

The Master Principle of EM Overunity and the Japanese Overunity Engines: A New Pearl Harbor?

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Abstract

Conservative fields and single-valued potentials are universally assumed in rotary electromagnetic engine design and analysis, as is the absence of timed automatic *regauging* of an EM engine stator section. As is well-known, a change of gauge involves only a symmetrical change of both \mathbf{A} and ϕ EM potential *magnitudes* (actually, *intensities*) while the *net* resultant force field acting on the system remains unchanged because the two new force fields appearing are equal and opposite. It follows that no excess *work* of the form $\int \mathbf{F} \cdot d\mathbf{r}$ need be accomplished by the operator upon a system to regauge it and alter its potential, because $\nabla \cdot \mathbf{F} = \mathbf{0}$ and $W = \int \mathbf{F} \cdot d\mathbf{s}$.

On the other hand, *asymmetrical* change of a single gradient-free EM potential or both (i.e., regauging) freely changes the stored energy in the regauged subsystem, and also introduces a *net free nonzero force field* essentially responsible for the emf induced in the circuit. Asymmetrical regauging is comparable to a free *refueling* process. Asymmetrical regauging can be introduced by several mechanisms, including direct, nondivergent Poynting \mathbf{S} -flow switched into the system via a dq/dt -blocked conducting bridge from a separate dq/dt -loop serving solely as a source of potential, \mathbf{S} , and emf. The adaptation of the Poynting energy loss equation for this regauging method is given.

Another straightforward way of regauging a narrow sector of the stator is to utilize a *multivalued* potential (MVP) in that stator sector, wherein a powered rotor suddenly experiences an instantaneous free "jump" in its confronting stator potential when it enters the multivalued region. In this fashion the potentialized vacuum itself directly and freely injects excess potential (stored) energy into the system during the multivalued potential jump, which automatically increases the stored potential energy of the system — in short, *free refueling* the system. This excess stored energy can subsequently be continually dissipated as work in a load during the remainder of the rotary cycle. No violation of the laws of physics or thermodynamics occurs in regauging, because during the jump in energy storage the system is an open system freely receiving an input of energy from an external source, the vacuum itself. In principle this is no different than the refueling of a conventional gasoline engine, except that in regauging, the vacuum's interaction with matter freely furnishes the fuel.

Ideally, in the regauging jump region itself, the fields remain unchanged and therefore unused. However, the fields between the regauging region itself and *outside* regions will change. Adroit

timing of these latter fields may be freely utilized to assist the stator rotation since fields experience no Newtonian third law reaction force. Regauging thus can provide work-free stored EM energy "refueling" of an electrical or magnetic system — a Maxwell's Demon of special kind. The *gauge freedom* axiom of quantum field theory already assumes that a system's potential energy can be freely changed at will.

In the real world, magnetic domains and moving electrical charges occupy finite volumes rather than the "point unit magnetic north pole" and "point positive coulomb of charge" assumed by conventional EM field theory. Particularly in a magnetic system, a highly nonlinear single-valued potential with radical magnitude changes in a stator region smaller than the finite domains of the rotor can be utilized as a "pseudo MVP," since a rotor domain will experience this rapid alteration of the magnetostatic scalar potential in a single domain as a nearly instantaneous "jump". Even over many domains, a sharply changed single-valued potential with a finite rise time can be used if the resulting field is radially oriented so that no tangential drag results on the rotor. The jump time dt can be made sufficiently small so that the overall $\int F(t)dt$ "back impulse" becomes negligible or vanishes. The jumped potential can be appreciably higher than that of the next forward tangential stator region. In that case a strong tangential force results which *accelerates* the rotor and adds energy to it. Consequently, immediately after the jump the rotor can experience a substantial net overall boost out of the pseudo MVP jump region, as formally proven by Johnson's magnetic gates in actual laboratory force-time measurements every 0.01 sec.

Explanations of the magnetic Wankel and Kawai engines are presented from the viewpoint of the potentials and regauging. The explanations and the overunity mechanism are straightforward once the pseudo-MVP jump mechanism is understood. It appears that "self-powering" electromagnetic vehicles utilizing these engines could be introduced in the U.S. by the Japanese as early as October 1996 for the 1997 automobile year.^[1] If so, then the United States and the other nations of the world are in for an economic shock of enormous magnitude.

Introduction

First some background information. In 1980 while serving on the Board of Directors of Astron, Inc., and involved in overunity motor research, I wrote an informal (at the time proprietary) paper pointing out the significance of multi-valued potentials for enabling overunity operations of electromagnetic processes.^[2] In a 1989 article^[3] we pointed out one method (one of Howard Johnson's methods) for an overunity permanent magnet motor without ancillary electromagnets.^[4] In 1993 we openly released a mechanism for obtaining "free energy" from the vacuum in electrical circuits,^[5] and followed that by filing a patent application and a continuation on the method and various embodiments.^[6] My associates and I followed with patent applications for room temperature superconductivity, Poynting energy generators and enhancers, and other related overunity embodiments.^[7] We are presently struggling to ready four other patent applications in this rapidly emerging overunity field.^[8]

In a recent article^[9] we cautiously pointed out potential Japanese overunity motor work which might

well result in the launching of a Japanese-dominated "overunity age" in the immediate future.^[10] With somewhat limited information on engine details and no test results of the reported Japanese overunity engine(s), such caution was appropriate. Therefore we assigned a probability of perhaps only 60% that the work was overunity.

Such caution was justified. In a preliminary electric motor scooter demonstration held for Western engineers in Europe, no one was permitted to examine the actual motor "under the hood," so to speak.

Therefore a question remained, because *independent certification tests* — at least by Western scientists and engineers — had not appeared. Nonetheless I felt that a potential Pearl Harbor of a different kind was possible, and ended my article as follows: "*We simply must not repeat a Pearl Harbor in the overunity electrical energy field. This time the torpedoes may be too devastating for America to survive.*" Added. My estimate of 1996 as the target year was correct. Had not the Yakuza interfered, my own group and company would have placed the Kawai system on the world market toward the end of that year.¹

Additional Information on Japanese Overunity Engines

Additional information on these Japanese engines is now available. A fundamental U.S. patent^[11] on an overunity engine (test numbers are clearly stated in the patent for overunity coefficient of performance of some 318%) has already been issued to Japanese inventor Teruo Kawai. Dr. Eugene Mallove has followed up this startling development by printing an excerpt from the patent, with a commentary,^[12] and also the transcript^[13] of a Fuji Television Network program (some eight minutes) aired on October 20, 1993 over Japanese Television, and dealing with "dream energy" from permanent magnets. The Kawai motor uses a combination of permanent magnets and electromagnets, in a multiplicity of radially opposed operations of the ancillary stator electromagnets with respect to the permanent magnet rotor.

The Japanese appear to have had a substantially funded, national strategic program in overunity motors and devices for at least twenty years. For example, it is well known that the Japanese are heavily involved in cold fusion research. Also, as early as 1979, they were already testing a 45 h.p. motor — the magnetic Wankel engine — in a Mazda automobile.^[14] As we shall see, it is obvious from the design of the magnetic Wankel engine that it can produce overunity coefficient of performance.

The present paper explains the gauge-theoretic background needed to comprehend overunity EM circuits and machines. It also advances a master overunity principle and explains the application of this principle in the Japanese overunity EM engines.

What Is Required to Explain Electromagnetic Overunity

As is well known in thermodynamics,^[15] any permissible overunity system must involve an open system that receives an input of excess energy from an external source.^[16] In other words, the open system must not be in thermodynamic equilibrium. This is important. If the system is open but in

thermodynamic equilibrium, it is prohibited from receiving *and storing* any excess input of energy that can then be gated to a load to power it. Therefore the open system in equilibrium cannot exhibit stable overunity coefficient of performance. So the first requirement is to explain how the system breaks thermodynamic equilibrium.

In the case of both the magnetic Wankel and Kawai motors it is important to detail the exact external source of the excess energy, and show how the system is indeed an open system receiving this excess energy from this recognized external source. In short, one must show (i) what the external source is, (ii) how and why the system is indeed an open system, (iii) why it is not in local equilibrium, and (iv) precisely how the system receives its "free" input of excess energy from the external source.

Energy Can Be Extracted from a Magnetic Dipole

There appears to be no explanation in the Kawai patent as to how the excess energy is arrived at, or what is its exact external source, except for vague reference to "extracting energy from a permanent magnet." To conventional Western electrical engineers, that kind of statement has long been deemed *nonsensical*.^[17] It is our purpose in this article to show that (i) it is not nonsensical at all to consider a magnetic dipole a source of energy, because that is already rigorously present in particle physics — and indeed any *electric* dipole is already known to be a source of energy also, (ii) the external source is indeed the vacuum, and excess energy can be extracted from a permanent magnet *by radial-only ancillary regauging operations* during a small fraction of a rotary cycle, (iii) this is related to the magnetostatic scalar potential (MSP), the magnetic field, and a multivalued MSP, and (iv) regauging the potential of a "reset" subsystem is a "master principle of overunity" with many special cases, by means of which either electrical or magnetic overunity efficiency, or a combination of both, can be obtained in electromagnetic machines.^[18]

But first we must break away from conventional EM theory and analysis. *No engine that operates entirely in accord with standard EM textbook theory can exhibit an overunity coefficient of performance, because all fields in the conventional theory are conservative.* That is another way of referring to Lorentz symmetrical regauging. The conventional closed-current loop circuit self-enforces Lorentz regauging and use of conservative fields during the circuit's or engine's excitation discharge. A priori, we must put as much energy into *that* circuit or engine as it outputs in the form of useful work and system losses.

So the first issue is, "How do we create a nonconservative field in the candidate overunity system?"

Asymmetry, Conservation, and the Modern Vacuum

In the standard electrical power engineering model it is erroneously assumed that the vacuum has no interaction consequences upon an operating physical system. Consequently many symmetries abound. Indeed, to every conservation law there can be assigned a symmetry. The conservation laws of which the power engineer is so proud thus can be regarded from the standpoint of their symmetries. It can come as a profound shock to the classical power engineer that the assumed symmetry of physical actions in physical systems *does not exist* unless the interaction of the vacuum

with the physical matter is included. This is well known and long since proven in particle physics, but it is absent from electrical power engineering.^[19]

In material particulate systems, there are three major symmetries — charge, parity, and time — that *individually or even in pairs* need not be obeyed. The requirement is that not all three can be broken simultaneously, in accordance with the well-known CPT theorem of particle physics. In other words, violations of each of the three, and of pairs, have been individually shown; but violations of all three at once have not been found. Violations of each of these symmetries can be most interesting and novel.

For example, local violation of time symmetry yields a local violation of the conservation of energy law, because energy and time are canonical.^[20] Electrical charge alone is *not necessarily individually conserved, regardless of what one was taught in electrical engineering.*^[21] Nature allows charge to become asymmetrical if the vacuum interaction is sufficiently asymmetrical; one must just discover how to do it.^[22] [Table 1](#) is a synopsis of some major aspects of asymmetry in modern physics.

Our point is that overunity EM machines must *a priori* involve one or more broken symmetries. This alone voids any "conventional EM" justification, because it voids *any* model that ignores the vacuum's interaction with matter. So to ascertain the exact nature of the "external source" that is furnishing the excess energy to an open system with broken symmetry, it is only necessary to realize that *a priori* the source becomes the quantum mechanical vacuum, according to well-established particle physics. Let us examine this a little more closely.

A Charge Is Already a Broken Symmetry

First, any electrical charge^[23] is *already* a proven asymmetry when considered as the dipolarity it actually is in modern theory. The bare charge is infinite. Clustered around it in the vacuum are partially shielding virtual charges of opposite sign. The clustering charge is also infinite. Yet the difference between these two infinite charges is finite; it is the conventional charge of the particle seen by an external observer and listed in conventional textbooks and handbooks. According to particle physics and the theory of curved spacetime, that dipolarity of the "isolated charge" is an asymmetry in the fierce virtual photon flux of the active vacuum. Hence the charge must act either as a gating *source* or a gating *sink* in the fiery flux of the local vacuum. In common terms, that charge is either *extracting and gating*^[24] real EM energy right out of the quantum mechanical vacuum^[25] and thereby acting as a free energy source, or it is gating real EM energy back into the quantum mechanical vacuum and thereby acting as an energy sink. The latter condition can also be thought of as gating extracting and gating negative energy from the vacuum as a free "negative energy" source.

Hence every charge in the universe already falsifies the classical EM and electrical engineering models, since every charge has a COP = ∞.

This immediately puts a different perspective upon an electrical dipole. It is simultaneously similar to a powerful energy spray pump (an energy source) on one end and an energy suction pump (an energy sink) on the other end. Electrical field energy (charge flux) is flowing from the vacuum out of one

end of the dipole, and from the other end back to the vacuum — all *driven* by the seething vacuum.

[26] A Poynting flow must be perpendicular to the field lines, by $\mathbf{S} = \mathbf{E} \times \mathbf{H}$. More conventionally, electrodynamicists assume (for circuits) that two \mathbf{S} -flows of energy are produced, one from each of the ends of the dipole. There is a net difference between these two flows and therefore a net potential difference between the ends of the dipole.

