\text{Force (pk)} = \frac{1.77e-8 \pi^2 F_s F_r M_r (IDr^2 + ODr^2) D}{4 K^2 + D^2} \text{ [lbs]} = 0.4004 \text{ lbs}$$

- F_s = Freq of Servo [Hz] (0.877)
- F_r = Freq of Rotor [Hz] (266.67)
- M_r = Mass of Rotor [g] (112)
- IDr = Inner Dia of Rotor [mm] (41.3)
- ODr = Outer Dia of Rotor [mm] (53.0)
- D = Gyros Separation [in] (4.50)
- K = Radius of Gyration [in] (7.28)



Quantum Fire Project – Third IRI Project for Testing an Asymmetric Design to Rectify the Microscopic Casimir Force



The **Quantum Fire Project**, under the direction the Project Engineer Robert DeBiase and Physicist Thorsten Ludwig, PhD, seeks to experimentally test certain force predictions of the proximity force approximation and a theoretical calculation for a perfectly conducting wedge, using an atomic force microscope that has been suitably modified, along with other experimental methods. Preparations for the experiments include carefully manufacturing clean, smooth saw toothed shaped corrugated surfaces on a non-conducting sphere, which then has one slope of the saw tooth coated with metal. This partially metallically coated sphere, when brought close to a metallically coated un-corrugated flat plate will create wedge shaped cavities (see diagram above). The experiment will then measure the nano-newton lateral **Casimir forces** on the sphere, in the vicinity of the adjacent surface of a diffraction grating with favorable microscopic grooves. The project aims to clarify the practical use of quantum fluctuations and zero-point energy.

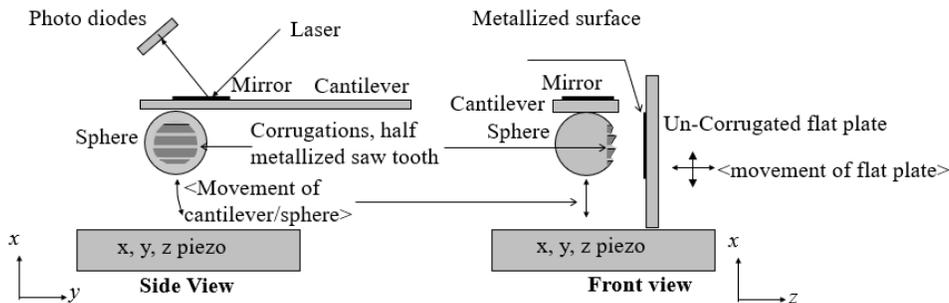
We are making progress on narrowing down materials that we can make the saw-tooth impressions in. The material needs to be soft enough that impressions can be made by bringing a polymer coated metal ball against a diffraction grating while the ball is attached to an AFM cantilever. Such a process is necessary in order for the grooves to be properly aligned for taking AFM measurements. But it needs to be hard enough that metal can be coated onto one slope of the saw-tooth without damaging the sawtooth groove, thus creating the asymmetric propulsive Casimir force on each wedge which are expected to add up to a significant and measurable summation.

Calculations need to be made for the theoretical lateral forces to be expected for the grooved ball using the perfectly conducting wedge theory, as shown in the diagram below. If lateral forces are proven to be present, fulfilling theoretical predictions, a prototype development of a **force production engine** can proceed, and commercial applications will be explored.

Perfectly Conducting Wedge

Conceptual setup of atomic force microscope to detect anomalous lateral forces

Detecting lateral forces with Chen, Mohideen setup



LEADING SCIENTISTS AND THINKERS ON ENERGY – THOMAS F. VALONE

Radio & Internet Interview by Futurist DAVID HOULE, Host of Evolutionshift
<http://davidhoule.com/evolutionshift-blog> edited reprint from September 21, 2007

(This is just as valuable a decade later since these issues are now even more urgent – Ed. Note)

Facing and solving the multiple issues concerning energy is the single most pressing problem that we face as a species. There is a lot of media coverage about energy, alternative energy and global warming, but what has been missing is the knowledge and point of view of scientists, at least in the main stream media. I met Tom at the Foundation for the Future conference in Seattle WA on the future of energy and was taken with his positive outlook and the fact that he has been a patent examiner.

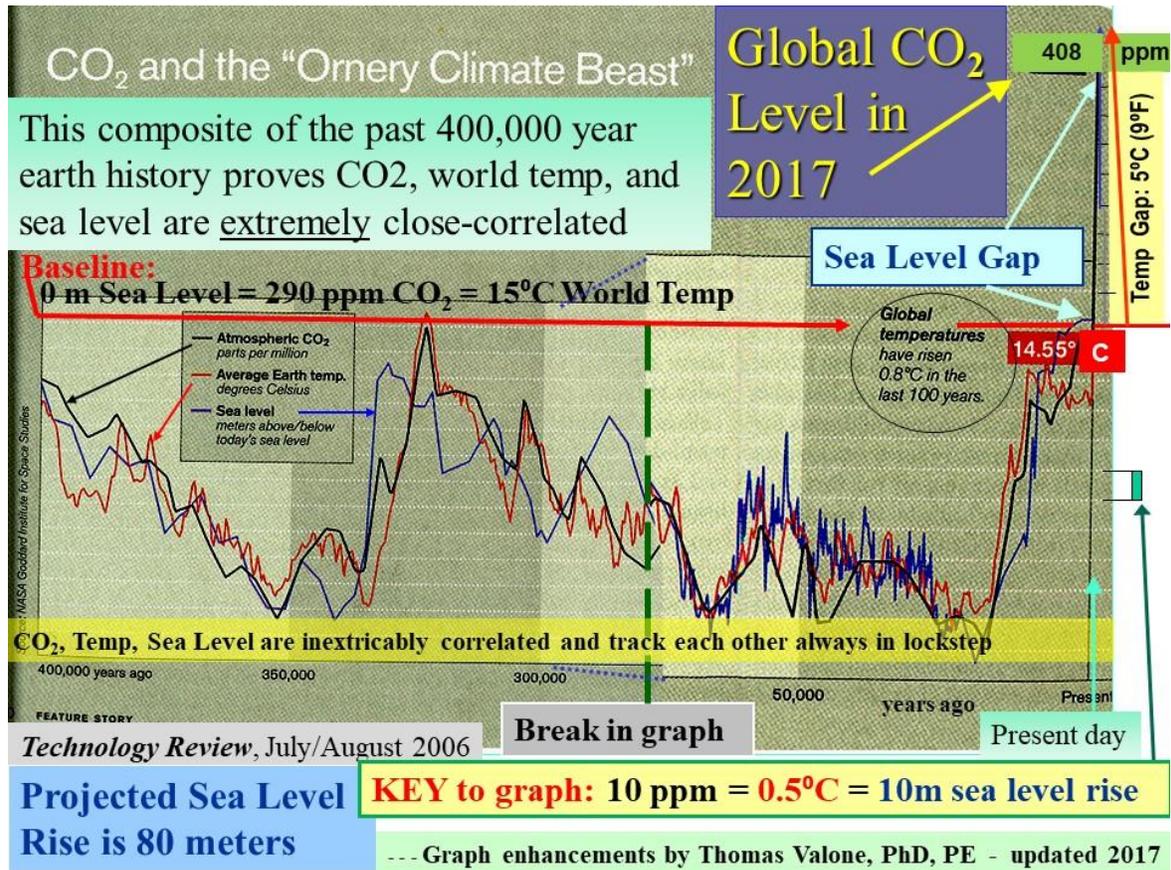
1. Evolutionshift: As a scientist and patent examiner you are in superlative company. Any other similarities with Albert Einstein? Seriously, how does your work with the government patent office compliment your scientific work and research?

VALONE: Of course, when a recent biography of Einstein was aired on the PBS channel, I was happy to watch, being a physicist and patent examiner. However, I learned from the narrator that “Einstein was employed at a dead-end job at the Swiss Patent Office” before he was freed by publishing three seminal journal articles and receiving other job offers. The work at the US PTO often feels like a dead-end, repetitive job since it is piecemeal, production work with no job security. However, I have tried to follow in Einstein’s footsteps, who was born in the same month as I was, by taking General Relativity as a physics graduate student years ago, using it for analyzing non-inertial reference frames in my physics Master’s thesis on the homopolar generator, and recently by buying the book “How to Think Like an Einstein”, and also writing a PhD thesis on zero point energy performance of useful work from the quantum vacuum. This last work, which I hid in my drawer at the Patent Office just like Einstein did, has evolved into the popular book, ***Zero Point Energy: The Fuel of the Future***, which presents practical suggestions for converting ZPE into electricity. That’s where the ability to search the scientific and patent literature comes in handy...finding science and engineering inventions in a particular field and thus doing ‘due diligence.’

2. Evolutionshift: Your presentation at the Foundation for the Futures’ future of energy conference was one of the more urgent presentations about the need for alternative energy sources. How urgent is the global energy situation?

VALONE: To answer the urgency question, we have to realize just one of the IPCC findings. That is, with every single degree of global temperature increase, there is a whole category on the average of increase in hurricane strength. We have already experienced this in our lifetime. A category 5 hurricane now will suck enough energy from the ocean to become a category 6, etc. The melting of the Antarctic and most importantly, the Greenland ice sheets is not only inevitable, according to a climate chart published by MIT’s ***Technology Review*** in July, 2006, but roughly equals the 80 meters of extraordinary sea level rise that is predicted by that calibrated chart. As fossil fuels continue to push carbon dioxide levels past the 400, 500 and the expected 700 ppm levels, we are entering new, uncharted territory on an earth that has not exceeded such levels in 400,000 years. We really need to introduce a completely clean and inexpensive source of energy for electricity, such as a zero point energy diode generator, in the next ten years to have any hope of revolutionizing the climate and energy usage. (Since this interview, Dr. Jim Hansen published

“Young people’s burden: requirement of negative CO₂ emissions” in 2017 (Earth Syst. Dynam., 8, 577–616, 2017, <https://doi.org/10.5194/esd-8-577-2017>) emphasizing the present crisis.



IRI-annotated MIT climate graph, with the most realistic projections expected for temperature and sea level, now being recognized by the climatologist, including the Climate Foundation, updated for 2017. – Ed. Note

3. Evolutionshift: Do you believe in Peak Oil? When will we be passing through it and when might the planet run out of oil?

VALONE: Peak Oil is not a matter of belief. It is a fact that Hubbert established to everyone’s satisfaction by predicting the United States’ peak of oil production twenty five years before it happened. His prediction for the world oil production has all the experts arguing about the give-or-take of only a couple of decades! That’s how close the tolerance is for Hubbert’s Peak. In other words, we are actually experiencing the maximum oil production that the world can sustain at the present time: about 72 million barrels of oil per day. This black, dead fossil liquid consumption by living human beings is on the same order of magnitude as the water flow over the American Falls in New York State, where I grew up. The only direction for this rate is downward. Saudi Arabia presently is preparing for their Peak Oil by investing heavily in tourism resorts and by building islands in the ocean with mansions on them. Technically, to answer the second question, the planet will never run out of oil. However, as Nikola Tesla pointed out, we won’t be able to continue burning it for fuel for the sake of our future generations.

