

Zero Point Energy

The Fuel of the Future

Thomas Valone, PhD, PE

Integrity Research Institute

Non-profit 501(c)3 organization

for Nikola Tesla, the true visionary who defined useful ZPE

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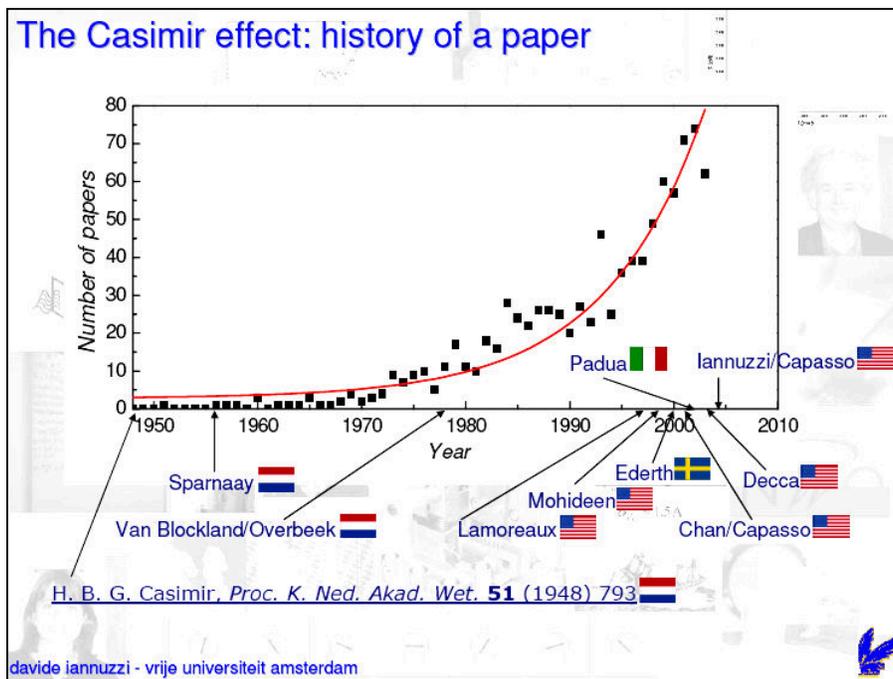
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Preface

Overview

When we look at a scientific revolution, there are always individuals of stellar ability and performance who lead the way intellectually, besides those who provide resistance.¹ Drs. H.B.G. Casimir, Timothy Boyer and Robert Forward were a few of the earliest pioneers in the zero-point energy arena. As can be seen from the graph below,² Casimir's original paper, about the zero-point energy force named after him, has had a worldwide, exponential effect on increasing the number of Casimir papers, showing the rapidly growing interest in the topic.



Dr. Boyer's articles in *Scientific American* and *Physical Review* spawned additional interest in fundamental processes and a new theory called "Stochastic Electrodynamics" (SED) which has provided answers to questions that quantum mechanics could not. Dr. Forward's articles started everyone thinking about possibly converting the Casimir force to usable electricity, which had not been considered before. Dr. Fabrizio Pinto, who has inspired me the most, is one of the more recent, amazing physicists to publish and patented his ZPE inventions. Dr. Peter Milonni's textbook, *The Quantum Vacuum*, provided the impetus for me and others to take the field of ZPE seriously. Even Tom Grace's novel, *Quantum*, a thriller centered on a free energy device, provided the intrigue and suspense for me to pursue this topic more fervently.³ However, it was Nikola Tesla's prediction of the field of zero point energy that inspired me with his contagious prophetic conviction.

After completing my "Feasibility Study of Zero-Point Energy Extraction from the Quantum Vacuum for the Performance of Useful Work" which was also used in partial satisfaction for a PhD in General Engineering, it became apparent that the discoveries that I reported on were not accessible to the general public because of the technical nature of the report and the physics equations which the study included. (The study has been released as a book, with a new title, ***Practical Conversion of Zero-Point Energy***, available from all major book distributors, including Amazon.com.)

Easy Reading

Upon designing the difficulty level of this book, it has been of paramount importance to me to make the book easy to read. Granted the topic is not an easy one but as a former community college teacher (Erie Community College, Buffalo, NY), I became an expert at reducing physics and electrical engineering to a high school level for general consumption. Adding personal insights, humor and sensory data, I worked the entertainment value of the book so that it could be high enough

to keep your attention. Even so, my hope is that each reader will grasp the significance of the true energy revolution that this book heralds.