Among leading university EM textbooks, a determined struggle with the flow of Poynting energy in electrical circuits is undertaken by Krauss. [27] [Figure 1](#) shows a partially corrected flow of the Poynting energy in a simple electric circuit, after Krauss. As can be seen, the flow of Poynting energy originates in the vacuum and returns to the vacuum, contrary to present electrodynamics textbooks.

Our external circuitry is just the "gating" applied to this freely extracted energy flow. Simply eliminate the external circuit, the battery and its internal resistance, but retain the separation of positive and negative charges, and one has arrived at a dipole. *The free flow of Poynting energy is due to this dipole*, not to the overall battery per se. [28] Electrical power systems do not directly power their external circuits; instead, they utilize their input energy to separate internal charges in them and make their source dipole between the terminals. Once made, the source dipole's asymmetry in the vacuum energy flux extracts usable EM energy from the vacuum and pours it out of the terminals, filling space around the conductors of the external circuit. All EM systems are thus powered by EM energy extracted directly from the vacuum. Indeed, all EM fields and potentials and their energy comes directly from the vacuum, extracted by the associated source charges. *As far as EM energy is concerned, there is nothing but EM energy extracted from the vacuum, because all EM field and potential energy comes from the vacuum.*

Every Electric Dipole Is Already a Free Energy Source

Every electric dipole in the universe is already a legitimate, proven, free energy device that directly extracts and gates energy from and to the active vacuum. [29] Such a *free energy device* is already included in every battery and generator ever built. It will persist so long as no internal work is done on the charges making up the source dipole, to *destroy* their separation!

We do not have to discover how to extract free energy from the vacuum. We just have to learn how to properly use the free energy extractors we *universally* have already!

We now have identified the energetic vacuum as a legitimate primary source of free energy from any electrical power source. From the seething vacuum, the dipolar source will extract two flows of Poynting energy (we will model it that way). The external conductors will gate and guide the Poynting energy flows \mathbf{S} — along with its concomitant emf and voltage — to the external circuit *indefinitely*, so long as the separation of the charges comprising the source's dipolarity is undisturbed.

[30]

A Magnetic Dipole Is Also a Similar Free Energy Source

A similar asymmetry also exists for any magnetic pole (magnetic charge, or magnetostatic scalar potential). A magnetic dipole — any common, ordinary permanent magnet, for example — thus

legitimately is already a rigorously proven free energy machine in particle physics, having $COP = \infty$.

A flow of Poynting energy is moving (by convention) between its north pole and its south pole, orthogonal to the magnetic field lines. This free flow of energy *from the vacuum* will continue as long as that separation of poles exists in the magnet.

One can also represent a magnetic pole as a *magnetostatic scalar potential* Φ . We do not have moving " $j\Phi$ " type material magnetic charges in the magnet, but we have moving massless $d\Phi/dt$. In the more accurate particle physics view, we have moving virtual photons, moving along the field lines.

Regauging a Magnetic Scalar Potential

To "regauge" a magnetostatic scalar potential on a stator, we must create a stator magnetic pole in such a manner that the magnetic field \mathbf{H} from the suddenly injected pole strength cannot cause tangential translation acceleration of the rotor *in the regauging region itself*. There is no such limitation on tangential translation acceleration of the rotor between the regauging region and regions outside it. Further, if the injected pole strength creates an accelerating *tangential* field from the regauging region to the next stator region, that can be highly beneficial and it can be utilized to enable overunity. In fact, that is the active principle used by the magnetic Wankel engine. On the other hand, Kawai creates a tangential force field by a stator electromagnet when it is just forward of the radial flux from a central ring magnet. This produces an accelerating tangential force field, which reduces as the rotor proceeds and the flux becomes aligned with the stator electromagnet. If unchanged, the tangential force component would then reverse in direction and add drag-back to the rotor. Just as the tangential force approaches zero and its reversal, Kawai regauges by de-energizing the stator electromagnet and resetting that stator coil potential back to zero. Hence the regauging "quenches" the back-drag field portion. This essentially doubles the energy available in the Kawai motor to drive it, by avoiding using half the collected EM energy in the circuit to overcome the back mmf.

Regauging is best accomplished by creating the magnetic field \mathbf{H} of the injected pole oriented radially with respect to the rotor pole in the regauging sector, as that rotor pole moves along its tangential path. In that case, no radial work on the rotor system is required in order to regauge the magnetic scalar potential. The injected magnetostatic scalar potential (pole) can readily be made sufficiently strong as to create an accelerating force between it and the potential (pole) next in rotation order. Thus the rotor can actually be strongly boosted through a region that would otherwise produce back-drag if regauging were not accomplished.

So, once the regauging jump of the magnetostatic scalar potential (MSP) is accomplished, the tangential back drag on the rotor in a permanent magnet motor arrangement can be eliminated or materially reduced — *or even reversed so as to aid the rotor's operation* — with the expenditure of very little switching energy in creating the "regauging jump." That is the regauging secret of the magnetic Wankel engine, together with sudden breaking of a small current through a radial stator coil in order to induce a momentary, free, very high Lenz-law MSP with its radial \mathbf{H} field radial to the rotor. This produces a large, *amplified* magnetostatic scalar potential^[31] "jump" so that the usual "tangential back drag" force — between the regauging region and the stator region directly ahead —

is actually *reversed* and now strongly aids in accelerating the rotor's movement out of the regauging region. The magnetic Wankel engine uses a "*convert decelerating drag into accelerating boost*" approach, while the Kawai engine uses an "*eliminate decelerating back drag*" approach.

It is important to note that the regauging "jump" region becomes an *energy reset and refueling* region. It is just like refueling a gasoline-powered automobile — by refueling, one resets the stored energy (i.e., the potential) in a subsystem (the gasoline tank) to its initial value.^[32] So *asymmetrically* regauging a stator sector of an EM motor of the magnetic Wankel or Kawai kind or similar is precisely a method of *refueling* or *resetting* the stored potential energy of the system.

For overunity operation, one simply resets (refuels), extracts energy as work in the load, resets (refuels) again, extracts more energy in the load, and so on.

There Is an Infinite Set of Nonlinear Maxwell Equations

Since overunity requires violating classical EM theory, we must further break our mindset from the typical EM engineering analysis usually applied to motors and generators. Most of the EM theory usually applied by engineers is based upon "the" Maxwell equations. However, when nonlinearities are considered, there is not just *one* set of "the" Maxwell equations available, but in fact there is an *infinite* set of them available.^{[33],[34]} This alone urges great caution when tempted to reach sweeping conclusions based upon "the" Maxwell equations and simple nonlinear EM analysis. Modern nonlinear work with electrodynamics and Maxwell's theory has shown many things that are not normally taught in university courses, and which are not normally part of the repertoire of the electrical engineer.^[35]

Three other things normally neglected in the conventional EM analysis are (i) any use of a multivalued potential, (ii) any use of nonconservative fields, and (iii) any use of gauge theory and especially *regauging* the metric at some point in a rotary cycle. We will briefly cover those areas, but only to the extent of what we need to extract from them for our overunity purposes.

Multivalued Potentials and Regauging

An unusual characteristic that can be achieved in nonlinear electromagnetics and circuits is the involvement of a multivalued potential (MVP) and a corresponding change of gauge of the very vacuum/spacetime in which one is working. That is, in one or more regions of the system we can produce the involvement of automatic "jumps" in the potential energy of the system. *Gauge transformations*^[36] in electromagnetic theory "consist of certain alterations in the values of those [scalar and vector] potentials that do not result in a change of the electric and magnetic fields."^[37] For free energy, we must "fracture" the usual *symmetrical* regauging and use *asymmetrical* regauging, at least for part of the cycle.

Modern electrodynamicists utilize the standard potentials \mathbf{A} and ϕ , where \mathbf{A} is the magnetic vector potential, to represent the electromagnetics in terms of potentials. However, Whittaker has already

shown that two *scalar* potentials can be utilized instead, and still produce all the electromagnetics. [\[38\]](#)

He specifically points out that this is in contradistinction to the standard (\mathbf{A}, ϕ) modeling. In short, Whittaker shows that the fields of classical electromagnetics can be replaced by *scalar potential interferometry* of two potentials. [\[39\]](#)

This is important, e.g., when one considers dq/dt blocking, as in the Fogal semiconductor. As noted by Jackson, *ibid.*, in the Coulomb gauge the scalar potential has instantaneous travel and is not limited at all to the speed of light. Further, the transverse current in a conductor extends over all space; it is not confined merely to the conductor. Jackson does not address the transverse flow of $\mathbf{S} = \mathbf{E} \times \mathbf{H}$ into and out of a circuit, particularly when the dq/dt is blocked in one or more of the conducting loops. Fogal has invented processes and devices which *infol*d signals — including any desired bandwidth — inside a DC voltage (inside a scalar potential) by special use of the Fogal dq/dt -blocking semiconductor, then *outfol*d the hidden signal from inside the DC potential at a great distance away. Since the Coulomb gauge results for this "infolded" EM, instantaneous or superluminal communication is a direct result, in spite of the overwhelming conviction of physicists that this is impossible. The superluminal effect can be shown directly upon the bench or in a large communication system at appreciable distance.

Our main point for this article is that one can *regauge* a potential, changing its local value, without necessarily changing the electric and magnetic fields (i.e., without changing the gradients of the potential). Or, one can regauge the potential asymmetrically and change the gradients, thereby obtaining a *net free force field* as well as free additional EM potential energy. Indeed, one can strongly argue that the passage of potential current $d\phi/dt$ without passage of dq/dt is a regauging operation. The reason is that the Poynting flow \mathbf{S} flows along an equipotential, which is another way of saying that a constant \mathbf{S} -flow carries a constant orthogonal \mathbf{E} -field and therefore a constant electrostatic scalar potential ϕ value right along with it. It also carries a constant orthogonal \mathbf{B} -field and therefore a constant magnetostatic scalar potential Φ value right along with it. In short, if one flows-in excess potential ϕ or Φ , one has flowed-in excess \mathbf{S} -flow. And vice-versa, if one flows-in excess \mathbf{S} -flow, one has flowed-in excess potential, without necessarily changing the existing potential gradients (i.e., without changing the force fields).

This is in fact *regauging*, accomplished directly in the electric or magnetic circuit itself. No work is required for regauging operation since the force fields are unchanged. A multivalued potential accomplishes just this very result, freely regauging the ambient vacuum potential at a multivalued point or emulated multivalued point, changing the fundamental potential energy in the system of interest, and thereby permissibly enabling *nonconservative* local fields and *overunity* coefficient of performance. It is very like one of the drawings by Escher, where stair steps descend endlessly because they "close" back via a "regauging" operation upon their starting point, yet are always running downhill.

For our purposes Jackson's discussion of gauge fields is sufficient. [\[40\]](#) What we wish to summarize is that — whether we are speaking of magnetic devices or electrical devices — one can use *regauging* by means of scalar potentials only, thereby changing the local energy of a system and its local reference potential. That is, *at a given "low potential" point or region in a rotary cycle, we can suddenly and freely shift the entire "local vacuum energy" in which the local portion of the system is*

embedded, by means of regauging via a multivalued potential. We thereby automatically and freely shift the potential energy of the subsystem, without the necessity of performing work upon the system. We *input and store additional excess energy in the system,* without doing work on it.^[41] In short, we *refuel* the system.

Pseudo-MVPs and Regauging

In real systems one moves *finite-sized* charges rather than theoretical "point" charges, as are conveniently utilized in EM theory. Consequently one can even *emulate* this multivalued potential by an ordinary single-valued potential that changes in a very small region with sufficient abruptness.^[42] Such an emulative use of a single-valued potential is referred to as a *pseudo-MVP* usage. Either real MVP use or pseudo-MVP use in a system means that one can effectively obtain *nonconservative* fields and cycles in that system.

Such a system is inherently capable of overunity coefficient of performance, merely by correctly timing the regauging/refueling operation. In effect, the system is "opened" to a sudden jump in potential energy in one subsystem, by the regauging of the local vacuum potentials in the "jump" region, and the system immediately receives an excess flow of work-free potential energy from the surrounding vacuum due to the regauging operation.

Regauging applies to both magnetic and electrical systems. However, it forces us to consider the scalar potentials rather than the force fields. In short, we must learn to consider the magnetostatic scalar potential and the electrostatic scalar potential, together with regauging, when we are involved in studying an overunity electromagnetic system.

It is already well known in foundations of quantum mechanics that the potentials, not the force fields, are the primary causes of electromagnetic phenomena.^[43] So by regauging and "resetting" the potential (the energy storage) in a system, one *really is* refueling the "primary EM causative agents" of that system.

The Conservative Field

In [Figure 2](#) we show by analogy a standard conservative field, viewed from the standpoint of the single-valued scalar potential. We have illustrated a circular track on an inclined board, with a ball rolling around the track. Here gravitation furnishes the potential at point A. The rolling ball passes from A to B to C to B' to A to complete one cycle.