4. Evolutionshift: What are the best sources of alternative energy for the next 20 years?

VALONE: The best sources of alternative energy for the next 20 years depends upon what application is in mind. The top of the list has to include photovoltaic solar electricity. I recently

wrote an article in the Integrity Research Institute's Annual Report about a "Revolution in Solar Energy" which summarizes the latest discoveries. The ability to generate more than one electron from a photon of light, has now been demonstrated by Los Alamos labs. Alan Heeger <<http://www.ipos.ucsb.edu/ajh.html>>, who won the 2000 Nobel Prize for his codiscovery of electrically conducting polymers, and his colleagues at the University of California, Santa Barbara <<http://www.ipos.ucsb.edu/>> (UCSB), have recently created process for multiple layers of plastic PV material with flexibility and high efficiency. The company Konarka based in Lowell, MA is the one to watch. Their polymer PV cells can even generate electricity with background room lighting. Another source of alternative energy that is on my "best" list is the permanent magnet motor, utilizing the 'magnetic gradient.' IRI has a spiral stator design that improves upon the old Kure Tekko Japanese patents of the 1970's with several innovative magnetic pulsing techniques. We can foresee the day when a magnetic car will compete favorably with the electric car, since it will not need recharging. Geothermal energy is another 'best' and ubiquitous source of energy that has been highly recommended for municipalities and centralized power. Another favorite of mine is zero point energy, since I have performed a feasibility study and found that 'zero bias' diodes are manifesting the rectified electricity which we all desire for a generator. The quantum vacuum continually generates random nonthermal noise (called 'zero point energy') in solid state devices, causing tunneling and electron flow. It is time to start using this free energy source in a big way. The end product will have a construction, much like the tiny LEDs in our flat screen televisions, with millions of diodes all transducing zero point energy into electron current. For the application of medium to large industrial plants, I recommend the conversion of waste heat into electricity. The company, Primary Energy, headed by Tom Casten, has a wonderful offer they cannot refuse: allow him to build the electrical generation plant on site and they save about half on all future electricity bills. Other promising alternative energy sources include off-shore wind generators, tidal generators, and ocean current electrical generators. For the transportation sector, I advocate compressed air cars and plug-in electric cars, which are making their debut in every other country but the US. The US, as you might remember, is the country and GM is the company "Who Killed the Electric Car." This debacle of purposely crushing every leased EV-1 electric car by GM is now recorded on DVD (by SONY Classic Pictures) for historical posterity. As Europe, Iceland, and other countries become energy independent and non-polluting, our EPA has yet to declare CO2 an environmental pollutant.

5. Evolutionshift: [Depending on your answer to #4] How soon do you these sources significantly impacting the world's use of fossil fuels? What can be done to accelerate the timelines?

VALONE: As mentioned above, the US EPA is at fault, just as the California Air Quality Board was in 2002, for not standing up to the most problematic greenhouse gas and limiting its emission rate. Once legislation has been passed, the industrial sector has proven its ability to adapt, which will accelerate the timelines. As was the case in the 1970's after the first Mid-East Oil Embargo, the US has the will power and the resourcefulness to put into practice the conservation mandates that are recommended by government. For example, conservation has not been advocated recently but back then it was and the US responded by almost a 50% savings in energy consumption. Today the Alliance to Save Energy here in DC is famous for "Energy Efficiency" forums, awards and programs. As Amory Lovins points out, it is easier and cheaper to save energy than to generate it. Therefore, to answer the question, in the short term, we can significantly impact this country's use of fossil fuels, while the 5 to 10 year lag of development of zero-fuel devices takes place.

6. Evolutionshift: What might be the sources of alternative energy longer term? What do you see that is promising?

VALONE: As mentioned above, for the longer term, zero point energy devices will be developed and are foreseen by many experts to permanently solve the energy problem, also making practical space travel possible. Cold fusion devices may also become available, along with other exotic sources of energy, such as the pB-11 plasma focus fusion under development at the University of Illinois. Still, the biggest breakthrough for the future has to be the Konarka multi-layer polymer solar cell which is predicted to be inserted into almost everything, since it generates electricity from ambient room light. (Ed. Note: pB-11 is shorthand for proton-boron fusion, also researched by Eric Lerner www.focusfusion.org who presented at the IRI-sponsored COFE3.)

7. Evolutionshift: Any final thoughts or comments?

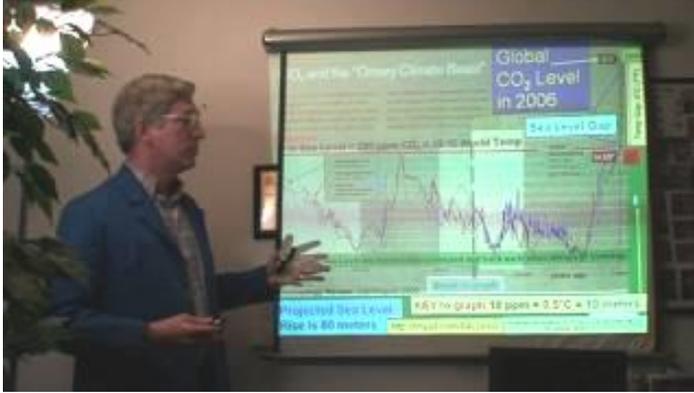
Everyone can do his or her part to conserve energy and reduce their personal carbon dioxide emissions, including recycling their waste, installing passive solar in their homes and buying a hybrid, if they can afford to do so. Writing their Senator and Congressman to include green legislation like the 10% renewable portfolio for each state is vital. Right now, Europe has a 20% renewable portfolio for their energy production and the US lags behind, even though we are the biggest consumer (20 million barrels per day) of oil and the biggest polluter in the world. It is up to the US to change its ways if we believe the world can change for the better. Supporting and buying stock in Planktos, Inc., which has a wonderful plankton-feeding program for the ocean to sequester millions of tons of CO₂, is also very important for the short term. The world's temperature and sea level are being driven (thermally forced) by the present heat-trapping 400 ppm of CO₂ in the atmosphere. Planetary wide modifications by the human race united for a common cause will solve this problem for the better.

Future Energy News Program: FUTURE ENERGY eNEWS Research of new emerging technologies; public appearances, free newsletters, brochures, and reports that include the latest news on energy developments, discoveries and research given to the public.



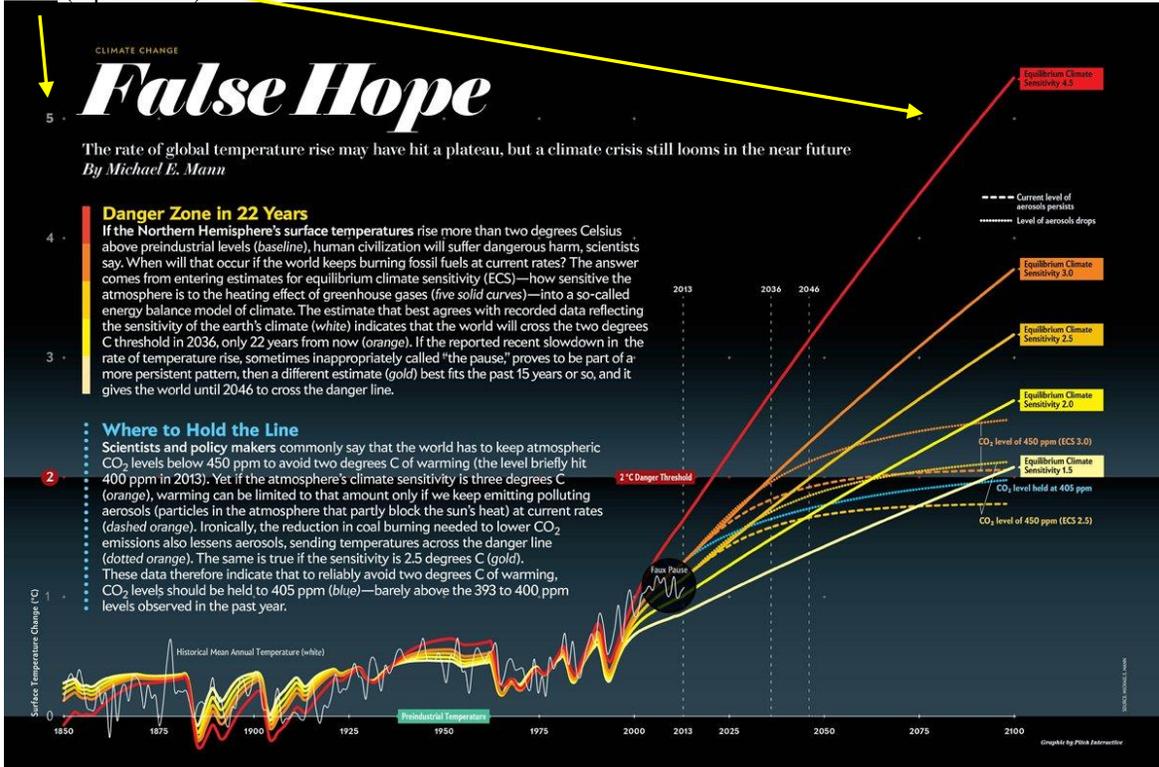
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IRI's 2006 Prediction of Future Earth 4°C to 5°C Temperature Increase Based on Changing CO₂ Levels is Confirmed by Climate Models Ten Years Later in 2017



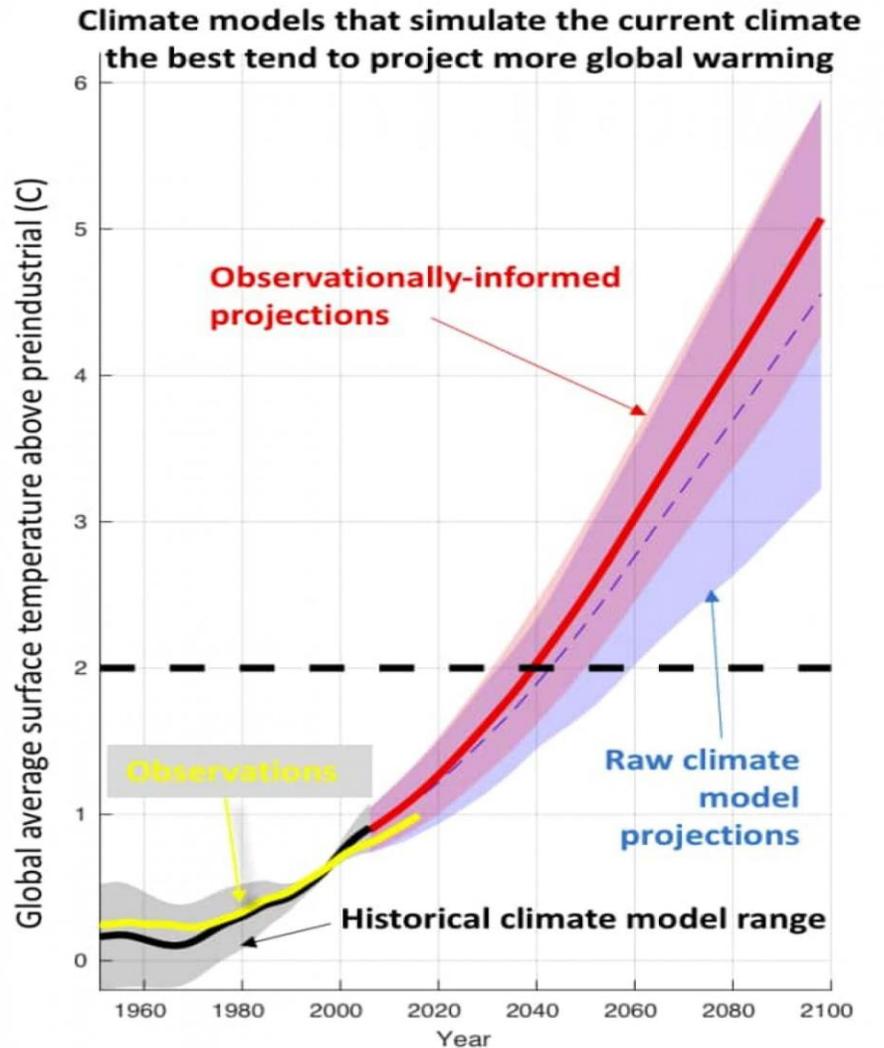
“Climate Changes” video is on the IRI website and on YouTube of Dr. Valone explaining the NASA climatologist **Jim Hansen’s** graph which combines a half million-year history of the earth’s average temperature, sea level and carbon dioxide (CO₂) levels (see Dr. Jim Hansen’s “Climate Beast” MIT *Technology Review* graph annotated by IRI elsewhere in this report). The surprise to Drs. Hansen and Valone is the *lockstep, close correlation* between the three variables which follow each

other inextricably, for thousands of years before the present. Dr. Jim Hansen, who met with Valone, was persecuted through the Bush years for predicting global warming trends but now is recognized as a hero and whistle blower. The most important trend revealed in comparing the 38% CO₂ increase (up to 408 ppm from 290 ppm) with the **amount of temperature increase necessarily anticipated to match it**. Clearly, 5 degrees C or 9 degrees F are predicted from the analysis. Even the uncertainty of how fast the climate will warm has been narrowed down by advanced computer models. *Dr. Valone announced this finding at COFE2 in 2006*. Below, *Scientific American* in 2017 showed a climatology consensus of of 5°C increase by 2100 (top red line):



https://static.scientificamerican.com/sciam/assets/image/articles/earth-will-cross-the-climate-danger-threshold-by-2036_large.jpg

Brown and Caldeira (2017) also have published in *Nature* magazine the most shocking graphs with the same 5°C prediction as the above projection shown here from *Scientific American*.