Exciting Future

Ever since 1980, my avocation has been directed toward “future energy” with annual lectures and a paper on the topic. Our nonprofit organization, Integrity Research Institute, formed in 1990, offers a free, monthly email news service called “Future Energy eNews,” and has my lectures, CDs, DVDs, books and papers on “Future Energy Technologies” available to the public. You may also request a free sample DVD of a 2006 lecture on this topic, which includes zero-point energy, given at the Conference on Future Energy (COFE) in Washington DC, just by visiting the order page at www.IntegrityResearchInstitute.org. All of this work has kept me abreast of the developments in future energy, which in my opinion, are headed toward a compact, portable electricity generator that consumes no fossil fuel but produces useful amounts of electrical power.

Our basic survival as a species depends on such an invention as we quickly exhaust all other energy sources. Surprisingly, many battery, ultracapacitor, and compact fuel cell developments fit the bill already. To gain a perspective on our dire situation as an evolving human race, just think of any major disaster where the concomitant deprivation always includes the loss of electricity. Looking at vast territories on earth that are uninhabited due to a lack of resources. Survey the underprivileged, third world countries that don't have even their basic needs supplied. Think of space travel for any appreciable distance, such as to Mars. All of these situations demand a denser, high quality electrical generator that is longer lasting, preferably on the order of years. Where there might not be sun, wind, or thermal energy, zero point energy fuel cells will be the only sustainable alternative in the future.

Zero Point Energy

The term, zero-point energy, has been written with and without a hyphen (e.g., zero point energy) in all of the major journals. Therefore, in this book, you will see it spelled both ways. It is also important for me to express to you my sincere desire for the truth in this field and every other one. I tend to follow the “4th Generation R&D” approach to new technology, which has specific concepts for recognizing a major trend of the future.⁴ *Zero point energy development qualifies as a major trend.* All of the evidence in this book and the discoveries yet to come point to this truth. Esoteric religious mystics also find it to be the Holy Grail of energy, which indicates a fundamental drive in the collective unconscious for fulfillment of an inherent need. In fact, one “history of energy” text that I read to prepare for this project indicated that the development of every society depends solely upon developing higher quality energy sources. Furthermore, the collapse of civilizations, they claimed, was due to the stagnation of the energy source depended upon and a lack of a superior replacement in time.

Resistance to Looking Under the Rock

There is a problem. Many scientists in the conventional academic world represent the status quo, which they seek to maintain. Anything that remotely looks like perpetual motion or free energy is summarily rejected out of hand by this group, even if it can be demonstrated. For example, Professor John Barrow from Cambridge University insists that,

In the last few years a public controversy has arisen as to whether it is possible to extract and utilise the zero-point vacuum energy as a source of energy. A small group of physicists, led by American physicist Harold Puthoff have claimed that we can tap into the infinite sea of zero-point fluctuations. They have so far failed to convince others that the zero-point energy is available to us in any sense. This is a modern version of the old quest for a perpetual motion machine: a source of potentially unlimited clean energy, at no

cost....The consensus is that things are far less spectacular. It is hard to see how we could usefully extract zero-point energy. It defines the minimum energy that an atom could possess. If we were able to extract some of it the atom would need to end up in an even lower energy state, which is simply not available.⁵

This narrow-minded opinion proves that converting or extracting zero-point energy for useful work is still plagued by ignorance, prejudice and disbelief. The majority of physicists do not in general acknowledge the emerging opportunities from fundamental discoveries of zero-point energy. Instead, there are many expositions from prominent authorities explaining why the use of ZPE is forbidden and bordering on the irrational. A scientific editorial opinion states,

Exactly how much 'zero-point energy' resides in the vacuum is unknown. Some cosmologists have speculated that at the beginning of the universe, when conditions everywhere were more like those inside a black hole, vacuum energy was high and may have even triggered the big bang. Today the energy level should be lower. But to a few optimists, a rich supply still awaits if only we knew how to tap into it. These maverick proponents have postulated that the zero-point energy could explain 'cold fusion,' inertia, and other phenomena and might someday serve as part of a 'negative mass' system for propelling spacecraft.⁶

With convincing skeptical arguments like these from the "experts," how can the extraction of ZPE for the performance of useful work ever be considered reasonable? What engineering protocol can be theoretically developed for the extraction of ZPE if it can be reasonably considered to be feasible? These are some issues that are points of discussion for raising ZPE consciousness.