From conventional electromagnetic theory, one of the ways of defining a conservative potential field is well known to be as follows:

$$0 = \mathbf{F} \cdot d\mathbf{r} = - \nabla \cdot d\mathbf{r} = - \bullet d \quad [1]$$

In equation [1] we are referring to the standard line integral of the differential of work about a closed

path in a region. Equation [1] specifies that the line integral is independent of the path between any two points P_0 and P_1 , and it holds so long as the potential is continuous and single-valued. For most applications this condition is true, and so equation [1] is a fundamental part of conventional electromagnetic theory, motor design, etc.

Equation [1] may also be visualized as the creation of a potential difference at a point A, with reference to point C, whereby energy flows from the potential to the kinetic system during the travel of the rolling ball from point A to point B to point C. That is, potential energy is changed into kinetic energy of the moving ball, with a consequent "drop" in potential of the ball. Subsequently, however, as the ball continues from C to B' to A, energy flows back from the kinetic energy of the rolling ball to the system potential. If we wished, we could take energy from the system during the travel of the ball along path A-B-C, but we would then have to do equal work back upon the ball during its travel along path A-B'-C. So here we have a *conservative field*. We simply cannot get an overunity coefficient of performance from this field, no matter what path we take. So equation [1] rigorously holds for [Figure 2](#). Note again the requirement that the potential be continuous and single-valued if equation [1] holds and energy is conserved.

Simply put, equation [1] is usually just written as

$$\mathbf{F} \cdot d\mathbf{r} = 0 \quad [2]$$

and, for any system for which equation [2] holds, that system is energy-conservative because the field is energy conservative. Specifically, one cannot get more energy out of such a system than one puts into the system in the first place. [\[44\]](#)

In [Figure 2](#), we can easily see this from the gravitational analogy: Suppose the track and rolling of the ball are drag-free and frictionless. As the ball rolls from A to B to C, it picks up speed and energy because of its "drop" through a difference in potential between point A and C. In other words, it is rolling "down hill," and the gravitational potential is adding the excess kinetic energy. However, as the ball starts back up hill in its travel from C to B' to A, it will steadily lose energy again, passing that energy back to the gravitational potential. It will just barely reach point A in a totally drag-free system.

For a perfect drag-free system, we could give the ball an initial push from point A, and then it would "orbit" around the track forever. Planets in orbit around the sun are in fact in exactly such a condition, at least to first order. [\[45\]](#) However, one could not extract any energy from the ball-track system during its fall along path A-B-C, and have the ball continue to roll around the track. So work is added to the ball from the gravitational potential along path A-B-C, and the ball then does work on the gravitational potential along path C-B'-A.

This "field" is locally conservative, and of no use to us in producing an overunity system.

The Non-Conservative Field

But now see [Figure 3](#). Here we show a track that "spirals downward" all the way from A to B to C to B' to D, and where D is directly under the initial starting point A. The gravitational potential adds energy to the rolling ball all along the path from point A to point D. In the ordinary 3-space, the gravitational potential *remains single-valued* along the line from D to A. Therefore we apply equation [1] or equation [2] and the entire field is still conservative. In short, we would have to do as much work on the ball from D to A as we were able to gain and extract all the way along A-B-C-B'-D. This is a normal conservative field and it will not yield overunity operation.

However, suppose that we are dealing with electromagnetic scalar potentials instead of gravitational potential. Further, suppose that the potential is *multivalued* from D to A. Now a strange phenomenon occurs. When the system has reached "point D" in its cyclic operation from point A, the potential value itself at D suddenly is altered and "regauged" back to its original value at point A. In short, the value of the potential "jumps" all the way back to the initial value of the potential at point A.

By the gravitational analogy, this would correspond to the ball rolling all the way from point A to point D, and then the vacuum "spacetime" suddenly regauging itself to throw the gravitational potential back up to its initial value at point A. In the physical ball-track analogy, this would correspond to an external agent suddenly and freely injecting excess energy to *instantly and freely* lift the ball from point D to point A.

In that case, so far as we are concerned, we would see the ball just continue rolling always downhill! We could continuously extract energy from it, and we would simply be extracting stored energy from the regauging and refueling by the multivalued potential that had come into being in the region from D to A. We have simply made a *nonconservative field* by use of a multivalued potential to accomplish regauging. [Figure 4](#) shows this "refueling" of an EM engine by regauging.

We accent yet again that no work is required for regauging per se, because in the regauging region the force fields remain unchanged and $\mathbf{F}ds = 0$ because $\bullet\mathbf{F} = 0$.

It is possible to make such a multivalued potential in electrical machines or in magnetic machines.

When we do, we make a nonconservative field in the machine. So we can *permissibly* make an electrical device or a magnetic device that yields overunity electrical performance. Any such system gets a free injection of potential energy by regauging during every cycle, simply being freely refueled by the vacuum itself! And we are then free to extract that *injected and stored* free energy from the system, and use it to do work in an external load. More than a single regauging per rotor rotation can be utilized, depending upon motor design (an example is the Kawai engine).

To make the so-called "closed-loop" free energy machine, all that is necessary is to (i) utilize a nonconservative field cycle by incorporating a regauging and refueling (resetting) sector of the overunity cycle, and (ii) collect a bit of the excess output positive energy (or transduce the negative energy output) and use it to run the circuitry that accomplishes the timing and switching for the regauging. Either an electrical or magnetic machine utilizing a nonconservative field and timed regauging can "run itself" while simultaneously powering a load.

Conservation Laws and Thermodynamics Laws Are Not Violated

We strongly point out that such an overunity system *is permissible, does not* violate the conservation of energy law, and *does not* violate the laws of thermodynamics. It *does* violate classical electrodynamics, as do many other electrical things in physics. It is simply a periodically opened system that receives excess input of energy by regauging the system's active potential via usage of a multivalued potential (MVP) or a pseudo-MVP. In short, it is a "freely refueled" engine. It is an engine that continually refuels itself from a free external source of energy.

The difference between using an MVP and using a pseudo-MVP is this: For the MVP, one must produce and use an actual multivalued potential. For a pseudo-MVP, one makes a single-valued stator sector potential that, though not actually multivalued, is so nonlinear in that finite but very small region, that the finite rotor system traversing the path^[46] experiences the potential in that narrow region essentially as if it *were* a true MVP. In other words, a sufficiently nonlinear single-valued potential can change so sharply in a small region that a somewhat sluggish finite system perceives the change as instantaneous and thereby perceives the potential as multivalued in that region. Both the magnetic Wankel and Kawai engines apply the pseudo-MVP principle.

Applying the Master Overunity Principle for EM Machines

The master principle (regauging) of overunity operation of rotary EM machines, switched circuits, and coupled oscillator circuits is accomplished as follows:

- Establish an appreciable work phase and a small energy intake phase.
- Reduce the angular spread of the energy intake phase to a small fraction of the angular spread of the work phase.
- Accomplish the energy input freely by performing a regauging operation using a multivalued potential (MVP) or pseudo-MVP.

The master principle (regauging the potential by emulating an MVP) can be applied to either an electrical device or a magnetic device.

Regauging an Electrical Circuit

In a current loop, whenever one stops the current dq/dt in a conductor but continues to pass voltage as displacement current d/dt , one continues to pass the Poynting energy flow given by

$$\mathbf{S} = \mathbf{E} \times \mathbf{H} \quad [3]$$

In short, we pass the flow of potential (i.e., we pass the voltage) and we therefore change the potential downstream. This *regauges* that part of the circuitry downstream. In one of our patent applications, my colleagues and I described this process as *bridging*.^[47] We used bridging to pass the potential from one dq/dt -closed sourcing circuit — where V is large, I is very small, and $[V \ I \ \cos]$ is

small — to a second dq/dt-closed circuit where V is large, I is large, and $[V I \cos]$ is very large.^[48] In short, we *regauged* the potential in the downstream receiving circuit, and that is a real work-free flow of excess EM energy into that receiving load circuit.^[49] The load is then powered by dissipating the regauged potential of the load circuit.

[Figure 5](#) diagrammatically shows our bridging approach that simultaneously produces room temperature superconductivity and a system COP >1.0. Work in the regauged load circuit does not "cost" us any degradation of the primary source, and it does not degrade the performance of the source furnishing the potential because it does not require load current to pass back through the source. In short, none of the energy extracted *from* the primary source is utilized to perform work *on* the source by driving spent load conduction electrons back through the source against its back emf.

Thus no work is done to destroy the separation of charges in the primary source.^[50]

We strongly point out that use of an MVP or a pseudo-MVP and the concomitant regauging is exactly the same thing as utilizing a dq/dt-blocked conductor to bridge the passage and flow of energy and emf. Regauging is just an instantaneous switch-in of excess potential. That is, the regauging accomplished an injection of potential energy and emf into the system at the "jump," without the use of dq/dt to transport excess energy into the system as \mathbf{j} . Again, it is an operation of *refueling the potential*.

We now rigorously show that Poynting \mathbf{S} -flow with its corresponding potential flow can yield overunity coefficient of performance in a system wherein a dq/dt-blocked sourcing current loop bridges the \mathbf{S} -flow, d/dt, and emf to a receiving load loop, where the load loop and the sourcing loop are dq/dt-isolated.

The Conventional Poynting Theory

Let us now examine the conventional Poynting energy loss equation. In classical EM energy flow through a unit volume, the Poynting vector $\mathbf{S} = \mathbf{E} \times \mathbf{H}$ generally suffices to represent the amount of EM energy crossing a unit area in unit time, normal to the flow direction of \mathbf{S} .^{[51], [52] [53]} A positive value represents EM energy flowing out of the unit volume through unit area, while a negative value represents EM energy entering into the unit volume through unit area. [We will later reverse that tradition]. For a medium that is linear in its electric and magnetic properties, the Poynting theorem^[54] states that

$$\text{div}(\mathbf{S} + \mathbf{S}') + \frac{1}{8\pi} \frac{\partial}{\partial t} (\mathbf{B}^2 + \mathbf{E}^2) + c\mathbf{E} \cdot (\mathbf{i} + \mathbf{i}') = 0 \quad [4]$$

where

c

$$\frac{S}{4\pi} = (E \times B)$$

is the Poynting vector, and S' is any vector field whose divergence vanishes; $\text{div}(S)$ is the rate at which the stored field energy is diminishing in the unit volume in question due to a net outward flow of energy;

$$\frac{1}{8\pi} \frac{\partial}{\partial t} (B^2 + E^2)$$

is the rate at which the amount of stored field energy in the unit volume is changing, and the expression $cE(i+i')$ is the rate at which the electric field does work on all the moving charges, in unit volume, losing energy at that rate. Further, i represents the ordinary gross macroscopic conduction current while i' represents the net microscopic current (within the molecules or within the atoms).

As Jackson points out, the curl of any vector field can be added to S , since the divergence of the curl vanishes. [\[55\]](#)

In the theoretical case, EM energy that flows along (outside) a wire in an *open* (i.e., dq/dt -blocked) electric circuit is just such a divergence-free field. [\[56\]](#) If we utilize a multivalued potential, then in the multivalued "jump" region there is just a sudden injection of excess S -flow due to the injection of a different equipotential. Consequently an "open circuit" — i.e., *one in which the current dq/dt is blocked* — may still pass Poynting EM energy since all the "energy flow" in a circuit exists in the flow of voltage (potential), [\[57\]](#) and voltage may flow without concomitant current. In fact, rigorously the EM energy flowing "in" an electrical circuit does not flow *through* the wire, but *outside* it. [\[58\]](#) The wire serves as a sort of waveguide or railroad track for the energy flow outside. Obviously, if we block the current dq/dt in the wire, we shall block the *expenditure of EM energy as work* in that blocked current loop. However, we can still pass the Poynting vector flows, and therefore we can still pass EM energy without any dissipation of it in that current loop. Since no work is being performed in the current loop, no work is being done inside the source for that blocked current loop — the source being in series in that loop.

Any Dipole is a Source of Free Energy Extracted from the Vacuum

As we previously stated, it is already shown in particle physics that any electric charge is an asymmetry in the violent energy exchange between the vacuum and the charge. Every charge is therefore either a source or a sink. Any dipole is automatically a source on one end and a sink on the other, *freely extracting and gating a circulation of excess energy from the vacuum to 3-space and back to the vacuum*. This is true for both an electric dipole and a magnetic dipole.

To build a free energy EM source, we do not have to discover how to extract and gate excess energy from the vacuum. Every source we have ever built is already doing just that. We only have to

discover how to *cease using half the collected energy in a circuit to do work on the internal separation of charges that makes the dipole itself, thereby destroying the source dipole*. In other words, we only need to cease "killing" our free energy sources already available in every EM circuit and system.