Comparison of raw and observationally-informed climate model projections from Brown and Caldeira (2017, *Nature*)

Ken Caldeira is the atmospheric scientist in the Department of Global Ecology at the Carnegie Institution at Stanford University and is a “reluctant advocate” of **geoengineering** as a result of the findings shown above. See his <http://issues.org/27-1/caldeira/> for his climate engineering ideas. Now that warm Arctic episodes have been linked with increased frequency of extreme winter weather in the United States (*Nature Communications*, 9, 869, 3/13/18), many people may be even more motivated to consider Caldeira’s “Simultaneous stabilization of global temperature and precipitation through cocktail geoengineering” (*Geophysical Research Letters*, 2017). Carnegie Science website has his Cocktail Geoengineering detailed at <https://tinyurl.com/saveclimate>: The team—which includes Carnegie’s Ken Caldeira, Long Cao and Lei Duan of Zhejiang University, and Govindasamy Bala of the Indian Institute of Science—used models to simulate what would happen if sunlight were scattered by particles at the same time as the cirrus clouds were thinned. They wanted to understand how effective this combined set of tools would be at reversing climate change, both globally and regionally.³ (This was attempted years ago and labeled “chemtrails” by the public who were exposed to cadmium and aluminum particles landing on their farmland. – Ed. Note) Caldeira notes that while global average climate was largely restored in their computer simulations, substantial differences remained locally, with some areas getting much wetter and other areas getting much drier.

³ Western scientists are also looking at aerosol particulates effect on climate and their possible enhancement for cooling the planet <https://www.eenews.net/stories/1060076777> .

CARBON CAPTURE AND STORAGE OR USE

A decade ago, policy-makers began advocating the idea of grabbing CO₂ and storing it underground, a technology called [carbon capture and storage \(CCS\)](#). Oil and gas companies had been doing this on a small scale since the 1970s, because it helped their bottom line. By pushing the gases emitted by their industrial plants back down into nearly spent oil seams, they were able to squeeze out the last remaining drops of crude. On a technical level, CCS works. The Boundary Dam coal-fired power plant in Canada [has been burying much of its CO₂ emissions since 2014](#), for example. But despite a number of governments appearing to back the technology in the early 2000s, CCS is stuck on the starting line. The sector has come up against a significant challenge: capturing carbon is expensive, and there are [no financial rewards for storing it](#). The promise of **carbon capture and use (CCU)**



is a burgeoning industry that has attracted billions of dollars in investment, some of it from major oil and gas companies. There are notable success stories. Already, companies are turning carbon dioxide into **plastics, fuel and concrete** – meaning that you could build your house or power your car with products that keep carbon dioxide out of the atmosphere.

The real question is whether these start-ups can grow fast enough and to be big enough to make a difference. For that, they need to use enough CO₂ to make a significant dent in the [37 gigatonnes emitted globally in 2017](#). But it is worth noting that big oil is also dipping its toe in the CCU pond. The **Oil and Gas Climate Initiative (OGCI)** is a collaboration between large fossil fuel companies, including Shell, BP, Statoil and Total. Together, they have

[committed to investing \\$1 billion in CCU start-ups](#) over the next 10 years. Similarly, it may not seem obvious that [CO₂ can be used to make buildings](#), but it is a simple chemical step away from **limestone** and other carbonates. “I can take a slurry of calcium oxide, put CO₂ into a bottle, shake it up and it’ll react very quickly [to make calcium carbonate],” says Peter Styring at the University of Sheffield, UK.⁴ “We think that by 2030 the market opportunity would be between 800 billion and 1.1 trillion dollars a year,” says Issam Dairanieh of the **Global CO₂ Initiative**, a private company that both funds research into CCU and invests in start-ups working in the field.

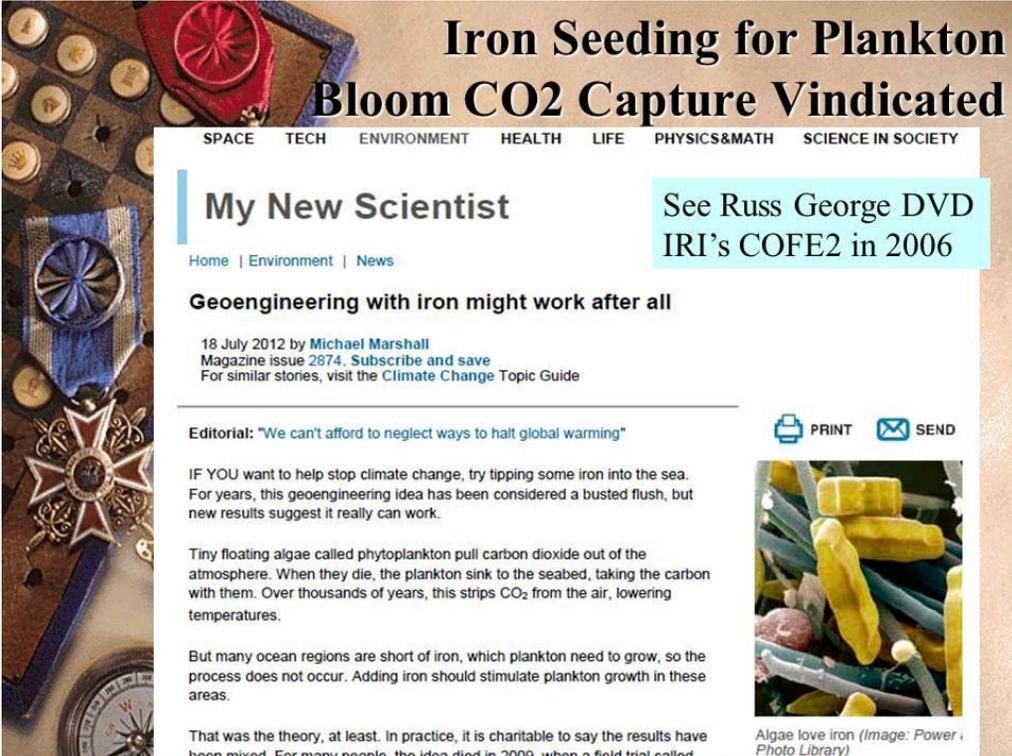
A flurry of companies are selling products that use carbon dioxide. The gas is either extracted from industrial emissions before they are released or sucked from the air:

1. **Carbon8 Aggregates (UK)** - Creates a **building material** from industrial waste and contaminated soil using CO₂
2. **CCm Research (UK)** - Has developed a system to **enrich fertilisers** with carbon from CO₂ and make CO₂-coated fibres that are incorporated into plastics
3. **Covestro (Germany)** - Makes polyurethane **plastics** for mattress foams
4. **Sunfire (Germany)** - Has developed a **synthetic fuel** called Blue Crude. Mass production is scheduled to begin in 2020, using CO₂ from air capture. Partnered with Audi
5. **Oberon Fuels (California)** - Makes dimethyl ether, a **synthetic diesel** that emits less particulate pollution and no sulphur. Partnered with Volvo, Ford and US truck manufacturer Mack
6. **CarbonCure (Canada)** - Sells a system that infuses CO₂ into **concrete**. The firm announced in January that a major US producer, Thomas Concrete, will be installing the technology at 22 of its plants
7. **Solidia Technologies (New Jersey)** - Makes a **concrete** that locks up CO₂. Claims to reduce energy and water use

⁴ “How concrete and condoms could turn a greenhouse gas green”, Michael Marshall, *New Scientist*, 14 March 2018

CARBON SEQUESTRATION: Iron Seeding of Plankton in Oceans Proven Years Later; Kelp Farming Proposed

Recognizing the need to capture CO₂ to counter climate change in 2006, COFE2 presented Russ George, President of Planktos, Inc. who described his ocean studies with iron seeding to stimulate algae blooms of plankton (which are becoming iron deficient worldwide). Russ also indicated the method is easily capable of absorbing millions of tons of CO₂. However, at the time, all of the “experts” and environmental groups, including Greenpeace, fought against him, criticizing the method, which actually occurs naturally. Then six years later in 2012 a field study published in *Nature* and *New Scientist* found that the majority of plankton did indeed fall to the bottom of the ocean with the captured carbon, thus vindicating the largest scale carbon sequestration concept ever conceived, until in 2017, Dr. Brian von Herzen from [the Climate Foundation](#) announced his tests of farming kelp for the same effect. IRI is proud to have been an early advocate of this amazingly effective process for bringing down atmospheric levels of CO₂ once a carbon-free power source has been mass marketed to replace the fossil fuel burners worldwide. This has to be done in order to save mankind from approaching 1000 ppm of CO₂ by the end of this century and known to cause “[cognitive impairment](#)” from closed room studies of CO₂ levels and thinking ability.⁵ In 2017 climatologists now predict an exponential growth of atmospheric CO₂ levels due to present rates of coal, gas, natural gas, wood, and oil burning that are anticipated to surpass 930 ppm of CO₂ by 2100 unless drastic measures are introduced, such as carbon-free transportation and carbon capture and use (CCU).



The image is a screenshot of a New Scientist article. The main headline is "Iron Seeding for Plankton Bloom CO₂ Capture Vindicated". The article is dated 18 July 2012 by Michael Marshall, in magazine issue 2874. The sub-headline is "Geoengineering with iron might work after all". The article text discusses the theory of iron seeding to stimulate plankton growth, which can capture carbon dioxide. It mentions that the idea was initially considered a "busted flush" but new results suggest it can work. A small image of yellow and green algae is shown on the right side of the article. The article also includes a link to a DVD by Russ George from IRI's COFE2 in 2006.

⁵ Ozin, Geoffrey, “CO₂ on the Brain and the Brain on CO₂”, *Adv. Sci. News*, Oct. 11, 2016; Allen, Joseph, et al., “Associations of Cognitive Function Scores with Carbon Dioxide, Ventilation, and Volatile Organic Compound Exposures in Office Workers: A Controlled Exposure Study of Green and Conventional Office Environments” *Environ Health Perspect*; V. 124, DOI:10.1289/ehp.1510037, 2016

NUCLEAR ENERGY WITH LITTLE OR NO WASTE

The rest of this **IRI Annual Report 2017** contains slides from Dr. Valone's presentation at events such as the Association of Energy Engineers ("aee") conference on "**Future Energy Breakthrough Technology**"

The screenshot shows the Science journal website interface. At the top, the word "Science" is prominently displayed in white on a black background, with the AAAS logo to its right. Below this is a red navigation bar with white text for "Home", "News", "Journals", "Topics", and "Careers". Underneath, a black bar lists various science fields: "Science", "Science Advances", "Science Immunology", "Science Robotics", "Science Signaling", and "Science Translational Medicine".

The main content area features a "SHARE" section with social media icons for Facebook (12 shares), Twitter, and Google+. The article title is "China-U.S. cooperation to advance nuclear power" dated "Aug. 5, 2016". The authors listed are "Junji Cao¹, Armond Cohen², James Hansen^{3,*}, Richard Lester⁴, Per Peterson⁵, Hongjie Xu⁶". Below the authors, there is a quote in red text: "...projecting that a doubling to quadrupling of nuclear energy output is required in the next few decades".

At the bottom of the article preview, there is another quote in blue text: "Nuclear scales up to 12x+ faster than solar/wind combined. Mass-manufacturing and coordinated approvals are key".