Sustainable Living

As we move into the 21st century, it is an honor to help usher in a vital ingredient for the future trials and tribulations that will inevitably assault this world. When we consider the

placid, past ten thousand years of inter-glacial period with relatively even temperature and constant sea level, it is important to realize that the earth is normally in an Ice Age for 90% of the time (lasts about ninety thousand years) and should be entering one right now. A recent *Scientific American* cover story indicated that it is only due to human activity that we haven't already entered the next Ice Age. However, humans have now overdone the compensating "thermal forcing" of the planet. Furthermore, all of the volcanoes, calderas, landslides, earthquakes, tsunamis, hurricanes, and most dangerous of all, meteorites, scheduled to become global catastrophes, at a time when the world population density is the highest it's ever been in urban areas, will necessarily cause a large-scale loss of life.

What a blessing it will be for everyone to have a small sealed box in his or her house and place of business that supplies a sustainable amount of electricity with a zero-point energy generator. Cooking, heating, air conditioning, water distillation, communication, computer and lighting needs will all be sustained during a major crisis, instead of being interrupted, as is the problem today. In his movie "Inconvenient Truth," Al Gore for example, cites drought brought on by climate change as a major cause of the bloodshed in Darfur. ZPE power sources and compatible electromagnetic medicine will help underdeveloped countries as well as the modern ones. With a source of electricity available everywhere, many consumable pharmaceutical drugs in Africa, which demand regular donations to sustain them, will slowly be replaced by a single, one-time investment of ZPE electrically-powered therapy devices (see the book, *Bioelectromagnetic Healing* by this author). This will be a lasting improvement to health and well-being worldwide.

I saved the technical, physics stuff for Chapters 9 and 10. Some readers may enjoy getting more of the scientific details that the last chapters provide. Hopefully, many of the graduates of this book will want to go onto the advanced text, *Practical Conversion of Zero-Point Energy*, that gives more of the real physics behind ZPE effects.

Private investment capital is needed for many of these projects to be completed. In the meantime, the rest of us can dream about the future that we all deserve to see materialized in our lifetime. Our mother earth needs the relief of clean zero



point energy so that she may heal the climate for our benefit. This is in keeping with the Gaia Principle. For years I have fought for the development of new sources of energy to avert the coming oil crisis, such as when I was on CNN on June 25, 2002. Hopefully, this book will help in that regard.

Thomas Valone
Washington DC



Figure 1.1 The first “Zero-Point Energy” toy on the market, a companion to the movie “The Incredibles,” released in 2004

Chapter 1

Introduction to Zero Point Energy

Overview

Zero point energy is the sea of energy that pervades all of space, often called by scientists, “the physical vacuum.” Perhaps a realization of the old *ether theory* or the Biblical *firmament*, it just happens to be the biggest sea of energy that is known to exist. Not only is it big but its energy is estimated to exceed nuclear energy densities. Even a small piece of it is “worth its weight in gold.” What is it? It is “the kinetic energy retained by the molecules of a substance at a temperature of absolute zero.”⁸ Still, most people are not sure what this “zero point energy” (ZPE) is and whether it can be useful for human energy needs.

Ether (Aether) Theory.

Light may use something as a medium, similar to how air and water is used by sound. Michelson & Morley proved it didn't exist but their experiment has been countered by Silvertooth⁷ and others with improved accuracy.

Does it offer a source of unlimited energy for homes, cars, and space travel? Depending on whom we talk to, ZPE can do everything and ZPE can do nothing useful. How can the energy be converted to produce electricity? It may be our primitive 20th century upbringing that stops us from putting a paddlewheel in this sea. What is the basic explanation of ZPE? *Space is quantized and virtual particles abound.* What are the new discoveries that have rocked the U.S. Patent Office, NASA, *Physical Review*, *Scientific American*, *Discover*, *New Scientist*, and the *New York Times*? What are some of the ZPE concepts that we should know about? These are the question that this

book will answer in the following chapters. This is a very useful chapter and every new term is defined in a special definition box for your convenience.