My colleagues and I have shown how to do it with electrical circuits and now with a special magnetic circuit called the motionless electromagnetic generator (MEG). Johnson has shown how to do it with a motor comprised only of permanent magnets in both the stator and the rotor. The Wankel engine has shown how to do it by using a single electromagnet in a narrow sector of the stator, and the rest of the stator comprised of permanent magnets while the rotor is composed of permanent magnets. Kawai has shown how to do it beautifully in a motor with the rotor comprised of permanent magnets and the stator comprised of electromagnets.^[59] All these various approaches are in fact applications of the same master overunity principle advanced in this paper. All utilized one or more methods of performing regauging by means of a multivalued potential (MVP) or a pseudo-MVP (i.e., an emulated MVP).

dq/dt-Blocking Enables Extracting of Energy from the Vacuum

Here is a very simple but profound truth. The very notion of a dipole already implies dq/dt blocking. That is, even though the two charges are attracting each other, they are not moving together. This automatically produces a flow of potential and energy.

Also, contrary to present electrodynamics practice, a potential — simple electrostatic voltage — is *not at all* "static" in and of itself. Its *intensity* at a fixed point is "static" in that it is not changing in intensity! The potential is no more static than is the steady light from a perfect light bulb. Internally, a "static" potential is comprised of bidirectional EM waves, arranged in precisely coupled pairs, as shown by Whittaker in 1903. If voltage truly were "static," it could never flow. A quiet river may have a static magnitude at a given point or points, but no one would dream of suggesting that the river itself was *static*. The magnitude of the potential is not the potential itself! It is just one *attribute* of the potential. A static magnitude of the potential at each and every point it occupies, does not tell one anything at all as to what the potential itself actually is, or what it is doing.

Because of its hidden dynamic composition, the electrostatic scalar voltage will "flow" from the charged end of a dipole if we extend the charges available to that end from point charges to line charges; i.e., if we simply "morph and stretch out" the end charges. If the resulting *circuit* is open, the voltage will still flow to the ends, even though (for ideal conductors) no current dq/dt flows. And we already know from Poynting theory that a real flow of EM energy of form $\mathbf{S} = \mathbf{E} \times \mathbf{H}$ continually flows along the conductors.

The primary electrical power source (i.e., the dipole) is *not* dissipated whenever only loss-free field energy density \mathbf{S} is extracted from it. Any source of potential is *a priori* a free source of EM field energy density — the open-circuit potential and the \mathbf{S} flows "for free" and at no dissipation to the source. The energy is extracted from the vacuum and flows along the blocked ("open") circuit wires as lossless flow of potential onto collectors (such as electron capacitors). Applying this potential to trapped charges in a capacitive collector allows energy to be extracted from the vacuum by the

source, and furnished to the collector as excess field energy on the blocked electrical charges of the collector.

So here we have extracted a principle: When the dq/dt current is blocked in a conductor, the conductor can still pass **S**-flow and the flow of potential. The current dq/dt is a *response* of the circuit to the free EM energy flow impacting the Drude electrons.

With dq/dt blocked, if voltage (potential) is varied across a coil, normal magnetic field **B** is created in the coil by the changing **E**-field. Energy is thus stored in the coil in the form of ordinary **B**-field.^[60] *It does not require moving charges dq/dt to create a magnetic field. As is well known, in the vacuum the magnetic field is continually created by the varying **E**-field, and there are no observable charges q present nor is any dq/dt present.*^[61]

Further, if the storage coil is the primary of a transformer, a correspondingly induced alternating **B**-field is created in the secondary in normal fashion as the **B**-field in the primary is produced in AC fashion. In short, *field energy density* flows from the vacuum through the charge-blocked primary and across to the secondary without work.^[62] In the external circuit on the secondary side, charges need not be blocked. In that case the excess field energy density and emf cumulated in the secondary *couples to* the conduction electrons in the secondary circuit. In the secondary closed current loop, the coupling-in (shuttling in) of excess voltage and emf activates the circuit, and drives electrons around the secondary current loop, passing through the load and powering it in normal fashion.^[63] None of this load discharge current passes back through the original source; hence no dissipation of the source occurs, even though the load is powered. So the charge-blocked and energy-shuttling system in this case has become a continuous “free power” system, powering a load without exhausting the primary power source.

In this way the source will power a load indefinitely. Energy is conserved, but not work. There is no law of physics that requires *work* to be conserved! The laws of physics and thermodynamics are not violated. The dipolar system is an *open* system, receiving and extracting usable EM energy from a recognized source (the virtual photon flux of the quantum mechanical vacuum).^[64] The continual bidirectional virtual energy exchange between the vacuum and charged particles in the dipolar separation of charges in the electrical power source provides a continual inflow and outflow of vacuum energy.^[65] By charge blocking, this exchange energy flux (potential) is gated by the circuit wiring (“waveguides”) and moved down the circuit without any work being done in the source antenna to dissipate its separation of charges. In the external circuit the energy density is collected as a finite amount of energy in a finite collector (a coil or a capacitor whose dielectric cannot undergo strain). By switching the capacitive collector or by inductive transformer coupling, the collected free energy is shuttled to a separate circuit and regauges that receiving circuit. The excess energy now stored in the regauged receiving circuit is then discharged normally in the load. In either case the “energy collection” circuit and the “load discharge” circuit are in separately isolated current loops. The result is a legitimate open system capable of overunity coefficient of performance (COP), comparable to a heat pump.

With the forthcoming closed-loop (self-powering) systems, the applications to portable systems

(power sources, laptops, lights, power tools, radios, TVs, mobile vehicles, etc.) are enormous. A single auto battery will be utilized with a charge-blocking/energy shuttling system to power a large, agile automobile or truck. Once in operation, the battery will be switched out of the circuit and the system will be self-powered. It will also be non-polluting. By dramatically reducing the heating problem, eliminating the need for a connection to an external power source, and indefinitely extending the “power on” time, these mobile systems will become dominant.

It appears that the Japanese are already poised to massively launch this revolution as early as October 1996. [Added]: As previously stated, this would have indeed happened, and my colleagues and I would have placed the Kawai system on the market ourselves, had not Japanese overunity systems been seized and kept off the market by the Yakuza.¹

Adapting Poynting Theory for dq/dt-Blocked Conducting Circuits

We now examine the Poynting flow when operating a circuit in a charge-blocking fashion. We start by examining the standard Poynting theory for loss of field energy stored in a unit volume, as shown in equation [4]. We again reproduce the equation here for ease in reading.

$$\text{div}(S+S') + \frac{1}{8\pi} \frac{\partial}{\partial t} (B^2 + E^2) + cE(i + i') = 0 \quad [4a]$$

The Poynting theory of equation [4] deals with the loss of EM field energy from a unit volume. It states that the field energy in a unit volume of interest can be lost by three methods, as previously explained. The three loss terms in equation [4] do not *overtly* allow a flow of energy into the unit volume, except by the divergence loss term becoming negative and hence a convergence, the field energy loss term becoming negative and hence an inflow, and the work term for translation of charged particles becoming negative, in which case the particles are giving up field energy to the volume.

So as far as electrical circuits are concerned, the standard Poynting equation is a very awkward expression, primarily adapted to deal only with energy flow out of unit volume and through unit area thereof. However, this shortcoming can be remedied by rewriting the terms so that all expressions deal both with field energy loss and field energy gain. For clarity, we use the following word equation shown in [Figure 6](#) for a change in the field energy stored in a unit volume:

[Figure 6](#) shows the word equation used to set up the necessary mathematical relationships. One simply starts with an initial amount of field energy in the unit volume, then adds all gains and subtracts all losses, to arrive at the final field energy stored in the unit volume. By definition, we take the convention that the algebraic sign of gains is positive, and the sign of losses is negative.

[Figure 7](#) shows the word equation used to set up the necessary *rates* of gains or losses of field energy in a unit volume. By integrating each term over a definite time t , that term becomes an amount of

change after that time t has elapsed. By then adding the initial EM energy, the final remaining amount of energy in the unit volume can be ascertained as was shown in Figure 6.

We take the initial field energy stored in the unit volume of interest as

$$\frac{1}{8\pi} (B_0^2 + E_0^2) \quad [5]$$

where the subscript zero means *initial*. We take the amount remaining after the change as

$$\frac{1}{8\pi} (B_f^2 + E_f^2) \quad [6]$$

where the subscript f means final. The amount gained by inflow is the time integral of the instantaneous rate of inflow, or

$$\int_t \frac{1}{8\pi} \frac{\partial}{\partial t} (B_{in}^2 + E_{in}^2) \quad [7]$$

The amount lost by outflow is the time integral of the instantaneous rate of outflow, or

$$\int_t \frac{1}{8\pi} \frac{\partial}{\partial t} (B_{out}^2 + E_{out}^2) \quad [8]$$

We shall assume there is no field divergence loss, since the circuitry wires act as waveguides and *energy transport flow* is confined to the waveguides. The loss in performing work to translate conduction charges is given by the time integral of the instantaneous rate of loss for conduction charge translation, which is

$$\int_t cE \cdot (i + i') \quad [9]$$

Note that, if we do not consider the internal atomic or molecular charge movement, this reduces to $\int_t cE \cdot (i + i')$. Further, if we block the charge flow i , the remainder of the term reduces to zero.

So with charge blocking, the instantaneous rate of change of the field energy stored in the unit volume is just

$$\frac{1}{8\pi} \frac{\partial}{\partial t} (B_{in}^2 + E_{in}^2) - \frac{1}{8\pi} \frac{\partial}{\partial t} (B_{out}^2 + E_{out}^2) + cE \cdot (i + i')$$

$$\frac{d}{dt} \frac{1}{8\pi} (B^2 + E^2) = \frac{d}{dt} \frac{1}{8\pi} (B_{in}^2 + E_{in}^2) - \frac{d}{dt} \frac{1}{8\pi} (B_{out}^2 + E_{out}^2) \quad [10]$$

In other words, the situation has reduced to pure energy transport without loss.^[66] Also, among other things this immediately proves that use of dq/dt-blocking accomplishes regauging of the downstream receiving circuit.

We note that the two terms on the right side of equation [10] need not be equal. If the rightmost term is largest, then the stored energy is discharging. If the leftmost term on the right side of equation [10] is the larger, then the stored energy is increasing.

When we regauge the system by injection of excess potential energy, then the leftmost term on the right side of equation [10] is much larger, and the stored energy of the system is rapidly increasing. Integrated over the very small but finite "jump" time dt, equation [10] then gives the total regauging energy freely added to the system.

We further point out that equation [10] applies to either an electrical device or a magnetic device, or a combination. If the current-free field energy is being stored in an inductive collector, the B-field increase is significant. If the current-free field energy is being stored in a capacitive collector, the E-field increase is significant.

dq/dt-Blocking as Regauging

With dq/dt-blocking, one may conduct work-free energy flow along electrical circuits without losses. This energy flow is in the form of d/dt, or simply put, dV/dt and it automatically involves S-flow and regauging of the receiving circuitry. It is directly comparable to the flow of open-circuit voltage down an ideal transmission line with an open circuit. From the standpoint of gauge field theory, it also involves a change of gauge in the receiving parts of the system, as we stated previously.

What is actually being "conducted" is the change in the *rate of virtual photon exchange* between the vacuum and charged particles. If the charges q do not translate (i.e., if their longitudinal movements are blocked), then ∇ (with respect to ground reference) is built up on each of them. That is, each of them is potentialized to the new potential. In this manner the energy coming from the vacuum exchange may be captured and stored on trapped/blocked charges q as excess E-fields between the potentialized charges and the ground line, and hence as excess field energy. This is a capacitive-type storage. Taking *only voltage* from the power source does not diminish its ability to continue to furnish such voltage. Adding this voltage V to trapped charges q produces an energy storage on those charges of Vq. The collector with its stored energy may then be switched out of the collection circuit and across a load, where it is discharged normally through the load in a separate circuit. The collector can then be switched back to the blocking/collection circuit to collect additional free energy. Obviously this modality allows overunity COP.

A Transformer Is Already a Bridge

We have previously explained the collection and shuttling of excess free energy **S**-flow using transformer coupling, and step-up transformers for amplification. Coverage for these areas was included in our patent application of February 1994 and continuation of May 1994. Additional coverage was included in our patent application of June 1995 and our provisional patent application of July 1995.