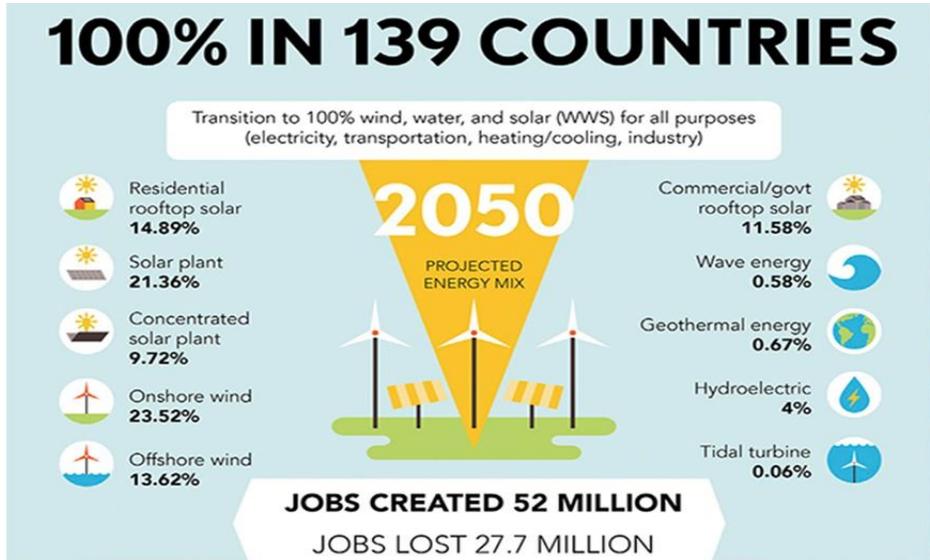
On the right side of the screenshot, there is a vertical blue graphic with the text "Thomas Valone - Integrity Research Institute" and the number "9" at the bottom.



While the world needs nuclear energy more than ever, in a balanced carbon-free portfolio, if we are to limit climate change, few people are aware of which nuclear reactor designs are the safest, with little or no radioactive waste. According to the International Energy Agency, the world's nuclear capacity *needs to more than double* by midcentury. Finland has 2.7 GW nuclear (30% of its need, Google) and buries its waste 300 meters underground in bedrock (*IEEE Spectrum*, Dec., 2009). France uses a closed fuel cycle where plutonium is separated from its waste and mixed with more uranium for reburning. A fast reactor is possible.

According to MIT's *Technology Review* (8/2/16), a molten salt in a new type of nuclear reactor cools the reactor and carries heat to drive a turbine and make electricity. At least in theory, this type of reactor can't suffer the kind of catastrophic failure that happened at Chernobyl and Fukushima, making unnecessary the expensive and redundant safety systems that have driven up the cost of conventional reactors. What's more, the new plants should produce little waste and might even eat up existing nuclear waste. They could run on uranium, which powers 99 percent of the nuclear power plants in the world, or they could eventually run on thorium, which is cleaner and more abundant. **Thorium reactors** are being built in Japan, Netherlands, India, and China. See "Thorium could power the next generation of nuclear reactors" (*New Sci.*, 8/25/17).

The ultimate goal of the Shanghai Institute: to build a **molten-salt nuclear reactor** that could replace the 1970s-era technology in today's nuclear power plants and help wean China off the coal that fouls the air of Shanghai and Beijing, ushering in an era of cheap, abundant, zero-carbon energy. Today, though, as climate change accelerates and government officials and scientists seek a nuclear technology without the expensive problems that have stalled the conventional version, molten salt is enjoying a renaissance. Companies such as [Terrestrial Energy](#), [Transatomic Power](#), [Moltex](#), and [Flibe Energy](#) are vying to develop new molten-salt reactors. Research programs on various forms of the technology are under way at universities and institutes in Japan, France, Russia, and the United States, in addition to the one at the Shanghai Institute.

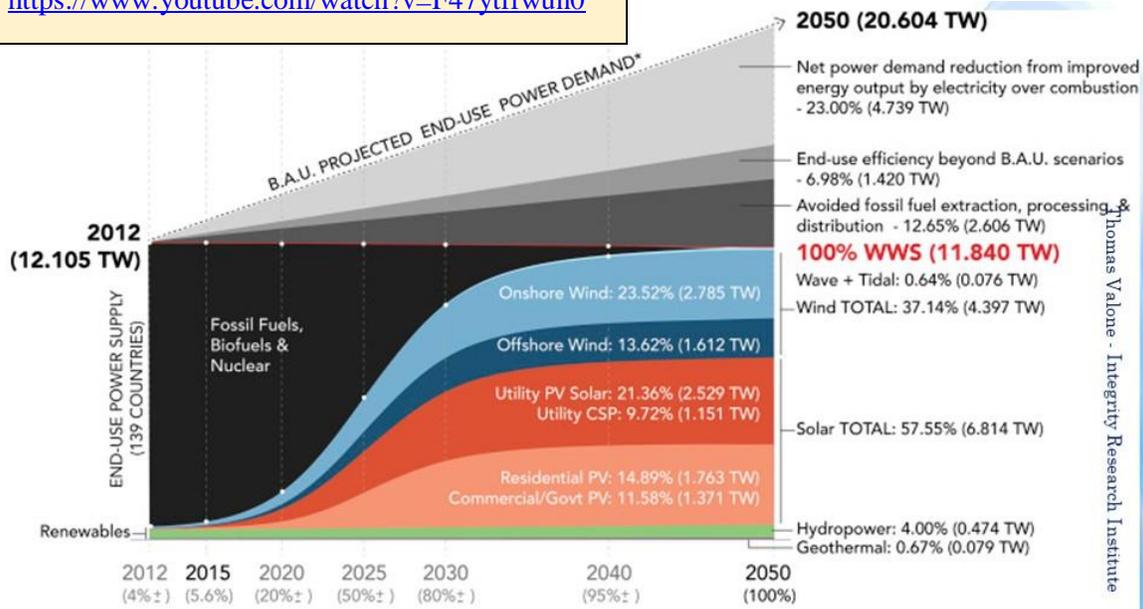


**Mark Z. Jacobson, director of Stanford University's
Atmosphere and Energy Program – Joule, 2017**

Thomas Valone - Integrity Research Institute

The above slide provides the key to Dr. Jacobson's amazing scenario which **solves a major world dilemma** of *how to wean 139 countries off of fossil fuels*. The renewable mix portfolio is clearly outlined in the margins, which also include technologies barely developed, such as tidal turbine power and wave energy, but which work 24 hours a day as compared with wind and solar. His short 8-min. YouTube video provides instructions on interpreting his summary graph below:

<https://www.youtube.com/watch?v=F47ytffwun0>



Thomas Valone - Integrity Research Institute

Projected Power Supply & Demand, 139 Countries
*ENERGY FOR ALL USES INCLUDING ELECTRICITY, HEATING, TRANSPORTATION, INDUSTRY

“100% Clean and Renewable Wind, Water, and Sunlight All-Sector Energy Roadmaps for 139 Countries of the World” – Joule, V.1, N.1, p. 108, 9/6,17

GEOHERMAL

Over 2,800 megawatts of electricity from geothermal power plants are supplying about 4 million people in the U.S.

Geothermal power plants have no smoky emissions. They emit water vapor.

Jan. 22, 2007
MIT Panel Backs Geothermal as a KEY US Energy Source – report: mit.edu

Growth in U.S. Geothermal Power

Year	Power (MWe)
1970	~100
1980	~500
1990	~2000
2000	~2800

The Norwegian company **Rock Energy** wants to be an international leader in geothermal heat and energy. A pilot plant has been planned for Oslo that will collect heat from 5500 meters deep. Temperatures from this depth can heat water to 90-95°C and can be used in district heating plants. The pilot plant will be built in cooperation with NTNU, which is

studying the thermal aspects of the plant. (Credit: Knut Gangåssæter/SINTEF.) Geothermal info is also at USDOE: “Costs of a geothermal plant are **heavily weighted toward early expenses, rather than fuel to keep them running.** Well drilling and pipeline construction occur first, followed by resource analysis of the drilling information. Next is design of the actual plant. Power plant construction is usually completed concurrent with final field development. The initial cost for the field and power plant is around **\$2500 per installed kW** in the U.S., probably \$3000 to \$5000/kWe for a small (<1Mwe) power plant. **Operating and maintenance costs range from \$0.01 to \$0.03 per kWh.**” https://www.energy.gov/eere/geothermal/geothermal-faqs#geothermal_energy_cost (which compares well to the commercial rate of ten and twenty cents per kWh). However, the higher temperature sources are better for energy output and efficiency. In the Washington DC area, Arundel Well & Pump provides geothermal drilling for generating electricity cleanly and efficiently: <https://tinyurl.com/ybv4uunm> .

The most exciting development for large scale production may be the use of volcano heat! In the case of **volcanic geothermal** energy, the **heat** comes from "supercritical water." [Magma Power: Scientists Drill into Volcano to Harness its Energy](https://www.livescience.com/57833-scientists-drill-volcano-core-geothermal-energy.html) <https://www.livescience.com/57833-scientists-drill-volcano-core-geothermal-energy.html>. Engineers harnessed one in Iceland by drilling three miles down to reach 900°C heat in 2017. [Hawaii is chasing 100% renewable energy — with active volcanoes](http://www.businessinsider.com/hawaii-volcanoes-first-100-percent-renewable-energy-state-...) www.businessinsider.com/hawaii-volcanoes-first-100-percent-renewable-energy-state-... July 29, 2015 - Engineers can tap these **hot** volcanoes for **geothermal** energy by sucking up **hot** briney groundwater, converting it to steam to power turbines, and then delivering the resulting electricity to the main power grid.

This raises the distinct possibility of reducing the “elephant in the china shop” risk which the US is exposed to with the largest supervolcano in the world, right here in **Yellowstone National Park**. It is called the “[Yellowstone Caldera](#)” which has been the focus of two-hour specials on the Science Channel portraying the scenario when it explodes, burying a 500 mile circle of the Midwest in four or more inches of volcanic ash. However, if volcanic geothermal energy production was developed at Yellowstone, instead of opening national parks to logging, this would reduce the risk by syphoning off some of the heat while producing vast amounts of electricity for the nation. Books have been around for decades on this topic and progress has been made in putting it into practice.⁶

⁶ [Volcanoes as a source of geothermal energy - ScienceDirect](https://www.sciencedirect.com/science/article/pii/0360544277900081) <https://www.sciencedirect.com/science/article/pii/0360544277900081> by WM Heffington - 1977

Energy Harvesting = \$7B Market



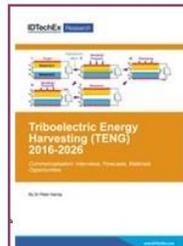
Energy Harvesting: Off-Grid Microwatt to Megawatt 2017-2027

Applications, technologies, forecasts including regeneration

By Dr Peter Harrop and Dr Harry Zervos

Reports Published by **IDtechEx.com**

Thomas Valone - Integrity Research Institute



Triboelectric Energy Harvesting (TENG) 2017-2027

Commercialisation: Interviews, Forecasts, Materials Opportunities

Brand new for August 2016
Harvests electrostatic energy with polymers for self-powered systems
By Dr Peter Harrop

Triboelectric energy harvesting transducers will be a \$400 million market in 2027

Solar cell captures CO2 and sunlight, produces burnable fuel



Researchers at the University of Illinois at Chicago have engineered a potentially game-changing solar cell that cheaply and efficiently converts atmospheric carbon

<http://harvestingjournal.com/articles/9812/solar-cell-captures-co2-and-sunlight-...>



"This market will reach over \$1.1 billion by 2026"

25

Energy Harvesting is easy, from wet surfaces, stray EMF, vibrations, vehicle pressure, or heat.

THERMOELECTRIC GENERATORS (TEGs) CAPTURE WASTE HEAT INTO ELECTRICITY



Three minute video: <https://youtu.be/DudsKeB39p8>

<https://www.alphabetenergy.com/> is financed to \$23 million, making waste heat valuable!