What is Zero Point Energy?

Maybe ZPE can shoot from a gun, like in the movie “The Incredibles” (Fig. 1.1)?⁹ Some scientists like to talk about the vast field of zero point energy pervading all space, as the *zero point field* (ZPF). We can envision the ZPF as a big sea in which we are all submerged. Contrasted with that is ZPE that locally involves energetic stuff on a microscale, which we can measure. Thus, ZPE is the energy that comprises the ZPF. Dr. Fred Wolf explains:

Virtual Particle. Also called a “virtual quantum,” it is an intermediate state where energy is not conserved. The theory of exchange of coulomb energy between two electrons involves an emission of virtual quanta by one and the absorption by the other. Virtual particles abound in the vacuum.

No matter how cool we make the chamber as we compress the gas, we would find that we could no obtain total order. Greater confinement of each molecule would produce, according to the uncertainty principle, a greater uncertainty in its possible speed and therefore less certainty about its individual behavior. The gas would exhibit what is called zero-point energy. Even though its temperature was reduced to absolute zero, the molecules would still continue to move. Each molecule, however, would no longer be able to occupy a single position at a single time. Instead each would ‘spread out’ throughout the whole volume of the chamber.¹⁰

With the discovery of ZPE, scientists find that space is rich with activity from *virtual particles* and full of energy. Therefore, physicists like to call it the “physical vacuum” when they want to talk about ZPE. Furthermore, the vacuum also vibrates and “fluctuates.” *In fact, that is the very essence of ZPE.*

Vacuum fluctuations are even predicted by a branch of physics, started by Albert Einstein, Neils Bohr, and Werner Heisenberg, called *quantum mechanics*. “Vacuum fluctuations” will be regarded as the same thing as ZPE, which are “a disturbance in the Force, Luke.”

Another aspect of both ZPE and ZPF is that the “vacuum” was supposed to be empty. This is the only “leap of faith” that is required of the reader: to keep an open mind to the fact that theory and experiment agrees that the vacuum is not empty. Instead, it is full of activity and, most importantly, it can spill over into the real world. As explained in later chapters, classical physics predicts the presence of zero point energy. The way it was discovered involved emptying a container of everything including the matter, gas, and any heat energy. The only thing left in that container, as the heat energy approaches the absolute zero point (0°K) will be the vacuum itself. This is why it is called zero point energy. (More historical ZPE information in Chapter 2.)

Scientists have cooled specimens to less than 1°K of the absolute zero point of temperature. A famous experiment proving the existence of ZPE involves cooling helium to within microdegrees of absolute zero temperature (between -272C and absolute the zero point of -273C). Amazingly, it will still remain a liquid! Only ZPE can account for the source of energy that is preventing helium from freezing.

Besides the classical explanation of zero-point energy referred to above, there are rigorous derivations from quantum

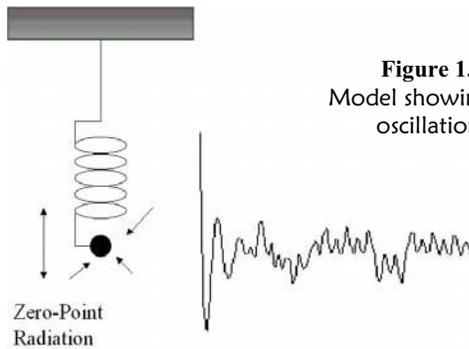


Figure 1.2
Model showing ZPE oscillations

physics that prove its existence. As one quantum mechanics text states, “It is possible to get a fair estimate of the zero point energy using the uncertainty principle alone”

(see Appendix). Because Heisenberg's uncertainty principle is so simple and fundamental, this implies that ZPE is also the same: simple and fundamental.

Infinite Energy

Everything about zero point energy is amazing. This apparently keeps physicists in a state of incredulity, unable to grasp its significance. For example, there is the question of whether the ZPF is *conservative*. (Unlike politics, conservative fields in physics are those that conserve energy, thus obeying the First Law of Thermodynamics.) If ZPE is not conservative, then we can extract "an infinite amount of energy" from the vacuum, according to Dr. Robert Forward. However, if it is proven that the ZPF is a conservative field, we can still extract energy from it. It is just that we would have to put energy in and store it somehow to get it out again.