This current-free energy flow for regauging the downstream circuitry does not dissipate the power source furnishing the potential and **S**-flow. One can draw nondiverging field energy from any source of potential indefinitely, without dropping the potential of the source. As we stated, this is because *internally* the "electrostatic" scalar potential is a bidirectional *flow* process, not a "static" thing as it is treated in electrostatics.^[67] In fact, any scalar EM potential may be considered as an infinite sum of a harmonic series of hidden bidirectional EM wavepairs, where each pair consists of the wave and its phase conjugate (time-reversed) replica wave.^[68]

There Are Also Gravitational Aspects

Via the distortion correction theorem^[69] of nonlinear optics, a true phase conjugate wave will precisely superpose *spatially* with its stimulus wave, but the two are *a priori* antiposed in the time dimension. This means that the individual moving EM force components of the two waves are seen to "cancel" electromagnetically, insofar as the external observer is concerned, but their energy components remain and add.^[70]

Hence the special "standing wave" that results from this novel superposition is a *true electrogravitational standing wave* of the variation in virtual photon flux density — and hence in the local stress energy density — of the vacuum/spacetime itself. It is well-known in general relativity that all potentials are gravitational in that they contain trapped energy, and in the modern view it is *energy* that is gravitational *a priori*. The Whittaker mechanism, however, reveals the nature of the trapped EM energy in the potential, as well as the nature of the *trapping mechanism*.^[71] Sweet and Bearden have previously released the results of a successful antigravity experiment using this aspect.^[72]

In our 1994 patent application and continuation, we showed methodologies and embodiments of the fundamental process for use of charge blocking to obtain overunity electrical power systems. Our fundamental claims apply to the use of any charge-blocking mechanism, such as use of a Fogal charge-blocking semiconductor, to achieve overunity by energy (potential) storage and shuttling to achieve overunity coefficient of performance (COP). Disclosure of part of the mechanisms and embodiments were made in February 1993,^[73] and additional disclosure presentations were made at a scientific symposium in May 1994.^[74] Since then our additional patent applications have materially extended the theory, the processes utilized, and the typical embodiments.^[75]

The Magnetic Wankel Engine

See [Figure 8](#) for the principle of the magnetic Wankel engine.^[76] Here a set of permanent magnets, each at an angle to the various radial lines of the device, comprises a slightly widening spiral stator that is "almost" circular but not quite. A circular rotor is mounted inside this spiral stator. An end gap exists in the stator as shown, so that the stator is not a complete closed ring. The direction of rotation for the rotor is clockwise as shown. For demonstration of the principle, the beginning air gap is 0.1 mm and the ending air gap is 5 mm.

A permanent magnet is mounted along the perimeter of an angular sector of the rotor. It is magnetized, say, with the north pole facing radially outwards, and the south pole facing radially inside. In the stator, the permanent magnet north poles are facing radially in toward the rotor, but at an angle, and the south poles are facing radially outside but at an angle.

Thus *tangentially* the north pole of the rotor is in a nonlinear magnetic field, and it will experience a clockwise force and acceleration from position 1 (where the air gap is the minimum) to position 2 (where the air gap reaches maximum).

If this were all there was to it, the magnetic Wankel motor would not be overunity because the tangential field is conservative. When the rotor crossed the end gap in the stator between point 2 and point 1, very sharp and dynamic braking work would be done back upon the rotor magnet by the field of the stator magnets at point 1. This braking work would precisely equal the amount of dynamic acceleration work that was done in accelerating the rotor magnet from position 1 to position 2, in accordance with equation [1] shown previously. For an absolutely frictionless machine with no losses, the coefficient of performance (COP) would be 1.0. Since any real machine will have at least some friction and drag, the actual COP would be less than 1.0.

Let us now utilize the notion of the magnetostatic scalar potential to examine a new situation in the end gap.

Technically, let us regard a single unit north pole in the rotor, going from position 1 to position 2 (the acceleration cycle, where the engine will deliver shaft horsepower against a load), and then from position 2 to position 1 (where the magnetostatic scalar potential must be regauged to equal or exceed the potential at position 1, in order for the rotor to continue unabated or even further accelerate. I.e., in the separation gap, a regauging operation must be done so that the "stator to inner" potential is increased equal to or exceeding the "stator to inner" potential of position 1. In normal machines, the regauging part of the cycle is always where the design engineer forcibly input energy from outside the system *to do physical work* on the machine to forcibly "reset" its energy storage back to initial conditions. In the past engineers have automatically assumed $COP < 1.0$ without exception, since their forcible RESET *work* was always equal to the maximum theoretical energy output to the load during the motor part of the cycle from point 1 to point 2.

So we simply must perform the regauging or RESET of the system's energy storage, *without performing tangential "drag" work on the rotor*. For that purpose, an electromagnet is utilized to fill the end gap in the stator, arranged so that when it is activated its north pole will face radially inward.

A small current activates the coil weakly, through a distributor with breaker points. At the proper timing (i.e., when the rotor is directly opposite the electromagnet pole piece, a set of ignition points is

sharply broken in the circuit with the coil of the electromagnet. Momentarily, a very high potential will appear at the end of the coil as the collapsing field is highly amplified and trying to sustain the previous current in its previous direction. The end result is the formation of a strong magnetostatic scalar potential (pole), of north polarity, on the stator pole piece facing the rotor. Note that no radial work can be done on either the stator pole piece or the rotor by this high potential, because they cannot move radially.

The potential in the end gap is now higher than the potential at position one. Consequently a clockwise tangential force field exists between the end gap potential and the lower potential at position one. A clockwise tangential force therefore appears upon the rotor, and the rotor is *accelerated* and "boosted" out of the stator gap and back past point 1. At that point the electromagnet has lost its potential, but the engine has now been *regauged* and now is in the clockwise acceleration field of the rotor-stator permanent magnets.

In short, the rotor perceived the sudden change of magnetostatic scalar potential from the electromagnet in the stator gap as a pseudo-MVP, and the system received a sharp influx of potential energy, without work except for that lost in the electromagnet circuitry. Since that loss can be made quite nominal by conventional electronic practices, the engine permissibly provides COP>1.0. It can therefore be rigged to power itself and a load simultaneously.

Placed in an electric vehicle with necessary switching circuitry and ancillary equipment, a properly designed magnetic Wankel engine and its derivatives should be capable of starting from a single ordinary battery, then powering the vehicle agilely, powering the accessories, and recharging its own battery — all three simultaneously.

There are still some disadvantages with the Magnetic Wankel engine. First, the cobalt magnets are expensive and require arduous manufacturing in the asymmetrical configuration shown. The dynamic balancing of the engine would be critical, since the stator is nonsymmetrical and so is the rotor. Also, the single rotor sector would have to be counterbalanced on the shaft, say by another Magnetic Wankel stage in counterbalance form. It would be desirable to eliminate these difficulties and also to reduce the rather appreciable costs of such an array of magnets.

The Kawai Engine

[Figure 9](#) shows eight snapshots of the rotor advance of a typical Kawai engine, taken from Kawai's patent.^[77] (Note: the Kawai patent in full, with diagrams, can be seen [here](#)). This is one end rotor/stator side of a two-rotor device, where a similar rotor/stator device is on the other end of the central shaft 11. In Figure 9A, pole piece 14 has three outward teeth 14b dispersed equally around the circumference, alternated with three notches. An end magnet 13 provides the source of flux passing through the pole piece. With the electromagnets de-energized, their core materials 16c, 16d, 16g, 16h, and 16k, 16l are shown shaded, by flux from central magnet 13 outwards through teeth 14b.

In Figure 9B, electromagnets 16a, 16e, and 16i are energized. The shaded area shows the sharp convergence of the flux from magnet 13 through pole piece 14 and the edge of teeth 14b. Since the electromagnets are magnetized in attracting mode, the rotor will experience a torque tending to widen

the flux path from magnet 13 to the activated electromagnets. Thus a clockwise torque exists on the rotor, and it will start to rotate clockwise.^[78] Note also that each electromagnet is operating independently of the other two.

As shown in Figure 9C, 9D, 9E, and 9F the rotation of the rotor continues clockwise, widening the connecting flux path to the three activated electromagnets. During this time the torque on the rotor is clockwise.

In Figure 9G, the flux path to the activated electromagnets is fully widened. Also, the leading edges of the three teeth are just beginning to enter the domains of the next electromagnets 16j, 16b, and 16f.

This is getting symmetrical to the original position shown in Figure 9B. Consequently, the electromagnets 16i, 16a, and 16e are deactivated, and electromagnets 16j, 16b (not labeled; see Fig. 9A), and 16f are activated. Symmetrically, this regauges and resets the engine back to the original starting position in Figure 9B, but one tooth farther along. The action cycle begins anew with the next tooth 16f, as shown in Figure 9H. As can be seen, in each complete rotation of the shaft, each of the three teeth of the rotor will be regauged 12 times. So 36 total regaugings/resetting/refuelings are utilized per shaft rotation.

In each stator coil, at energization a tooth is just entering that coil. Energized in attractive mode with respect to the ring magnet around the shaft, the flux in the pole piece "jumps" from fully widened flux (and small or vanishing radial torque on the rotor) to angled and narrowed flux (with full radial clockwise torque on the rotor). As previously explained, the narrowed flux and its angle exert a clockwise accelerating tangential component of force upon the rotor. Each coil is de-energized prior to beginning to exert radial back emf (which it would do if it remained energized as the trailing edge crossed it and again narrowed the flux path). So the Kawai engine uses normal magnetic attraction to accelerate the rotor for a small distance, then regauges to zero attraction to eliminate the back-drag portion of the attractive field. It regauges to zero as the "RESET" condition.

For appreciable power and smoothness, the Kawai engine uses an extensive number of regaugings per axle rotation, being 36 times on each end, or a total of 72 for the two ends. The force field of each coil, accompanying its increased magnetostatic scalar potential, is oriented radially inward, so that radial work cannot be done by the coil on the rotor because the rotor does not translate radially. Advantage is taken of the initial clockwise acceleration force initially produced, and regauging eliminates the counterclockwise drag or "decelerating" force that would be produced without the regauging.

The major benefits of the Kawai arrangement are that (1) a large number of regaugings occurs for a single rotation of the rotor assembly, enabling high power-to-weight ratio, (2) each electromagnet is energized only when positively contributing to the clockwise torque that drives the rotor, and (3) each coil is de-energized to regauge the system during those periods when the coil would otherwise create back-drag (counterclockwise torque) if it remained energized.

So the Kawai engine delivers what it advertises: It dramatically reduces or eliminates the "back drag" from the fields of the stator electromagnets, because there are no fields activated in the electromagnets during the back-drag sectors of rotation. A conservative field cycle is one in which

the back-drag is equal to the forward boost. Eliminating the back-drag portion of the cycle is a form of regauging. Note that again it was accomplished by a change in the magnetostatic scalar potential being reset to zero by the de-energized coil during the back-drag portion of an otherwise conservative cycle. The Kawai engine therefore uses regauging and nonconservative fields in order to legitimately achieve overunity operation.

Because of the numerous regaugings and back drag elimination, this engine definitely can provide a $COP > 1.0$ if very efficient switching (such as photon-coupled switching) is utilized. Placed in an electric vehicle with necessary switching circuitry and ancillary equipment, a properly designed Kawai engine and its derivatives should be capable of starting from a single ordinary battery, then powering the vehicle agilely, powering the accessories, and recharging its own battery — all three simultaneously. And in so doing, it complies with all the laws of physics and thermodynamics.

Conclusion

In this paper we have briefly discussed the storage of energy in an electromagnetic circuit from a gauge-theoretic viewpoint. We have presented the multivalued potential and the pseudo-multivalued potential, and their usage in regauging the potential in the energy-storing subsystem of an EM engine. Regauging accomplishes a work-free resetting or "refueling" flow of energy in an electrical circuit, from a modified Poynting vector standpoint. In addition we have presented embodiments of the current blocking, energy storage, energy shuttling, multivalued potential (MVP), pseudo-MVP, and regauging approach for overunity electrical power systems and for room temperature superconductivity.

In addition we have explained two Japanese overunity engines, at least one of which (the Kawai engine) appears to have reached full production capability in an extremely well funded, national Japanese strategic effort lasting more than two decades.^[79] The ominous implications for U.S. science and industry — and U.S. financial stability — are sobering to say the least. Beginning in model year 1997, a certain percentage of all new automobiles sold in the U.S. must be *zero-polluting* vehicles — i.e., *electric* vehicles. U.S. manufacturers are already irretrievably committed for the specific electric vehicles they will offer. These U.S. offerings will be bulky, cumbersome, largely impractical, expensive, and maintenance-intensive. They will require frequent and lengthy recharging of their huge battery packs. They will give poor performance, get very low mileage (range) between recharges, and will have only austere powered accessory systems. The manufacturers will have to either sell them or give them away somehow in order to meet their mandatory quotas.

The Japanese manufacturers appear to be poised to introduce *en masse* a substantial line of powerful electric engines which are overunity and self-powered, and a substantial line of powerful electric vehicles utilizing those engines. In short, those vehicles can be initiated from a single battery and self-powered from then on. They are eminently practical, unlimited in range and performance, can be large and luxurious and agile, can have full-powered accessory systems, and will probably be available in a wide range of sizes and performances.

In short, there is evidence that the Japanese have scored a great coup on the entire automotive world, and especially upon the U.S. Japanese businessmen are *samurai*; such is in their psyche and ingrained

in their culture. For the Japanese businessmen, the financial struggle is just like any other war and any other struggle. They attack the business struggle with single-mindedness typical of the Japanese samurai warrior. They have also been strongly motivated by national need; Japan is energy-poor and literally has been at the mercy of the energy-rich nations of the world. The Japanese samurai simply have attacked their nation's energy problem like the sturdy warriors they are, and put their funds, their hearts, and their minds into it with a single purpose: *winning*.^[80] Now we are faced with a *fait accompli*.