17

Thomas Valone - Integrity Research Institute

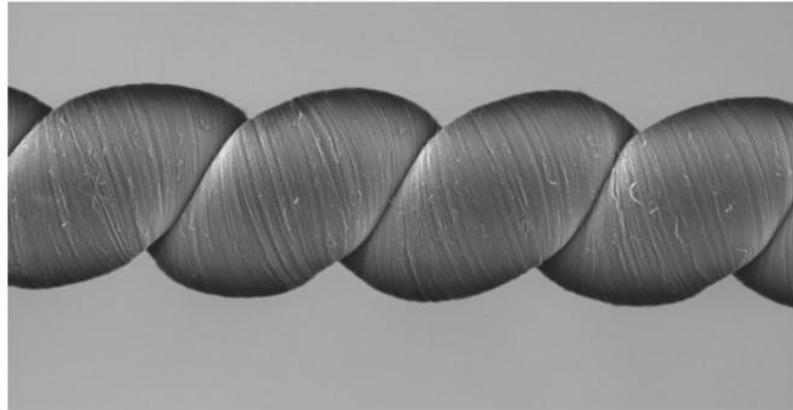


RESEARCH

Text size: + -

No Batteries Required: Energy-Harvesting Yarns Generate Electricity

Aug. 25, 2017



Thomas Valone - Integrity Research Institute

“If our twistron harvesters could be made less expensively, they might ultimately be able to harvest the enormous amount of energy available from ocean waves.”

Dr. Ray Baughman, director of the NanoTech Institute and a corresponding author of the study

Coiled carbon nanotube yarns, created at The University of Texas at Dallas and imaged here with a scanning electron microscope, generate electrical energy when stretched or twisted.

Stretching the nanotube yarn 30 times a second generated 250 watts per kilogram of peak electrical power

Zinc oxide piezoelectric nano-generators for low frequency applications

E S Nour, O Nur¹ and M Willander, Published 15 May 2017 • © 2017 IOP Publishing Ltd
[Semiconductor Science and Technology](#), Volume 32, Number 6 Special Issue on Piezotronics

BREAKTHROUGH

Innowattech – 500 kW per km

- Piezoelectric panels for roadways and train tracks
- Generates electricity from passing vehicles
- Game changing invention ready for installation
- Should be developed in this country as well
- Advocated by IRI in *Future Energy Annual 2017*




Piezo panels ready for insert

For applications less than 100 Hz, ZnO described in the above article offers an ambient, energy harvesting generator that works very efficiently to transduce movement into electricity, in the same way that the carbon nanotube yarns also generate electric energy. Nour et al. designed their piezo generator array to work with “footstep pressure” but Innowattech tested in 2008, solid state piezo generators for under railroads and highways generating 1/2 MW / km <https://tinyurl.com/Innowattech>. In 2017, California initiated a test for a 60-meter (200 feet) section of highway with stacked piezoelectric generators and also contracted **Pyro-E, LLC** of San Jose, CA to run a similar test generating enough power to run 5,000 homes using piezoelectric generators under roads and rails.

See www.pyro-e.com funded by NSF, California Energy Commission, and <https://elementalexcelerator.com/>.

Potential for widespread electrification of personal vehicle travel in the United States

Zachary A. Needell^{1,2}, James McNerney¹, Michael T. Chang¹ and Jessika E. Trancik^{1,3*}

Electric vehicles can contribute to climate change mitigation if coupled with decarbonized electricity, but only if vehicle range matches travellers' needs. Evaluating electric vehicle range against a population's needs is challenging because detailed driving behaviour must be taken into account. Here we develop a model to combine information from coarse-grained but expansive travel surveys with high-resolution GPS data to estimate the energy requirements of personal vehicle trips across the U.S. We find that the energy requirements of 87% of vehicle-days could be met by an existing, affordable electric vehicle. This percentage is markedly similar across diverse cities, even when per capita gasoline consumption differs significantly. We also find that for the highest-energy days, other vehicle technologies are likely to be needed even as batteries improve and charging infrastructure expands. Car sharing or other means to serve this small number of high-energy days could play an important role in the electrification and decarbonization of transportation.

“We find that the energy requirements of 87% of vehicle-days could be met by an existing, affordable electric vehicle.”

Energy

Why Range Anxiety for Electric Cars Is Overblown

A new study says that today's electric vehicles can handle almost 90 percent of all car travel in the U.S.

by Catherine Caruso August 15, 2016 *New Scientist* 27



DOI: 10.1038/NENERGY.2016.112

IRI predicts that onboard electrical chargers will be in electric vehicles in the near future.

HANERGY.COM SOLAR ELECTRIC VEHICLE

July, 2016



Solar-powered car travels **80 km (50 miles)** on a **5 to 6 hour charge** in the sun. Can also be plugged in. Hanergy outfits RVs, buses, trucks with solar PV affixed to body.



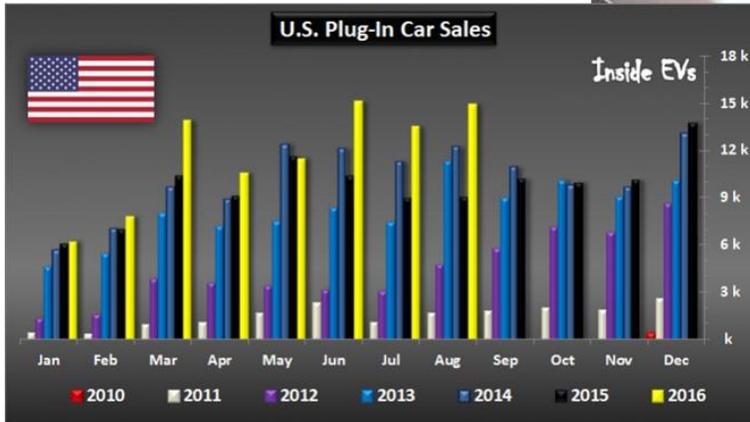
30

ELECTRIC PLUG-IN CAR BOOM

“Within three years we expect 150 to 200 miles to become the new normal for all-electric cars priced at \$30,000 to \$45,000, perhaps lower” – *Green Car Reports*, February, 2016



Thomas Valone - Integrity Research Institute



Electric Vehicles to be 35% of global new car sales by 2040

“Continuing reductions in battery prices will bring the total cost of ownership of EVs below that for conventional-fuel vehicles by 2025, even with low oil prices.”

Bloomberg New Energy Finance – Feb 25, 2016
<https://about.bnef.com>

28

24M LITHIUM-ION BATTERY BREAKTHROUGH

Dr. Chiang’s innovation, which was developed in his MIT lab, is an electrode formed by mixing powders with a liquid electrolyte to make a gooey slurry. The design enables 24M to increase the amount of energy-storing material in a battery and give it **15 to 25 percent more capacity than conventional lithium-ion batteries of the same size.**

- No coat, dry, cut, or compress electrode
- 1/5 time to manufacture
- **Less than \$100 per kWh***
- 24M scaling up factory for high-volume by 2018

<http://24-m.com>

* \$350/kWh last year

MIT Tech Review,
 June 21, 2016



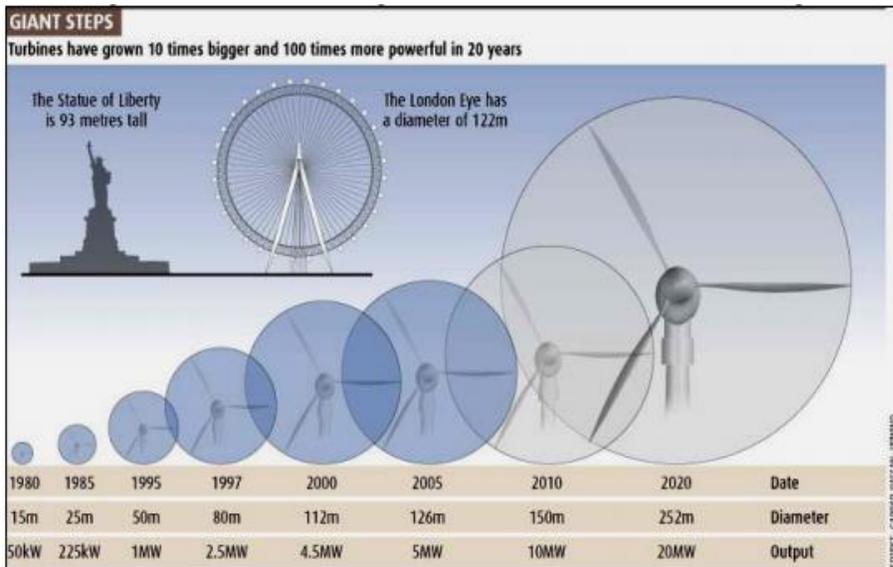
**Semisolid electrode
 “safest lithium-ion
 battery ever made”**



Thomas Valone - Integrity Research Institute

U.S. WIND ENERGY DOUBLES POWER CAPACITY EVERY TEN YEARS*

In the ideal, environmentally friendly government, incentives and tax credits for 160,000 giant offshore megawatt wind turbines on the East Coast would be a priority. The immediate availability of giant wind



turbines offshore has been vastly overlooked in the United States. Thirty General Electric 10 MW wind turbines eliminate one polluting coal or natural gas power plant with *no need for fuel*. Offshore wind could be big. Offshore wind has the potential to become a major source of clean, renewable energy for coastal communities across the nation. America already has

a [number of ports](#) that could be modified to support offshore wind development (Energy.gov).

The price of wind energy is projected to be directly competitive with conventional energy technologies within the next decade. Wind energy could be a viable source of renewable electricity in all 50 states by 2050. Wind energy could support more than 600,000 jobs in manufacturing, installation, maintenance and supporting services by 2050. Wind energy could save \$508 billion from reduced pollutants and \$280 billion in natural gas costs by 2050. Wind energy could save 260 billion gallons of water that would have been used by the electric power sector by 2050.

The European Wind Energy Association also forecasts rapid growth over the next decade in Europe where the economic incentives are much better. It is noted that “22% of Europe’s electricity needs were met by wind energy *yesterday*” <https://windeurope.org/>.



WIND VISION

See the projected growth of the wind industry over the next 35 years.

Select a Year

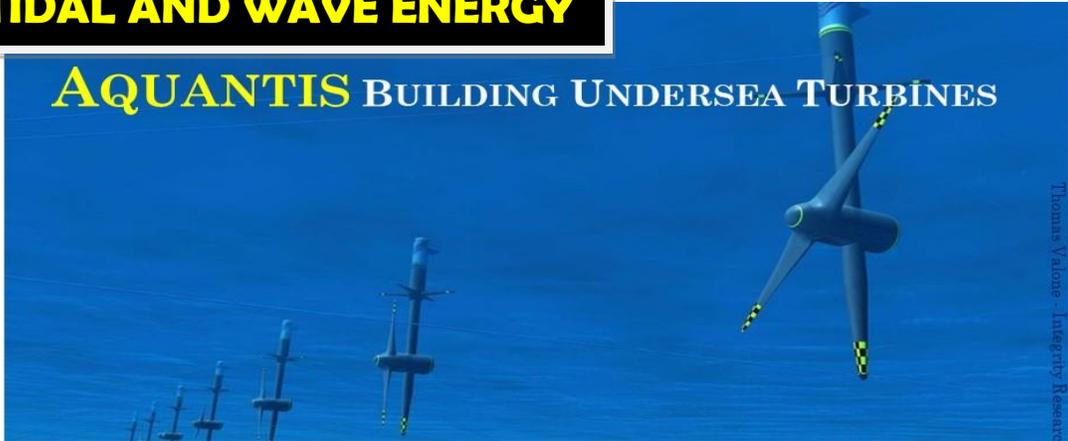
2000 2010 2013 2020 2030 2050 ▶

TOTAL WIND CAPACITY PROJECTED IN 2030
224.07 GW ACROSS 47 STATES
AN INCREASE OF 110.66 GW SINCE 2020

*Credit: <https://www.energy.gov/articles/new-interactive-map-shows-big-potential-america-s-wind-energy-future>

TIDAL AND WAVE ENERGY

AQUANTIS BUILDING UNDERSEA TURBINES



Thomas Valone - Integrity Research Institute

With turbines already in production and being distributed to Wales and the Isle of Wight in 2018, the start of something big could be just around the corner. Soon after the first turbines have been erected, the biggest will be at a site in the Gulf Stream in 2019/2020 and will consist of a **200 MW field of marine turbines**. Department of Energy grants have already been awarded to the team, and even Mitsubishi Heavy Industries has claimed a little piece of investment.