The evidence seems to favor a **nonconservative ZPF** so far, with an open system bath or plenum. In addition, the capability of ZPF storage and retrieval has convincingly been presented by Dr. Forward, as presented in the next chapters.¹¹ An article entitled, "Energy Unlimited" appeared a few years ago when Professor Jordan Maclay received a NASA grant to try to extract ZPE from elongated, oscillating, tiny metal boxes.¹² A physics journal article points out, "However, vacuum fluctuations remain a matter of debate, mainly because their energy is infinite. More strikingly, **their energy per unit volume is infinite.**"¹³ Interestingly, this seems to create intellectual difficulties which can only be artificially eliminated. "Problems with the infinite energy of vacuum fluctuations has led to the view that vacuum energy may be forced to vanish by definition...[from] the need to regularize the infinite energy-momentum tensor." However, this causes even more complications: "This procedure gives rise to ambiguities and anomalies, that lead to a breakdown at the quantum level of usual symmetry properties of the energy-momentum tensor."¹⁴

Some physicists defend the infinite energy theory because presently there is no known limit to how small an electromagnetic vibration can be.¹⁵ Therefore, they argue that there has to be infinite possible electromagnetic vibrations in the ZPF. This logically leads to the conclusion that infinite vibrations yield infinite energy content. However, this argument seems to apply more to energy density rather than total energy content. As Dr. Milonni explains, **“The zero-point energy of the vacuum is infinite in any finite volume.”**¹⁶ “A charged particle in the vacuum will therefore always see a zero-point field of infinite energy density.”¹⁷

For example, imagine what is the smallest vibration that could exist. That tiny wavelength has to resonate with a correspondingly high frequency.¹⁸ This calculation still leads to very high energy density and a really big number for the total ZPE available in the universe. We will call this the “limited” ZPF as opposed to the “unlimited” ZPF that yields infinite energy density.¹⁹ (More details are in ref. 18 and in later chapters.)

In an interview taped for television on PBS's *Scientific American Frontiers*, which aired in November (1997), Harold E. Puthoff, the director of the Institute for Advanced Studies, observed: **‘For the chauvinists in the field like ourselves, we think the 21st century could be the zero-point-energy age.’** That conceit is not shared by the majority of physicists; some even regard such optimism as pseudoscience that could leech funds from legitimate research. The conventional view is that the energy in the vacuum is miniscule.²⁰

Ten years later, this skeptical viewpoint is unfortunately still held by the physicists/scientists who want to keep their funding.

Contrary to this pessimistic, irrational belief, the actual scientific estimate of energy density of even the *limited ZPF* (bounded by a maximum frequency) is astounding. It is much more than we humans normally can comprehend. For example, if we presume that the minimum possible wavelength is limited to the size of the proton, the famous Nobel Prize winning physicist, Richard Feynman, calculated that the energy density

of the ZPF would be ten raised to the 108th power *joules* per cubic centimeter (10^{108} J/cc). Today, physicists want to look at even smaller vibration units like subatomic particles, etc. This makes the ZPF energy density escalate even more. Just as a comparison, if we converted energy to mass using $E=mc^2$, we find that the equivalent “mass density” of the ZPF is ten to the 94th power grams per cubic centimeter (10^{94} g/cc). Compare that with typical nuclear densities of ten to the 14th power grams per cubic centimeter (10^{14} g/cc).²¹ Therefore, gram for gram, *ZPE offers almost ten to the eightieth times more energy for the same amount of space than nuclear reactors*. Therefore, if we presume similar energy conversion efficiency, then 1 ZPE Engine = 10⁸⁰ Nukes. This leads to the surprising ZPE conclusion: ***Space itself contains more energy than matter does for any given volume.***