We close by emphasizing the final statements of our previous article on the Japanese overunity engines. *"He that does not know history, it's been said, is doomed to repeat it. We simply must not repeat a Pearl Harbor in the overunity electrical energy field. This time the torpedoes may be too devastating for America itself to survive."*

Epilog (Added)

As stated in footnote 1, this time the "Pearl Harbor" in energy systems was avoided by the direct intervention of the Japanese Yakuza only a few months after writing the original article for the Virtual Times. Eerily, the timing in the original 1995 article was "right on", and 1996 was indeed the year in which Japanese overunity systems would have been introduced to the market worldwide. When writing the article in 1995, the last thing that would have occurred to me was that Kawai would come to America to see us in Spring 1996, and contract with us to market his system worldwide. Teruo Kawai is a true gentleman, however, whom I deeply respect. I also deeply regret his misfortune.

^[1] Added. I originally wrote these words in latter 1995. This marketing of the Japanese engines did not occur in 1996 after all, because the Japanese Yakuza apparently seized and has withheld Japanese overunity systems from production and world marketing in that year. The Yakuza's suppression of the Kawai system, for example, occurred right here in Huntsville, Alabama in front of my CTEC board of directors and I, in spring of 1996. We had just reached a verbal agreement with Kawai to market his COP>1.0 motors (including the self-powering version) worldwide. Agreement occurred on a Thursday afternoon; that night a jet aircraft arrived post haste from Los Angeles. The next morning the Kawai party was in fear and trembling, and Kawai no longer controlled his own company, his invention, or his own fate. The Japanese then packed up two Kawai engines shipped in here and departed, and that was that.

^[2] Tom Bearden, "A Direct 'Free Energy' Method," 1980. Internal private personal paper at the time, but long since unrestricted.

^[3] T. E. Bearden, "On Rotary Permanent Magnet Motors and 'Free' Energy," Raum & Zeit, 1(3), Aug.-Sep. 1989, p. 43-53.

^[4] Some years ago I personally witnessed a complete demonstration of a small prototype rotary permanent magnet device built by Howard Johnson. Johnson's original permanent magnet motor

patent is "Permanent Magnet Motor," U.S. Patent No. 4,151,431, Apr. 24, 1979. For a later Johnson patent on his magnetic gating processes, see Howard Johnson, "Magnetic Force Generating Method and Apparatus," U.S. Patent No. 4,877,983, Oct. 31, 1989. In his very complex stator field gates, Johnson created a pseudo-multivalued magnetostatic scalar potential. This allowed the rotor magnet to be given a free "propulsion boost" when passing through the stator gate. *Regauging* was why the stator gate could "attract in" the incoming rotor, and then strongly repel it on out during exit. Hard measurements made with an excellent force meter at every 100th of a second verify the multivalued potential boost effect. Johnson is presently processing a separate patent application covering this free "acceleration burst" achieved by means of his incorporated pseudo-multivalued potential (MVP). As we state in the present paper, a wide variety of electrical and magnetic overunity machines actually and unwittingly obtain their overunity operation from (i) the use of an MVP or pseudo-MVP, and (ii) use of one or more of the application rules for utilizing the MVP.

[5] T. E. Bearden, "The Final Secret of Free Energy," February 1993, released over the Internet and published in several magazines as well.

[6] Thomas E. Bearden and Stephen L. Patrick, "Method and Apparatus for Extracting Internal EM Flow Energy of the Potential and Reducing Back EMF in Electrical Sources to Improve Operational Efficiency," U.S. Patent Application no. 08/192687, Feb. 7, 1994, and Continuation, May 13, 1994.

⁶ T. E. Bearden, Steven L. Patrick, and Kenneth D. Moore, "Room Temperature Superconductivity, Poynting Energy Flow, and Overunity Coefficient of Performance of Electrical Systems." U.S. Patent Application, June 7, 1995. Thomas E. Bearden and Kenneth D. Moore, "Passive and Active Amplification of Input Voltage to Increase Output Field Energy Density of Poynting Generators," Provisional Patent Application, filed July 1995.

[8] However, there is in process an astounding compromise of the entire U.S. patent system that threatens the effectiveness of any inventor's future patent application. See columns by John D. Trudel, in Electronic Design, Oct. 2, Oct. 24, Nov. 20, and Dec. 16, 1995. See also William J. Broad, "In the Realm of Technology, Japan Looms Ever Larger," New York Times, May 28, 1991, p. C1, C8. Bills now in Congress which are of terrible concern are as follows:

(1) H.R. 1732, "The Patent Reexamination Reform Act of 1995," is a hunting license for large companies to bring their full legal resources to bear against any individual inventor. This challenge to an issued patent circumvents the Federal court system. *The company behind the reexamination is kept secret*, an attorney is usually named as the Examination Requester. After an examination is completed, another, and another, and another Examination Request can be filed. A Requester is allowed to participate in the reexamination. A patent cannot be realistically enforced while a reexamination is in progress. Coupled with the new 20-years from date of first application rule, this means that a large company can simply utilize a small inventor's patent at will, ignore the inventor, and simply keep requesting reexamination of his patent application, until it expires — and the inventor will not even know what company is his "attacker," or even in which foreign country the attacking company is located!

(2) H.R. 1733, the "Patent Application Publication Act of 1995," provides for the 18 months pre-grant publication of patent information. It will prematurely disclose an American invention to foreign competitors so that they can compete with the inventor *before he even has a patent to protect his invention — and in many cases, before his Patent Examiner has even examined his application*. This creates a whole new collection and category of prior art (includes information on patent applications never issued) which then can be used in filing arguments in patent opposition. Note that interferences under H.R. 1732 above, by *hidden* foreign companies, can thus be launched against an inventor 18 months after he files his application, so that he is thwarted from the very outset. Meanwhile, his 20-year clock runs out as he faces one examination request after another, and that is the end of him. Further, as these new actions gravitate to countering actions between large companies of multiple nations, the end result will be total paralysis and "gridlock" of the Patent Office and the entire U.S. patent effort.

The GATT agreement plus these monstrous bills could spell the end of U.S. patent rights for the small inventor, as we have known them. Since 65% of U.S. job creation base depends upon (i) the US technology lead and (ii) the U.S. having the largest body of intellectual property in the world, the disastrous future impact of these measures can be easily forecast. For more information and all the specifics, the concerned reader should contact The Alliance for American Innovation, 1100 Connecticut Ave., NW, Suite 1200, Washington, D.C. 20036-4101, phone (202) 293-1414 or Fax (202) 467-5591. Added. Fortunately wiser heads eventually prevailed and these bills did not pass in original form.

^[9] T. E. Bearden, "Japanese Overunity Motor and a Commentary," Explore More!, Number 13, 1995, p. 37-42. Unfortunately the typesetting process utilized a software translation process from my furnished word processing disk, and it *mutilated* the mathematical symbology in the published article. This has now been corrected and the corrected article made available to the magazine's subscribers without charge.

^[10] This article was stimulated by a foreign article, "Perpetual Motion Machine," Guartest, Sept. 1994.

^[11] Teruo Kawai, "Motive Power Generating Device," U.S. Patent No. 5,436,518; issued July 25, 1995. Filed June 17, 1993. 16 claims and 19 drawing sheets. Patents cited: 24 U.S., 2 foreign.

^[12] Dr. Eugene Mallove, "Claimed Over-Unity Magnetic Motor Awarded U.S. Patent: 318% Mechanical Output/Electric Input," Infinite Energy, Sept.-Oct. 1995, p. 40.

^[13] Infinite Energy, Mar.-Apr. 1995, p. 48-49.

^[14] David Scott, "Magnetic 'Wankel' for Electric Cars," Popular Science, June 1979, p. 80-81.

^[15] We particularly include the relatively "new" thermodynamics of a dissipative system far from thermodynamic equilibrium. A useful summary of the theory of such systems is given by Gregoire Nicolis, "Physics of far-from-equilibrium systems and self-organization," Chapter 11 in The New

Physics, edited by Paul Davies, Cambridge University Press, New York, 1989, p. 316-347. *Added*: See particularly D. Kondepudi and I. Prigogine, Modern Thermodynamics: From Heat Engines to Dissipative Structures, Wiley, New York, 1998, reprinted with corrections in 1999.

[16] Indeed, any ordinary power system is just such an open system already. E.g., when we add the fuel to a gasoline engine, we introduce "concentrated stored energy" (the fuel) from an external source. So we periodically "open" the system and inject a form of excess energy — the fuel. *While we are adding the fuel*, the system is not only open but also out of equilibrium. Note that, from the standpoint of the potential energy of the system, we periodically inject additional potential energy. In other words, rigorously we *regauge* the system by changing its inherent potential energy. Further, the refueling and regauging operation is accomplished by a negligible amount of work. Since we already regauge our normal engines, then it behooves us to extract this "master process" and further develop it.

[17] Although it has not been deemed nonsensical to the U.S. Patent Office or to particle physics.

[18] This is the same master principle of the multivalued potential that was advanced in reference 1 above. We have added additional modern material to show how the principle is applied.

[19] The reader is referred to any good texts on particle physics. Two excellent, readable references are by Nobelist T. D. Lee, and they are (i) Symmetries, Asymmetries, and the World of Particles, University of Washington Press, Seattle, 1988 and (ii) Particle Physics and Introduction to Field Theory, Harwood Academic Publishers GmbH, New York, 1981, Second Printing with Corrections, Nov. 1982. Particularly see p. 181-188 and p. 824-828 of the latter reference.

[20] Broken time symmetry and its concomitant violation of local energy conservation was the basis for the overunity mechanism proposed for a Johnson permanent magnet motor in 1989. See Footnote 2 above.

[21] As a case in point well-known in solid state theory, adding energy to Dirac electrons can lift "virtual" electrons from the Dirac sea, into real, observable electrons that "appear from nowhere." Actually, they appear or materialize from available energy.

[22] Fundamentally, broken symmetry involves an alteration in the local energy of the vacuum and its structuring. This corresponds to a locally curved spacetime in some aspects. As a special case, use of an MVP allows the local energy of spacetime to be altered in an instantaneous "jump" between two different uncurved states. So one can "regauge" the vacuum's local energy in a chosen "reset" sector of an electrodynamic machine, without having to pay the piper because one avoided the notion of spatial translation of forces and altered force fields. Rigorously it need not require work in order to transfer energy to a system, if the energy transfer is done by lossless energy transport.

[23] Also, we strongly point out that physicists and engineers do not really know what exactly electric charge is. A rare physicist will even openly admit it. E.g., see M. P. Silverman, And Yet It Moves:

Strange Systems and Subtle Questions in Physics, Cambridge University Press, Cambridge, 1993, p. 127. Quoting: "...*curiously enough, we do not know exactly what charge is, only what it does. Or, equally significantly, what it does not do.*" The present author has proposed the first order definition q

$$\frac{m}{q} \cdot q$$

[24] Rigorously, the dipole diverges the vacuum flux into two streams of energy. The conductors (transmission lines) connected to the ends of the dipole provide the gating and transmission medium.

[25] I.e., directly from the charge q's virtual photon exchange with the vacuum flux.

[26] Added. See T. E. Bearden, "Giant Negentropy from the Common Dipole," Proceedings of Congress 2000, St. Petersburg, Russia, Vol. 1, July 2000, p. 86-98. Also published in Journal of New Energy, 5(1), Summer 2000, p. 11-23. Also carried on DoE restricted website <http://www.ott.doe.gov/electromagnetic/> and <http://www.cheniere.org/>.

[27] John D. Krauss, Electromagnetics, Fourth Edn., McGraw-Hill, New York, 1992. Pages 577-580 cover the applications for Poynting vector to very simple circuits. Figure 12-60, on p. 578 shows Krauss' diagrams for the Poynting power flow in a simple circuit containing a battery and a resistor. The diagrams err, however, in showing the energy flow originating in the battery and ending in the resistor. In fact the energy flow originates in the vacuum surrounding and permeating the battery, flows out through both terminals and along both feeder lines to the resistor, then is scattered back to the vacuum from the resistor. Some of the flow is also scattered back to the vacuum from the internal resistance of the battery itself. Another very useful reference is H. G. Booker, Energy in Electromagnetism, Peter Peregrinus LTD, 1982. Part of the IEE Electromagnetic Waves Series 13.

[28] This can be seen as follows: $\mathbf{S} \equiv \mathbf{E} \times \mathbf{H}$. There exists an \mathbf{E} -field between the separated charges of the dipole. Further, the fundamental charged particles of the charges are spinning, and they have magnetic spins and magnetic fields that are not aligned with the \mathbf{E} -field. Therefore $\mathbf{E} \times \mathbf{H} \neq \mathbf{0}$, and there exists a continuous free flow of EM energy from any dipolarity (including any charge as a bare charge with clustering).

[29] The dipole possesses a scalar potential difference between its two separated charges. For mathematical proof that any scalar potential is indeed a bidirectional flow of EM waves, see E. T. Whittaker, "On the Partial Differential Equations of Mathematical Physics," Mathematische Annalen, Vol. 57, 1903, p. 333-355. Whittaker mathematically decomposes the scalar potential into a bidirectional series of EM wave pairs in a harmonic sequence. Each wavepair consists of the wave and its phase conjugate.