31



Atlantis Resources Corporation
A tidal energy turbine built by Lockheed Martin and installed in the Bay of Fundy off Nova Scotia.

In 2014, the Fundy Ocean Research Center for Energy (FORCE), another research hub, installed underwater power cables in the upper portion of the Bay of Fundy that can transmit a total of 64 megawatts, at peak tidal flows. (Yale. Edu/features). The Atlantis group recently began construction on a submerged tidal turbine array consisting of four, three-bladed, seabed-mounted turbines,

enough to deliver 6 MW for Scottish homes. By the early 2020s, Atlantis is planning to build 269 turbines in the firth, capable of generating 398 megawatts of electricity, enough to power roughly 200,000 homes. Many European countries are already embracing **tidal energy**, with France and the U.K. as leading examples. France first embraced tidal in 1966 when it opened the **Rance Tidal Power Station**. Today, Rance continues to generate 600 GWh a year, powering 130,000 homes. In the EU, the aim is to reach 100 GW of combined wave and tidal capacity installed by 2050. GE is aiming at the 1 TW stored in the world's oceans (Renewable Energy World).

Potential of tidal energy

It is estimated that around 1 terawatt of exploitable power is stored in the world's oceans. This would be enough to power 10 billion 100w lightbulbs at once.

GE

COLUMBIA NEWS

Office of Communications and Public Affairs

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Energy Harvested from Evaporation Could Power Much of U.S., Says Study

September 26, 2017

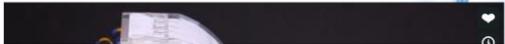


Evaporation Engines Could Produce More Power Than Coal, with a Huge Caveat

A new study suggests we could tap into natural evaporation for a huge part of our energy needs, but it would come at a high cost to our freshwater resources.

by James Temple September 26, 2017

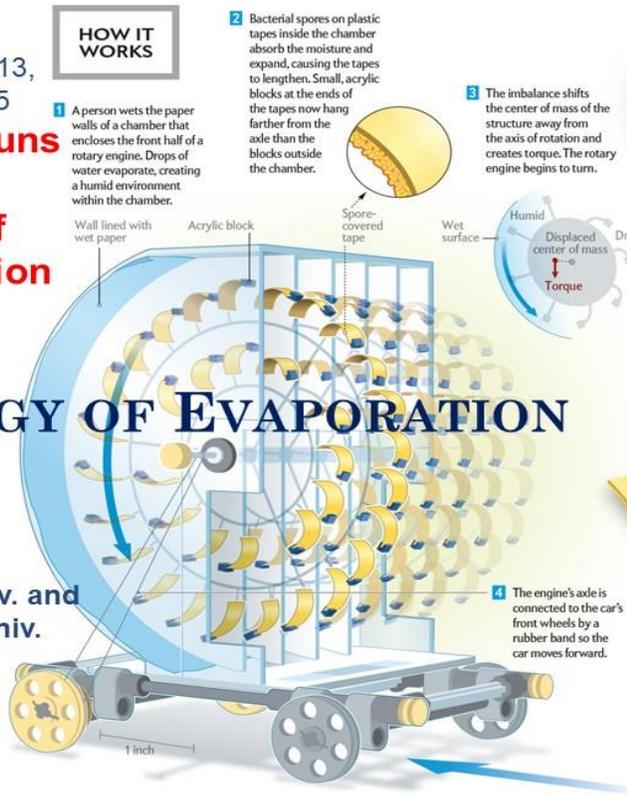
WATER-POWERED CAR – COLUMBIA UNIVERSITY



Sci. Amer. 313, 26, Aug. 2015
Toy car runs on the energy of evaporation

ENERGY OF EVAPORATION

Harvard Univ. and Columbia Univ.



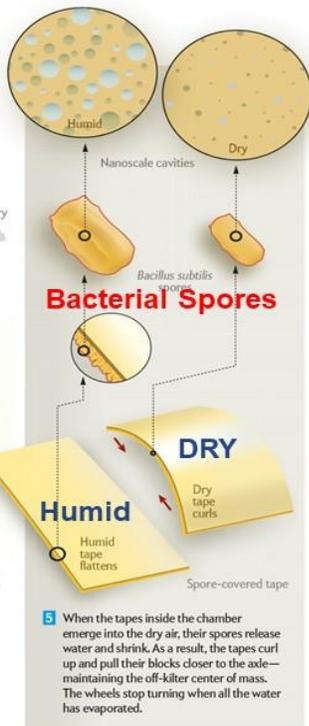
HOW IT WORKS

1 A person wets the paper walls of a chamber that encloses the front half of a rotary engine. Drops of water evaporate, creating a humid environment within the chamber.

2 Bacterial spores on plastic tapes inside the chamber absorb the moisture and expand, causing the tapes to lengthen. Small, acrylic blocks at the ends of the tapes now hang farther from the axle than the blocks outside the chamber.

3 The imbalance shifts the center of mass of the structure away from the axis of rotation and creates torque. The rotary engine begins to turn.

4 The engine's axle is connected to the car's front wheels by a rubber band so the car moves forward.



5 When the tapes inside the chamber emerge into the dry air, their spores release water and shrink. As a result, the tapes curl up and pull their blocks closer to the axle—maintaining the off-kilter center of mass. The wheels stop turning when all the water has evaporated.

Thomas Valone - Integrity Research Institute

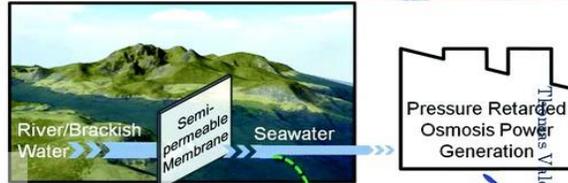
Thomas Valone - Integrity Research Institute

OSMOTIC POWER GENERATION

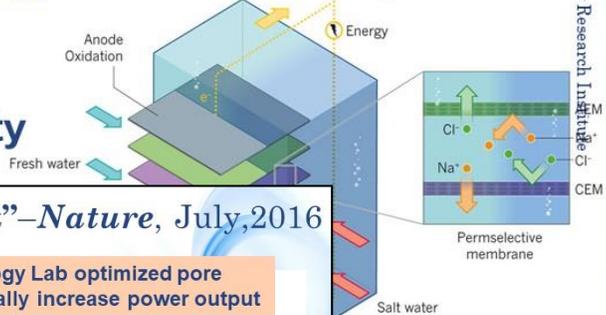


Statkraft said osmotic power has global potential of more than 1600 TWh of energy at 1 W/m² of semi-permeable membrane area

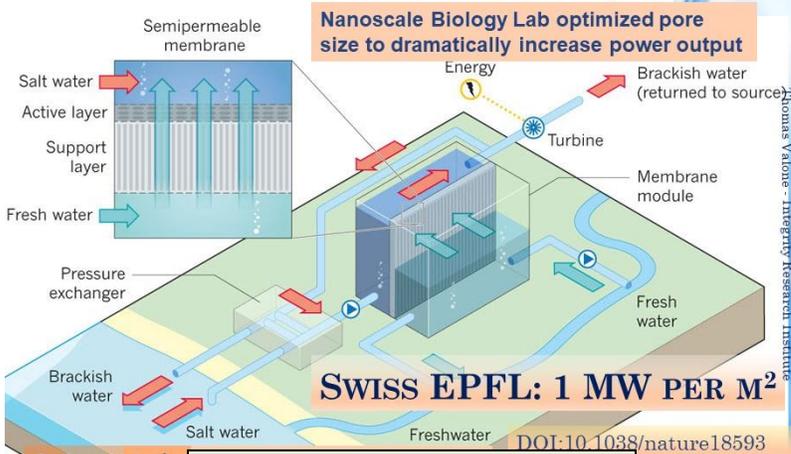
Norway's Statkraft opened world's first osmotic power plant in 2009 to produce emission-free kilowatts of electricity



$$\Delta G_{\text{mix}} = \text{Frictional Losses} + \text{Unutilized Energy} + \text{Extractable Work}$$



“Osmotically induced current” – Nature, July, 2016



<https://youtu.be/W3FnfJ2biY4>

The International Forward Osmosis Association (IFOA) says the addressable FO-RO (forward-reverse osmosis) market ranges from \$300 million up to \$6 billion in 2017. <http://www.forwardosmosistech.com/>

The movement of the salt from saltwater into fresh water in a process called osmosis pressure is where **osmotic power** is operating by creating pressure across a membrane (see picture in upper right hand corner). “In our research, we used a concentration gradient, where we have a very high-concentration salt solution on one side of a membrane, and a solution with a very low concentration of salts on the other.” explains Aleksandra Radenovic, head of the EPFL Laboratory of Nanoscale Biology <https://lben.epfl.ch/>. The Swiss EPFL's new technology published late in 2016 is *far more* efficient than existing osmotic power systems (OPS), thanks to a unique membrane that is just three atoms thick. While Norway's Statkraft OPS was operating on 1W/m² before being discontinued, the [amazing Swiss breakthrough](#) achieves a *million times more power* at 1 megawatt per square meter: “Single-layer MoS₂ nanopores as nanopower generators” (*Nature*, V. 536, p. 197–200, 11 Aug. 2016). Many estuaries and river mouths have seawater and fresh water interfaces which are suitable for this.

Using elastomer films to generate electricity from flowing water in small rivers

October 5, 2017 <https://www.sciencedaily.com/releases/2017/10/171005103533.htm>

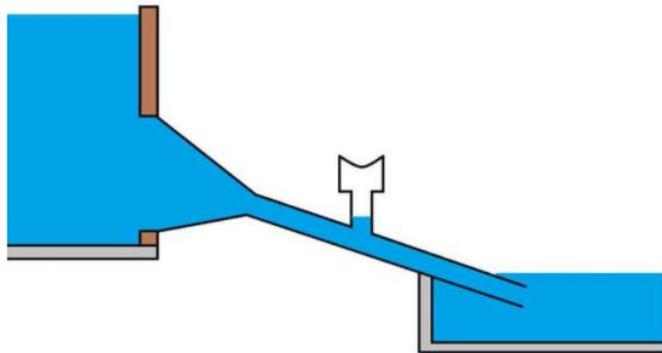
Fraunhofer-Gesellschaft -- *Science Daily* and *Phys.org/news*

Water is still the most important source of renewable energy in Bavaria, Germany, accounting for some 33 percent of all renewable energy produced in the region. But conventional and micro hydro generators, are a subject of controversy due to their low output volumes and their interference with the ecosystem. Researchers are working on an environmentally friendly alternative: innovative elastomer materials are set to convert the mechanical energy produced by **flowing water** in small rivers directly into electrical energy.



Würzburg-based researchers are using highly flexible and ultra-thin elastomer films that work as capacitors. The silicone films are coated on both sides with a **conductive elastic layer** and furnished with a protective layer of insulation. They are installed in small rivers and streams where the constant deformation and relaxation of the elastomers converts the mechanical kinetic energy from the water directly into electrical energy. The flowing water deforms the soft film, the characteristics of which are similar to those of a balloon. When deformed, **the films carry a high electric charge generated by the stretching process**. The elastomer film is then mechanically relaxed to its original state. "At this point, a high volume of electrical energy has been generated and charges a temporary storage device on an integrated circuit. It is from here that we siphon the energy. This deformation and relaxation cycle is repeated once a second," explains Dr. Bernhard Brunner, project manager and scientist at Fraunhofer ISC. "If we apply a potential of 4000 volts, for each deformation we can generate 100 milliwatts of electrical power per film."

Water flows through a constricted tube building up negative air pressure -- a concept also known as the Venturi effect -- which causes the elastomer film to deform (four **Venturi tubes** are seen in the photo). An air valve is then opened to equalize the negative air pressure and the elastomer film returns to a non-deformed state. What makes the design so ingenious is that the air vent is self-controlled: it opens and closes on its own without requiring electronics or power. In total, such a system with 1000 generators could supply the grid with **876 MWh of power annually**. Austria and Switzerland -- with their abundance of mountain streams -- as well as developing countries would also benefit from this innovative mechanical excitation concept. Decentralized energy supply is now possible from these elastomer generators which are designed to operate silently in shallow and small waters without a check dam. They are suitable, for example, for use as a decentralized power supply for campsites or remote settlements located in the immediate vicinity of water. In the lab, Brunner and his team are currently developing two types of generator: one that floats and one that is fixed to the riverbank.