Free Energy

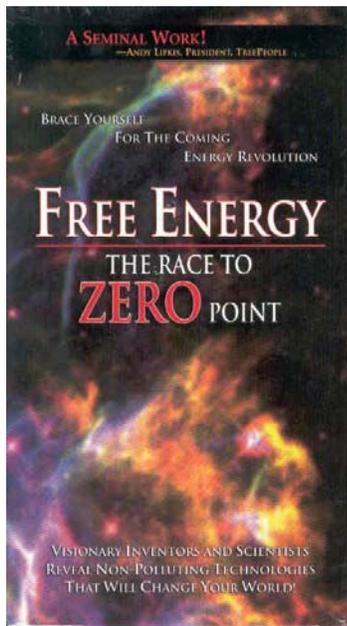


Fig. 1.3 This ten-year old videov (DVD) is a classic

This raises the exciting and controversial issue of “free energy.” This is “**one of the world’s twenty greatest unsolved problems,**” according to a new book published by Prentice Hall that devotes an entire chapter to free energy.²² Historically, when natural gas (1950s) and again when nuclear power (1960s) was introduced to society, “cheap energy” was their advertising slogan. Back in 1903, Nikola Tesla completed the Wardencllyffe Tower on Long Island, in order to broadcast cheap electrical energy to Europe. Tesla was stopped by J.P. Morgan who wanted to know how he could possibly put a meter on it. This caused Tesla’s free

energy dream to be suppressed. Today this movement is still a suppressed, popular conviction held by the majority opposed to the high cost and slavery of electrical grid power and ridiculed by mainstream physics. In 1995, I was the technical consultant to a bold, pioneering video “**Free Energy: Race to Zero Point**” which introduced and discussed ZPE with state of the art graphics and professional narrator. It also contains examples of promising inventions that showed characteristics of self-powered operation, though no endorsement was made of their outcome.²³

Now with the advent of ZPE, localized free energy looks much more promising than ever before. In 2001, *Popular Mechanics* featured an article talking about putting “free energy to work” moving a nanoscale seesaw (see Fig. 9.1).²⁴ In 1998, a physicist with the Jet Propulsion Laboratory invented a **nanoscale** ZPE engine that pumps electrons, with the help of a tiny laser, just like an electrical generator. Dr. Pinto states,

In the event of no other alternative explanations, one should conclude that major technological advances in the area of endless, by-product free-energy production could be achieved.²⁵

Pinto’s accomplishment has brought much needed legitimacy to the ZPE conversion arena. Another exciting endorsement has come from the prophetic Arthur C. Clarke who was recently overheard talking to Astronaut Buzz Aldrin in Sri Lanka, broaching the issue of zero point energy,

I'm now convinced that there are new forms of energy, which we are tapping, and they make even nuclear energy look trivial in comparison. And when we control those energy sources, the universe will open up.²⁶

Nanotechnology. Atomic size engineering, on the scale of a billionth of a meter (10^{-9} m), which is a nanometer. Such technology often uses scanning tunneling microscopes and other means to position even single atoms. Nanoscale motors, nanotubes, and nanobots are a few of the creations of this exotic world.

The Need for ZPEED?

In the movie “Top Gun” with Tom Cruise, there is a famous line: “I feel the need for speed.” Today the need for a nonpolluting, abundant energy source like ZPE is greater than ever. Maybe it will be called “zpeed” in the future for that reason, with milder addictive side-effects than we have now. Our world is battling another energy crisis of unprecedented proportions. However, the present levels of greenhouse gases that are by-products of fossil fuel energy are already impacting the climate and weather. The environmentalists’ demand to reduce the carbon emissions by 60% to 80%, in order to stabilize the earth’s atmosphere, clashes sharply with the public’s increasing demand for energy. While the world relies heavily on an oil-based energy that experts say is at peak production, new futuristic energy sources are still out of reach.

Fortunately, the ultimate goal of ZPE vacuum engineers is none other than free energy (with a single capital investment) and unlimited amounts of electrical power. Zero point energy is the much-anticipated promise of the future. It is the omnipresent bulwark of nature’s machinery, and the most abundant energy source in the universe. It already powers a surprising number of processes from quasars to atoms, while also linked by theoretical physicists to inertia and gravity. The applications of ZPE are limitless. We just need to design effective transducers to put the energy to use.

Dr. Marc Millis, at NASA’s Breakthrough Propulsion Physics Program, calls zero point energy the “leading candidate” for interstellar travel. It also is much more vital for interplanetary travel than NASA’s overgrown firecrackers, invented by the Chinese over one thousand years ago.

Facing the future with knowledge and forethought will empower us to find success in the midst of our dilemma. The questions are simply:

- (1) How can energy be used anywhere without burning something?