[30] It turns out that we already evoke much greater flows of energy in our circuitry than we are able to collect and utilize, the nominal fraction of collection and usage being about 10^{13} . Could we collect and use more of it, then a single flashlight battery could drive a battleship. Additional discussion of this interesting phenomenon is given in T. E. Bearden, "Chasing the Wild Dragon: Foundations of a New Science," The Virtual Times, Internet node WWW.HSV.COM, November 1995.

[31] Note that when one says "magnetostatic scalar potential," one has also said "magnetic pole" and "pole strength."

[32] Most electrical engineers do not seem to realize that *all* force fields represent a differential between two stored energy states (two potentials) having different energy storages. Thus it is unappreciated that, by creating a static potential at a point, one can then create another static potential nearby, and thereby produce a force field of strength and orientation as one desires. And one may simply keep changing one or more of the two potentials, to alter the stored energy in the states, without fighting force fields or doing work. Instead of thinking in terms of forcibly using fields to engineer system operations, the overunity engineer must think in terms of switching potentials to *freely engineer the fields* he needs and to place them where he needs them and with the orientation in which he needs them. By manipulating the potentials, one can manipulate the energy storages where and when he needs to in the system, at will. He can also get "free refills" from the vacuum, since the vacuum is itself just one gigantic potential to which all the EM potentials superpose.

[33] E.g., see G. A. Kotel'nikov, "Toward a nonlinear electrodynamics," *Izvestiya Vuz Fizika*, 38(2), Feb. 1995. The English translation is in *Russian Physics Journal*, 38(2), Aug. 1995, p. 205-208. We point out that exploration of this "infinite set" of Maxwell equations is still in its infancy. Nonetheless its conclusions already can be quite startling to the classically trained engineer.

[34] To see how *really* complex are the actions in motors and generators, the reader is referred to the work of Gabriel Kron, possibly the greatest U.S. nonlinear electrical scientist of all time. Even full general relativity — which Kron rigorously applied to rotating electrical machines — still falls short of what is needed. E.g., the technical reader might wish to peruse Kron's "Four abstract reference frames of an electric network." *IEEE Transactions on Power Apparatus and Systems*, PAS-87(3), Mar. 1968, p. 815-823. Electrical engineers often treat their stationary networks, rotating machines, and microwave electronic devices as a collection of impedance elements Z without decomposing Z into its RLC components. Kron shows that a lumped or distributed impedance network, surrounded by its own electromagnetic field, is actually the sum of four different types of multidimensional networks: (1) the well-studied 1-network of branches in which the currents flow, (2) a 0-network formed by all the point generators, (3) a 2-network of equipotential surfaces that pass through the generators perpendicularly to the branches, and (4) a 3-network composed of three-dimensional impedance blocks surrounding the branches. Thus the topological structure of a stationary or rotating, electric or electronic network is neither a graph nor a polyhedron, but a so-called fiber bundle over a non-Riemannian manifold.

[35] For one thing, the electromagnetics operations one can accomplish are to a large extent dependent upon *the topology of the mathematics in which one's electromagnetics model is embedded*. Normal EM theory utilizes vector or tensor algebra, but many higher topology algebras are available, as are higher topology EM models built upon them as the base algebra. E.g., normal analysis by vectors and tensors *cannot* show many of the operations that Tesla actually accomplished in his patented circuits. Yet an analysis of the circuits in quaternion algebra — which is of higher topology than either vector or tensor algebras — will show these functions clearly. For rigorous proof, see T. W. Barrett, "Tesla's

Nonlinear Oscillator-Shuttle-Circuit (OSC) Theory," Annales de la Fondation Louis de Broglie, 16 (1), 1991, p. 23-41. We point out that Barrett is a masterful theoretician and one of the pioneers of ultrawideband radar — which does not function by the ordinary "sine wave decomposition" and transform methods of the conventional EM radar theory.

[36] In a general sense, modern gauge theories are an extensive expansion of their parent electromagnetic theory. A particularly good little summary of gauge theories is provided by Benjamin W. Lee, "Gauge Theories," Encyclopedia of Physics, Eds. Rita G. Lerner and George L. Trigg, Addison Wesley Publishing Company, Reading, MA, 1981, p. 349-351. A useful and slightly more technical summary is given John Taylor, "Gauge theories in particle physics," Chapter 17 of The New Physics, edited by Paul Davies, Cambridge University Press, New York, 1989, p. 458-480.

[37] For just a "quick feel," see "Gauge Theory," Encyclopaedia Britannica, 15th edition, 1985, Micropaedia vol. 5, p. 147. For a better look, see particularly Article 6.5, "Gauge Transformations, Lorentz Gauge, Coulomb Gauge," in J. D. Jackson, Classical Electromagnetics, 2nd Edition, John Wiley & Sons, 1975, p. 220-223.

[38] E. T. Whittaker, "On an Expression of the Electromagnetic Field Due to Electrons by Means of Two Scalar Potential Functions," Proceedings of the London Mathematical Society, Series 2, Vol. 1, 1904, p. 367-372.

[39] Since Whittaker also showed in 1903 that any scalar potential is a special set of multiple EM wavepairs, it follows that the interference of two scalar potentials is just the hidden interference of their biwave internal components. In that manner, scalar interferometry is just a special case of multiwave interferometry, one in which the multiwaves are hidden from 3-space and nonobservable, but their interference becomes observable in ordinary 3-space. The practical ramifications of such scalar interferometry are enormous but beyond the scope of this paper. They have been extensively covered by the author elsewhere.

[40] Jackson, 1975, *ibid.* Added: For a good history, see J. D. Jackson and L. B. Okun, "Historical roots of gauge invariance," Reviews of Modern Physics, Vol. 73, July 2001, p. 663-680.

[41] The business of "performing work upon a system" is still inadequately resolved in foundations of physics. Rigorously one may define "work" as either the scattering (dissipation) of energy or the change in form of the energy. Nonetheless, work requires translation of a force through a distance. Energy storage can be accomplished in two fashions: (i) by doing work on the system to change its physical form, as in charging a capacitor by dielectric strain, or (ii) simply changing the inherent potential energy of the system directly without system strain. Regauging, or altering the local vacuum potential in which the system is embedded, is the latter kind of storage of excess energy in the system. Therefore it is a storage of energy accomplished with $\int \mathbf{F} \cdot \mathbf{s} = 0$, and therefore without doing work on the system.

[42] By "sufficient abruptness" we mean that one fundamental "charge" element or "charge grain" — or in the case of a magnet, one single magnetic domain — has a greater diameter than the distance in

which the abrupt change or "jump" of potential occurs. For electrical charges this is difficult, but not for magnets. The "back drag" magnetic work experienced by this "real physical charge" of finite magnitude in a magnetic stator/rotor arrangement varies from the theoretical "point-unit north pole value" used in conventional field theory, as rigorously proved by Howard Johnson in actual force and time measurements. One will just get a small back impulse $F(t)dt$, over a very short time dt , which means that less retardation work is experienced in the "jump" or regauging region than the work that was obtained from the unit during the rest of the cycle involving the boost. In short, one is dealing then with a *nonconservative* field, and equations [1] and [2] no longer hold.

[43] E.g., see Y. Aharonov and D. Bohm, "Significance of Electromagnetic Potentials in the Quantum Theory," Physical Review, Second Series, 115(3), 1959, p. 485-491 for a cogent discussion. For a thorough review with hundreds of references, see S. Olariu and I. Iovitzu Popescu, "The Quantum Effects of Electromagnetic Fluxes," Reviews of Modern Physics, 57(2), Apr. 1985, p. 339-436. The Aharonov-Bohm effect was later extended by Berry to the Berry phase, and then further extended by Aharonov and Anandan to the geometric phase.

[44] Note, however, that we have great latitude as to how we go about inputting the energy utilized by the system in its operation. We are *not* required to use "fields only" and we are *not* required to do work ourselves (other than a little switching energy expended) to input the energy! The thing is to trick the vacuum into giving us the regauging energy freely or almost so.

[45] Because of the multiple bodies involved, a planetary orbit is actually chaotic rather than exactly linearly oscillatory as shown. But the ideal orbit is linearly oscillatory.

[46] And that is thereby performing the line integration of equation [1].

[47] In essence, a bridge is just a section of a two-line conductor where dq/dt is blocked, but dV/dt is not blocked. Such a component passes the potential, the \mathbf{S} -flow, and the emf but does not pass current dq/dt . So one may simply extract \mathbf{S} -flow from one dq/dt -isolated circuit without loading that circuit, to a second dq/dt -isolated circuit, where the load is in the second circuit and powered normally. In that way one may isolate the load current from the primary source. We highly stress the fact that no battery or generator furnishes a single electron to its external circuit; the conduction electrons comprising the current dq/dt are in fact provided by the materials comprising the circuit itself. In any electric circuit, the source *does not furnish current*; instead, it furnishes \mathbf{S} , emf, and potential to drive the available conduction electrons as current. All one needs to take from the primary source is Poynting energy flow \mathbf{S} . Every dipolar source is already a free energy source, and it will furnish energy flow (\mathbf{S} -flow) indefinitely, directly from the vacuum.

[48] Note that energy is conserved from the sourcing circuit to the load circuit, but *work* (energy dissipation) need not be conserved, because we are passing energy from a nearly-free source as pure energy transport, bridged into a separate dq/dt current loop containing the load. Almost all of the work (i.e., dissipation of the energy flow) occurs in the load circuit, not the sourcing circuit.

[49] We point out that voltage is joules per (collecting) coulomb. That is, one volt of potential established from one coulomb of charge q to another reference potential level will result in the *collection* of one joule of excess potential energy upon that coulomb of charge. When we "potentialize" the conducting electrons in a dq/dt -blocked circuit, we freely add real energy to those electrons. Each one corresponds to having been raised from D to A automatically, in Figure 3, as shown by the jump in Figure 4.

[50] This description of course is for the ideal system. In a real system, a very small current must be drawn in the primary source loop. However, this current may be made much smaller than the load current. Also, voltage multipliers can be added in the receiving load loop to increase the load voltage and current, without affecting the primary source current and dissipation.

[51] See any good EM text, in its section on Poynting vector theory. For the original, see J. H. Poynting, "On the transfer of energy in the electromagnetic field," Philosophical transactions of the Royal Society of London, Vol. 175, 1884, p. 343. Poynting and Heaviside developed the energy-flow theory in EM in parallel, after Maxwell was already dead. Energy-flow does not explicitly appear anywhere in Maxwell's publications; the *notion* that energy flowed through space was exceeding novel to all of physics when developed by Heaviside and Poynting. Note that circuitry practices, utilizing amperage and voltage, were already long established before the notion of energy flow through space was created by Poynting and Heaviside. For the original Heaviside source, see Oliver Heaviside, "Electromagnetic Induction and Its Propagation," The Electrician, 1885, 1886, 1887, and later. This is a series of 47 sections, published section by section in numerous issues of The Electrician during 1885, 1886, and 1887. See also Oliver Heaviside, "On the Forces, Stresses, and Fluxes of Energy in the Electromagnetic Field," Phil. Trans. Roy. Soc. London, 183A, 1893, p. 423-480. For a statement of Heaviside's precedence, see Editorial, "The Transfer of Energy," The Electrician, Vol. 27, July 10, 1891, p. 270-272. Quoting: "*...the idea that energy is located at all, and that, when it changes its position, it must move along a definite path, is quite a new one. The law of the conservation of energy implies that energy cannot disappear from one place without appearing in equal quantity somewhere else; but, although this fact has long been accepted, it is only within the last few years that the idea of transference of energy has been developed, or that anyone has attempted to trace out the actual path along which energy flows when it moves from place to place. The idea of an energy current is of more recent date than the electro-magnetic theory, and is not to be found explicitly stated anywhere in Maxwell's work. We believe that the first time it was applied to electrical theory was in the pages of The Electrician, by Mr. Oliver Heaviside, to whom so much of the extension of Maxwell's theory is due. The idea was also independently developed and brought to the notice of the Royal Society in a Paper by Prof. Poynting.*" As quoted in Paul J. Nahin, Oliver Heaviside: Sage in Solitude, 1988, p. 117.

[52] We caution the reader that modern theoreticians are still confused in attempting to apply the Poynting energy flow to electrical *circuitry*, and have only done embryonic and incomplete work with respect to that effort. In short, modern power engineers *do not* track the energy flow in an electrical circuit, but only the power and work flow. One very real problem is that power engineers use the term "power" quite differently from physicists, and in two quite contradictory ways. The engineers use "power" to mean the rate of flow of energy that is not dissipating or diverging (i.e., for pure energy transport) and also for the rate of dissipation of the energy. In physics power is

rigorously the rate of performing work, which is the rate of *scattering* or *conversion of form* of the energy. Power engineers thus use "power" as an oxymoron. Further, most leading EM texts give Poynting vector application to circuits a very short shift, then heave a big sigh of relief that it's done, and immediately leave it there without further ado. They do cover radiation of energy into space quite well, however. As an example of one of the very best of the theorists to struggle with Poynting flow in circuits, see John D. Kraus, Electromagnetics, 4th Edn., McGraw-Hill, 1992, p. 575-580. On the other hand, J. D. Jackson, Classical Electromagnetics, 2nd Edn., John Wiley & Sons, New York, 1975 hardly mentions it.