Cross section of the Venturi tube. When the water flows through the uptake tube, negative pressure builds that forces the elastomer film (center of the image) to extend inwards. Credit: Fraunhofer ISC

Bacteria made to turn sewage into clean water – and electricity

A self-powered waste water treatment plant using microbes has just passed its biggest test, bringing household-level water recycling a step closer



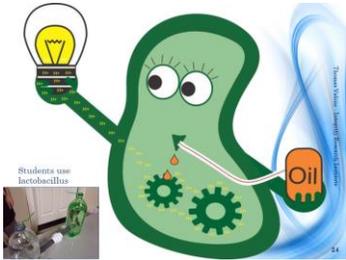
BioVolt microbial fuel cell uses GMO *Geobacter* strains which generate electricity, grow slowly and do not create microbe cake – **Cambrian Innovation** tested at Naval Surface Warfare in MD – scaling up from 2000 liters/day to 20,000 liters/day



A number of teams are working on their own versions of these cells. Orianna Bretschger at the J. Craig Venter Institute in San Diego, California, is testing hers at a farm run by the San Pasqual High School in Escondido, California, using it to process about 650 litres of pig waste per day.

“The bacteria that purify the water also liberate electrons, turning the set-up into a battery”

Bretschger is in the early stages of building a larger pilot system, to be commissioned in Tijuana, Mexico, next year. “I think that we will still be on track for commercialisation in the next three to five years,”



Calvin College has a vital project ongoing which converts waste into electricity with a biological fuel cell called “BioVolt”. Visit <https://tinyurl.com/biovolt> for complete details on this easy to replicate process. Different types of microbial fuel cells can process different types of waste, perhaps recovering useful by-products. Another type called EcoVolt, generates methane as it cleans up waste water produced by a brewery while cutting energy use. There is hope that BioVolt will scale up to processing more than 20,000 liters per day.

Because the technology is largely based on biological materials, the eventual cost could be lower than solar PV cells and other technologies that require specially manufactured materials. Interestingly, *Bacillus subtilis* spores continue to perform the necessary mechanical motion even when they are dead or dormant.

Nation's Capital D.C. Water Harnesses Electricity from Every Flush

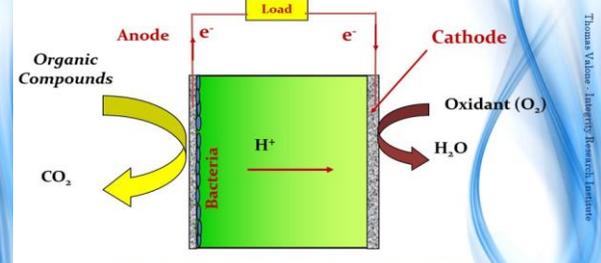


Uses Norway's “**THERMAL HYDROLYSIS**” to convert sludge left over from sewage (with microbes) into **13 MW** of electricity

Dairy farms are a big market since only four current use digesters out of hundreds of farms that use digesters – Dr. Lansing



BACTERIA GENERATE ELECTRICITY AND PURIFY WASTE WATER



Also Craig Venter Institute testing 600 liters/day pig waste at local farm in Escondido CA and Penn State University generates kilowatts from human waste



Thomas Valasek - Emerging Research Institute

Thomas Valasek - Emerging Research Institute

CONSUMER SOLAR POWER

Everyone on the block recognizes the prevalence of solar panels on homes in their neighborhood. However, which companies are the best and what offers are still out there for discounts and rebates? [Consumer Affairs](#) answers this and we chose the “most popular” to list them here:

- [Vivint Solar](#) is a technology and solar energy system company whose mission is to provide clean energy throughout the United States. [READ 1255 REVIEWS](#)
- [Sunrun](#) - \$0 down & include free maintenance, repairs, monitoring, & insurance for 20 years. [READ 377 REVIEWS](#)
- [SunLux Energy](#) was formed to help consumers switch to renewable energy to save money and maximize efficiency. [READ 150 REVIEWS](#)
- [Dividend Solar](#) works with a preferred network of solar installers to offer \$0-down loans to homeowners looking to go solar. [READ 605 REVIEWS](#)
- [SolarCity](#) is a fast-growing solar power company. It was founded in 2006 by two brothers who wanted to provide solar power to residential customers. It is one of America's largest providers. [READ 488 REVIEWS](#)
- [Solar Spectrum](#) Each plan lasts 20 years at a locked-in, affordable rate. Solar Spectrum covers all repairs, operation and monitoring. [READ 23 REVIEWS](#)
- [SunPower](#) is one of the oldest solar power companies in the United States in 1985. Its solar-powered catamaran continually sails around the world without relying on external fuel sources. [READ 108 REVIEWS](#)
- [RGS Energy](#) has currently sold over 22,500 solar energy systems to homes, businesses and educational and governmental institutions. [READ 27 REVIEWS](#)

SOLAR ENERGY MODULES



Solar Illuminations lamp
8 hours light with solar



NO KEROSENE="NOKERO"



Inflatable Solar Light
\$15 from MPOWERD.COM



MPOWERD.COM
8 hours light
Solar recharge

LIGHTS FOR GOOD
Join us in delivering light all over the world.

Distributed electricity
that is failure-proof:

- solar lanterns
- networked solar rooftops

For individuals who want to reduce their carbon footprint, IRI recommends the solar-LED-battery combo units seen here.

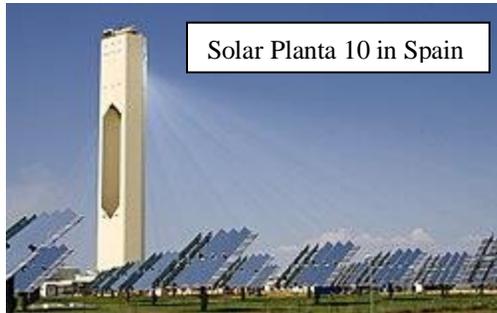
We have purchased both www.nokero.com and www.mpowerd.com solar lights and use them in closets, kitchen, over the dryer where it is hard to read the controls, and where occasional lighting is needed, as well as in outdoor sheds. Hours of bright LED light for sun-charging about once a month! **You can also have them donated to kids in Africa easily online.**



CONCENTRATED SOLAR

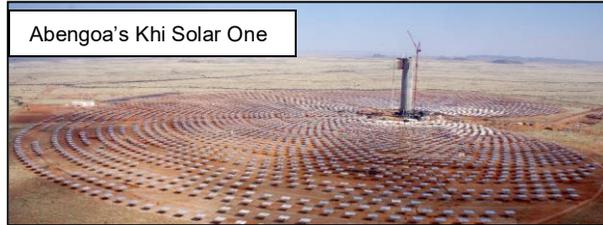
With solar power growing at a fast pace around the world, it is worth looking at the most powerful utility-sized plants using that technology. **Concentrated Solar Power (CSP)** reached a record in 1986 when the 10 MW world's largest solar thermal facility was opened in Kramer Junction, CA called **Solar One**. It was followed by **Solar Two** in 1996 operated by an industry consortium and the US DOE until 1999. Today, with the use of heat transfer fluid, 16 plants are in the US while Spain has 33 CSP plants under construction.

SolarReserve is a US company which uses integrated molten salt thermal energy storage technology in conjunction with solar power towers licensed from **United Technologies Corporation (UTC)**. The company has got approvals to build CSP plants in Arizona and California. The company has tied up with Chinese solar wafer giant GCL to build solar projects across the USA and holds 1100 MW of projects in development.



Acciona – the Spanish Renewable Energy Giant is one the most experienced in the Solar Thermal Category. The company built one of the large solar thermal plants in the US named Nevada Solar One in the 1980s. **Areva** – Another Giant Global Electrical Equipment Conglomerate which entered the Solar Thermal Energy area by acquiring a struggling CSP startup Ausra. The company is planning like the others to make a major investment of around \$3 billion to build 1000 MW capacity in India. The company is the biggest nuclear equipment supplier in the world and has interests in biomass energy as

well. **Abengoa** – one of the most well known suppliers of Solar Thermal Equipment in the world and is a proven developer of large scale Solar Thermal Plants in Spain and USA. This Spanish giant has signed a JV with India's largest capital equipment company BHEL to manufacture components for **Solar Thermal Plants**. It has managed to win a large DOE grant for constructing another large Solar Thermal Plant in the USA. It has also signed a JV with Abu Dhabi promoted Masdar to build a **100 MW Shams 1** plant near Madinet Zayed in UAE. Here is a short list of some of the worlds solar thermal energy companies and links to their websites:

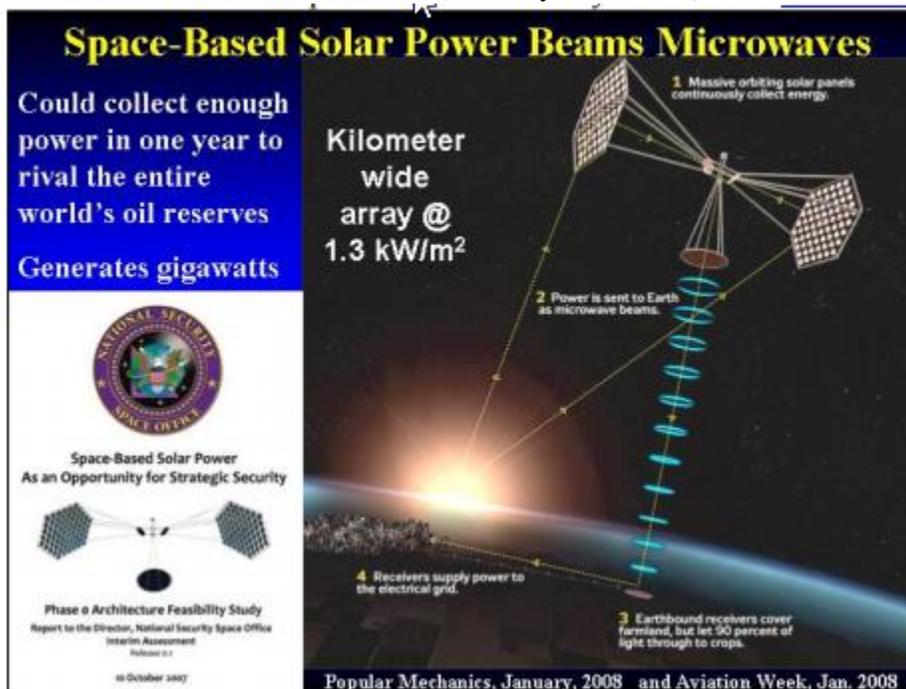


- [Abengoa](#)
- [Acciona](#)
- [Ausra \(now Areva Solar\)](#)
- [BrightSource Energy](#)
- [eSolar](#)
- [Iberdrola](#)
- [Schott](#)
- [Sener Solar](#)
- [SkyFuel](#)
- [Solar Euromed](#)
- [SolarReserve](#)
- [Solet](#) (purchased by Siemens)
- [Sopogy](#)
- [Torresol Energy](#)
- [Wizard Power](#)



SPACE SOLAR POWER

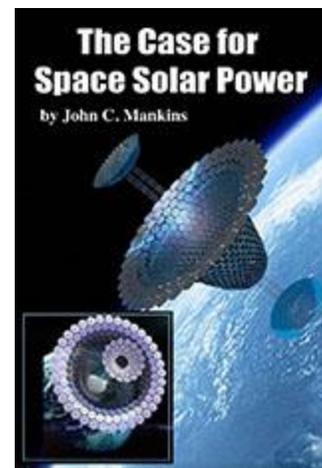
Not many have heard of the **Space Solar Power (SSP)** project originally proposed by Gerard O'Neill from MIT over twenty years ago (www.ssi.org). The biggest advantage still is the **ten-times (10x) improvement** in the performance of any PV solar cell without the *losses introduced by the atmosphere* on sunlight. In other words, instead of only 100 Watts per square meter on the ground for the average solar PV conversion rate on an intermittent basis, we can expect 1,300 Watts per square meter (**1.3 kW/m²**) in space. Today even the Pentagon has endorsed the concept for national security reasons and [a 2-minute video of demo is online](#) (courtesy of NASA) which features many experts that



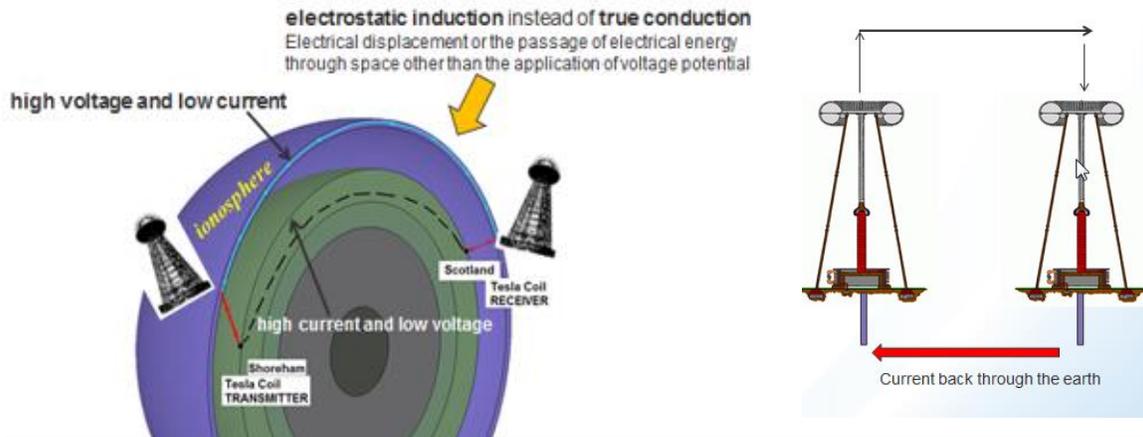
explain the advantages. SSP offers many stabilizing, round-the-clock features that solve the intermittent nature of other renewable energy on the earth. IRI recommends that a single prototype should be funded by the incoming Administration to prove the

feasibility and robust nature of the process. SSP is the only energy technology with the capability for replacing all of the electricity generation in the U.S. in a relatively short time. A test satellite should be the number one priority for NASA as part of a new administration's Comprehensive National Energy Initiative perhaps. National Space Society (nss.org) is a great resource for SSP.

Landmark book released January 2014: [The Case for Space Solar Power](#) by John C. Mankins. A must read! This groundbreaking new book by renowned expert John Mankins lays out a path forward that is both doable and affordable: within a dozen years or less, the first multi-megawatt pilot plant could be in operation. Space Solar Power could transform our future in space, and could provide a new source of virtually limitless and sustainable energy to markets across the world. [See NSS review.](#)



WIRELESS TRANSMISSION OF POWER THROUGH EARTH AND IONOSPHERE CAVITY



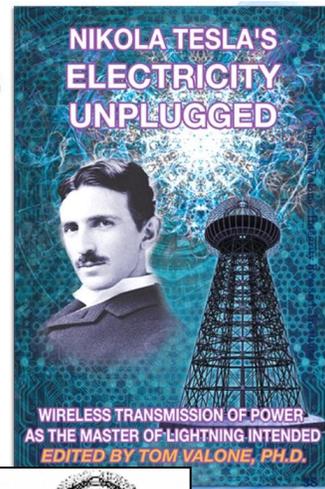
In 2015, IRI held COFE7 featuring **Dr. Nick Simos** from **Brookhaven National Lab**. His talk was on how Tesla's wireless transmission of power actually is feasible. He disclosed that Nikola Tesla found an 11.78 Hz resonant frequency for wireless transmission through the earth-ionosphere cavity. His diagrams here, such as the "Atmospheric Conduction Method" above show the physics explaining the method that Tesla pioneered. For more info, see *Harnessing the Wheelwork of Nature: Tesla's Science of Energy*, (2002) and *Nikola Tesla's Electricity Unplugged*, (2016), both by Thomas Valone. IRI also held a Wardencllyffe Tower Centennial Conference honoring Nikola Tesla in 2003.



Dr. Jim Corum and Ken Corum, with Texzon, have a 75-page Chapter 20 in this book entitled, "Bell Labs and the Radio Surface Wave Propagation Experiment" detailing the 80-year old results which were the first modern proof of the robust Zenneck surface wave component of wireless power transmission and its inverse frequency dependence. (Mr. Zenneck was a friend of Nikola Tesla and can be seen together with him in the old photos reprinted in the chapter.) Texzon Utilities offers an email list which one can join specifically for wireless power news. This is the future that Tesla envisioned, free from an electrical grid umbilical cord.

WIRELESS POWER BECOMES AVAILABLE

From short range to long range, the latest wireless solutions are in a 450-page illustrated book → Long range wireless power transmission uses Zenneck Surface Waves, being demonstrated by Texzon Technologies (Texzont.com)



Tesla Energy Conference & Exposition

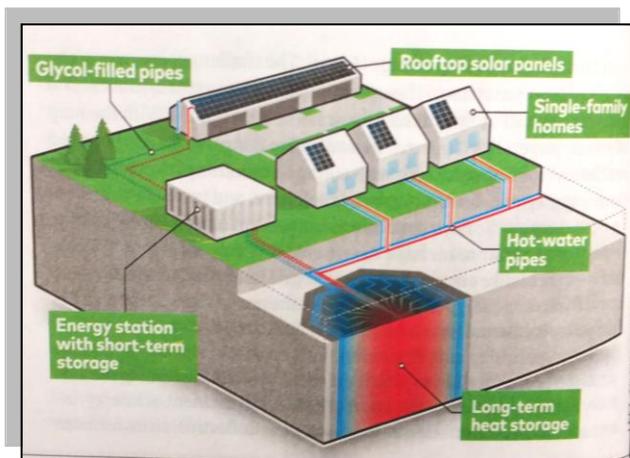
November 8 & 9, 2003
Sheraton College Park Hotel
 4095 Powder Mill Road, Beltsville MD 301-937-4422
** in the Washington DC metro area **

Celebrating the *Wardencllyffe Tower Centennial (1903-2003)*, Nikola Tesla's wireless transmission of energy, & other Tesla

AFTERWORD

As we end the *Future Energy Breakthrough Technology* section with the ongoing IRI advocacy of wireless power, optimistically

looking at the future of energy, propulsion, and bioenergetics, it is a chance to sum up the findings presented in this 2017 *IRI Annual Report*. To begin with, the emphasis at IRI has always been the concern for the future well-being of humanity with an eye toward the emerging energy tech that is on the horizon, along with propulsion and bioenergetics developments that are sustainable. Here we also show the state of the art with conventional renewable energy as well as the advances in water, solar, wind, tidal, wave, nuclear, energy harvesting, and other technologies. To achieve a systems approach to the global evolutionary picture, when power disruptions are becoming more likely as the *world average temperature climbs one degree Celsius every generation*, for the foreseeable future, IRI encourages everyone to have electrical backup plans in mind.



One of the emerging concepts for electrical power these days, even for rebuilding Puerto Rico, is the use of **microgrids**. It is a design concept that groups smaller numbers of homes and businesses into a separately sustained system, often with mixed power sources. An interesting simplification for energy storage in such a microgrid is shown here from the Jan/Feb. 2018 edition of *Popular Science*. Here we see the use of solar thermal systems with fluid carrying heat to an underground thermal energy storage (UTES) which, like the simple water-pumping mechanical energy storage system (“pumped hydro”) also in use today, allows an almost failure-proof source of energy

as a backup for the short-term electrical battery supply bank. The plan calls for pipes to warm the earth to about 175°F which, according to Dr. Mark Jacobson, can be retained until winter time. It is well worth listening to Mark’s YouTube talk (p. 23) on his 100% renewable energy program for 139 countries, which is very encouraging. He also has several papers and lectures online dealing with the inevitable sticky question of geoen지니어ing to cool down the world as the CO₂ and global temperature reach intolerable levels.

We encourage all of our readers to study p. 35 of this report, contact a solar panel installer for your home from the list, and also purchase one of the Nokero or our favorite, www.mpowerd.com solar lights and start discovering ways in which to use these *small inflatable, waterproof packs* of free energy from the sun! Mpowerd calls them “the Luci family”. The least expensive Luci (\$15) has just one bright LED like their Solar Candle, which is just like a real dinner candle (even with a flickering yellow light), or the EMRG, which has bright white LED and clear bottom panel or flashing red LED. The [Luci Original](#) (\$20) is even better with a low, medium, high white light with several LEDs around in a circle and a flash mode, made to **last 24 hours** on a single charge. The [Luci PRO Series](#) (\$35) is the best and bigger (seen here), with a USB port to charge your phone on the go or for speedy full charging in 2 hours and lasting up to 50 hours on a single charge.

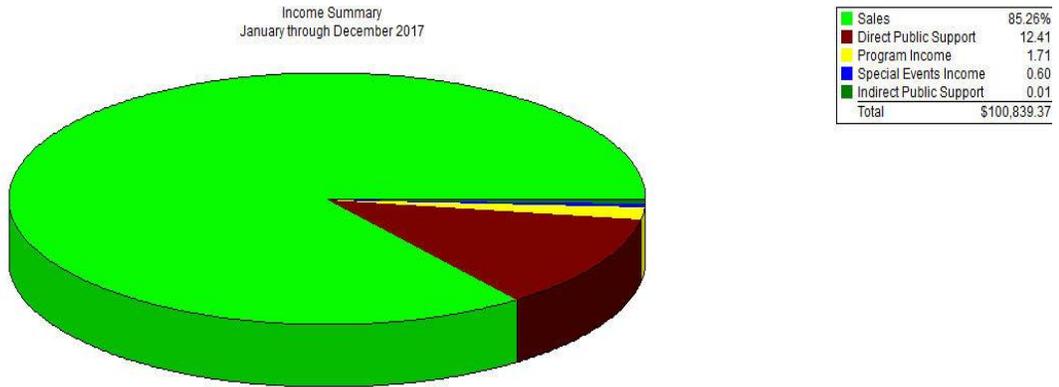


Toward our future energy independence,

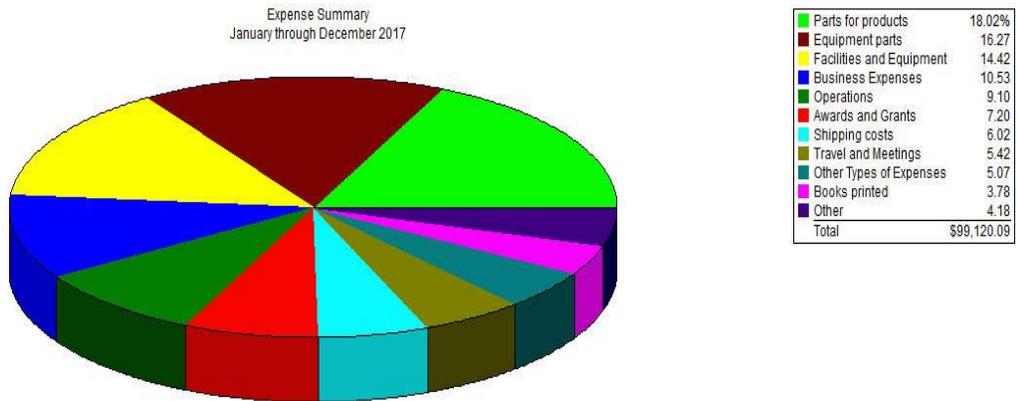
Tom Valone,
President

IRI 2017 FINANCIAL REPORT

INCOME: \$100,839.77



EXPENSES: \$99,120.09



By Account

FUND BALANCE BEGINNING OF YEAR	\$29,385.00
FUND BALANCE END OF YEAR	\$19,697.00



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Integrity Research Institute is a 501(c)3 nonprofit organization incorporated in Delaware that researches and develops eco-friendly Emerging Energy Technologies, Bioenergetics for sustaining/restoring human health, and Advanced Propulsion/Engine Drive alternatives