[53] For an article showing what Heaviside's unpublished papers accomplished in this respect, see E. R. Laithwaite, "Miles Walker — a Pioneer at Met-Vick and UMIST," Electrical Review, 211(16), Nov. 12, 1982, p. 44-45. To Poynting's power equation $\mathbf{P} = \mathbf{E}\mathbf{H}$, Heaviside added an arbitrary vector \mathbf{G} , representing a circuitual energy flux, to obtain $\mathbf{P} = \mathbf{E}\mathbf{x}\mathbf{H} + \mathbf{G}$. Note that Heaviside is correct. In transferring excess Poynting field energy density flow to closed current loops and coupling the field energy density to the conduction charges in that closed current loop, our patent pending Poynting generator circuits provide additional "trapped" EM energy that is collected in the receiving current loop prior to its dissipation in the load. It follows that these patent-pending circuits can be *electrogravitational* circuits if so utilized with significant power. As an example, we point out that the force existing between two one-coulomb charges separated by one meter distance is about one million tons. So if one is significantly gating the Poynting energy flow in a deterministic manner, one can gate the forces, including *unilateral* forces. Obviously the manipulation of local gravity and antigravity becomes a factor in overunity electrical systems when even fractions of such powerful forces are generated. Therefore it should not be surprising that, in addition to overunity operation, the Sweet vacuum triode amplifier could exhibit strong antigravity effects. See Floyd Sweet and T. E. Bearden, "Utilizing Scalar Electromagnetics to Tap Vacuum Energy," Proceedings of the 26th Intersociety Energy Conversion Engineering Conference (IECEC '91), Boston, Massachusetts, 1991, p. 370-375.

[54] See any good electromagnetics textbook or handbook. E.g., see E.U. Condon, "4. Poynting Theorem," in "Chapter 1: Electromagnetic Waves," Handbook of Physics, 2nd Edn., Eds. E. U. Condon and Hugh Odishaw, McGraw-Hill, New York, 1967, p. 6-6 to 6-7.

[55] John David Jackson, Classical Electrodynamics, 1975, *ibid.*, p. 237.

[56] *Ibid.* Jackson also states that adding the curl of a vector field can have no physical consequences; however, our comment is that the addition of a second *divergence-free* \mathbf{S} vector *flow into* the unit volume of interest can indeed have physical consequences because it increases the field energy in that volume and regauges it. The physical consequences follow because this increase in field energy can come from an electrical power source without any dissipation of that source. The excess energy flow into the unit volume can be trapped (stored) therein, then this stored energy can be switched or shuttled to a separate load circuit and discharged through the load to power it, *all without any dissipation of the original power source*. Added: When we consider the huge Heaviside nondiverged component of energy flow, it does have significant gravitational consequences, contrary to Jackson's conclusion. E.g., the present author has nominated this unaccounted huge EM energy flow, associated with every EM field/charge interaction, as the source of the puzzling excess gravity holding together

the arms of the spiral galaxies.

[57] We accent again that a "flow of potential" or "flow of voltage" is automatically a flow of \mathbf{S} .

[58] E.g., see Mark A. Heald, "Electric fields and charges in elementary circuits," American Journal of Physics, 52(6), June 1984, p. 522-526. Quoting: "The charges on the surface of the wire provide two types of electric field. The charges provide the field *inside* the wire that drives the conduction current according to Ohm's law. Simultaneously the charges provide a field *outside* the wire that creates a Poynting flux. By means of this latter field, the charges enable the wire to be a guide (in the sense of a railroad track) for electromagnetic energy flowing in the space around the wire. Intuitively one might prefer the notion that electromagnetic energy is transported by the current, inside the wires. It takes some effort to convince oneself (and one's students) that this is not the case and that in fact the energy flows in the space *outside* the wire."

[59] Kawai uses "zero attraction" as the regauging condition. He places the next stator electromagnet in attractive mode for the flux from a central ring magnet at the center of a magnetic flux conductor, then regauges by de-energizing the coil as the "back drag" region arrives, thus zeroing the back-drag.

[60] Rigorously, to drive a primary of a transformer in this fashion, the circuit feeding the excess voltage and emf to the primary must be isolated from the reflected impedance of the transformer. A complete dq/dt blocker in the conducting lines accomplishes this insulation from the reflected impedance. In short, one must transfer voltage and emf between two closed current loops, absolutely without the exchange of dq/dt between the loops, and without the reflectance of impedance between them.

[61] The practical difference for circuits, however, is that the "collapse" or "escape" of such a magnetic field occurs via field energy \mathbf{S} -flow rather than sluggish \mathbf{J} flow speeds, whenever the $\mathbf{J}\phi$ is blocked. One must therefore utilize *microwave* switching techniques rather than slower switching techniques such as usually utilized in motors and generators. The rule is this: Coupling of the potential fields to sluggishly moving electrons accounts for the gradual buildup and collapse (i.e., the hysteresis) of inductors. In other words, it is the involvement of $\mathbf{J}\phi$. When the electron movement as dq/dt is blocked, the field energy moves as radiant energy and \mathbf{S} -flow, hence essentially at the speed of light.

[62] Obviously here we are considering an *ideal* transformer. A real transformer will inevitably experience some losses in the transformer itself.

[63] We strongly emphasize that all closed current loops furnish their own conduction charges for their current dq/dt . The source coupled into such a circuit does not furnish a single electron, but only excess voltage and emf. For a simple battery/resistor circuit, e.g., for every electron that is emitted from the positive terminal of the battery into the external circuit, a corresponding (but energetically spent) electron enters the negative terminal. No current dq/dt is actually drawn from the battery per se! Instead, the free conduction electrons already in the circuit are *potentialized* by the battery's emf,

which drives the electrons through the circuit, including through the loads. The dq/dt acts rather like incompressible fluid flow; for one electron to fall through the entire potential drop in the external circuit from the positive line to the ground return line, a "spent" electron in the ground return line must be forcibly pushed back up through the battery itself, against the battery's back emf. If one shuttles-in and couples excess voltage and emf to a closed current loop, *regardless of how it is accomplished*, the loop is potentialized and regauged. That loop will thus be "powered" without furnishing current dq/dt to it, and without dissipating the primary source furnishing the excess field energy density (voltage) and emf.

[64] As is well known in quantum physics — and now accepted by the particle physics community and the U.S. Patent Office — the vacuum is already filled with seething EM energy, and is thus a legitimate source of EM energy. Further, the conventional protest that thermodynamics prohibits extracting and using the vacuum's electrical energy as heat and power is unfounded. Thermodynamics in fact permits just such extraction and usage. For proof, see Daniel C. Cole and Harold E. Puthoff, "Extracting Energy and Heat from the Vacuum," Physical Review E, 48(2), Aug. 1993, p. 1562-1565. So one no longer has to prove that the source is there, or that it is *possible* to extract and use the energy. One just has to show how the extraction, gating, collecting, and usage of the vacuum energy is accomplished.

[65] We may also regard this exchange of energy between the vacuum and the bipolarity (potential) of the source to be a wave exchange. Any scalar EM potential can be mathematically decomposed into a harmonic series of EM wavepairs, where each pair consists of an EM wave and its true phase conjugate (time-reversed) replica wave. See Whittaker, 1903, *ibid*. See also Whittaker, 1904, *ibid*. In the latter paper Whittaker shows that the fields of classical electromagnetics can be replaced by scalar potential interferometry of two potentials. Since by "scalar potential interferometry" one just refers to the interference of multiple hidden waves, the term is not an oxymoron but an actual fact of nature. Indeed, Whittaker's 1904 paper anticipates the Aharonov/Bohm effect by over five decades, and dramatically extends it as well, since Whittaker interferometry is distance-independent. Whittaker 1904 has been utilized by succeeding theorists — such as Debye, Dirac, and others — to establish many other kinds of *superpotentials*. Presently it is known in quantum theory that all electrical phenomenology is primarily caused by potentials, not by the force fields. Indeed, the force fields are known to exist only in and of matter, not in the vacuum. Classical electrodynamics, however, has never been changed to correct this fundamental oversight and foundations error.

[66] Note that an exciting feature of this equation is that, when applied to a static Poynting generator (i. e., crossed static **E**-field and **H**-field, then together with Poynting's vector definition it proves that the static generator produces an unending stream of free energy flow from the vacuum. So any static Poynting generator is also a free energy source, as we stated in our pertinent patent applications.

[67] E. T. Whittaker, 1903, *ibid*. It is that combined energy density of all the bidirectional standing waves at each point in the electrostatic scalar potential that is "static" as of each instant, just as the amplitude of a fixed standing wave is "static" at each point. However, the *individual* EM waves comprising the scalar potential are continuously flowing, just as are the individual waves in an ordinary standing wave.

[68] E. T. Whittaker, 1903, *ibid.*

[69] See Amnon Yariv, Optical Electronics, 3rd Edn., Holt, Rinehart and Winston, New York, p. 500-501 for a precise statement of the distortion correction theorem.

[70] *Added*: This is directly related to conclusions of quantum field theory. See F. Mandl and G. Shaw, Quantum Field Theory, Wiley, 1984, Revised Edition 1993, under the heading "5.2 Covariant Quantization" and "5.3 The Photon Propagator" in Chapter 5. There are four photon polarizations: two transverse, longitudinal, and time-polarized (scalar). The longitudinal and scalar polarizations of the photon are not directly observable individually, but only in combination, where they manifest as the instantaneous Coulomb (i.e., electrostatic) potential interaction, "*which emerges as an exchange of longitudinal and scalar photons.*" With a view to causality, a real process must have a cause, the interaction of the cause with something to be affected, and an effect. The combining process is the input of one of the photons (as the cause) to an interaction with a charged particle, absorption by that particle, and re-emission of the other photon (as the effect). So there are two cases: (1) the scalar (time-polarized) photon is absorbed by negative charge, which transduces the excitation energy to 3-space, and re-emits the longitudinal photon in 3-space; (2) the longitudinal photon in 3-space is absorbed by the positive charge, which transduces the excitation energy to the time domain, and re-emits the scalar photon into the time domain. These processes are phase conjugates of each other. Further, they involve a 4-symmetry in EM energy flow between the time-domain and 3-space. This 4-symmetry in EM energy flow interactions seems to have been neglected in conventional physics.

[71] Whittaker, 1903, *ibid.* Also Whittaker, 1904, *ibid.* shows that if two such scalar potentials are interfered, then normal EM fields will again appear in space in the interference zone — *even at a great distance*. *Added*: For rigorous proof, see M. W. Evans, P. K. Anastasovski, T. E. Bearden et al., "On Whittaker's Representation of the Electromagnetic Entity in Vacuo, Part V: The Production of Transverse Fields and Energy by Scalar Interferometry," Journal of New Energy, 4(3), Special Issue, Winter 1999, p. 76-78.

[72] See footnote 48 for reference to the Sweet vacuum triode overunity device, which was rigged for actual production of true antigravitation. Sweet and Bearden, *ibid.* provide the major results of the experiment.

[73] T. E. Bearden, "The Final Secret of Free Energy," Feb. 1993, distributed worldwide over Internet, with follow-up publications in several magazines and journals.

[74] T. E. Bearden, "Overunity Electrical Power Efficiency Using Energy Shuttling Between Two Circuits," Proceedings of the 2nd International New Energy Symposium, Denver, Colorado, May 13-15, 1994, p. 49-65. A substantial expansion of the paper published in the Proceedings was given as T. E. Bearden, "Overunity Electrical Power," presented to the 2nd International New Energy Symposium, Denver, Colorado, May 15, 1994. A videotape of the formal presentation is available from Backcountry Productions, 831 alpine St., Longmont, CO 80501, phone (303) 772-8358. The actual title viewgraph is titled "Practical Overunity Systems, via Separated Charge, Interaction of Free Displacement Current, and the Use of Work-Free Longitudinal Fields." The presentation, which

differed considerably from the Proceedings paper, included additional charge-blocking applications and embodiments, including the fundamental true negative resistor. The gist of the INE presentation is given in T. E. Bearden, "Practical Overunity Electrical Devices; With Special Overunity Circuits Utilizing the Fogal Blocking Semiconductor," May 13, 1994, distributed worldwide over Internet.

Both the theory and practical "type circuits" are discussed.

[75] T. E. Bearden, Stephen L. Patrick, and Kenneth D. Moore, "Room Temperature Superconductivity, Poynting Generators, and Overunity Coefficient of Performance of Electrical Systems," filed May 1995. Approximately 260 pages, 19 drawings.

[76] Figure 8 is after David Scott, "Magnetic 'Wankel' for electric cars," Popular Science, June 1979, p. 90.

[77] Teruo Kawai, "Motive Power Generating Device," U.S. Patent No. 5,436,518, July 25, 1995. Filed June 17, 1993. 16 claims, 19 drawing sheets.

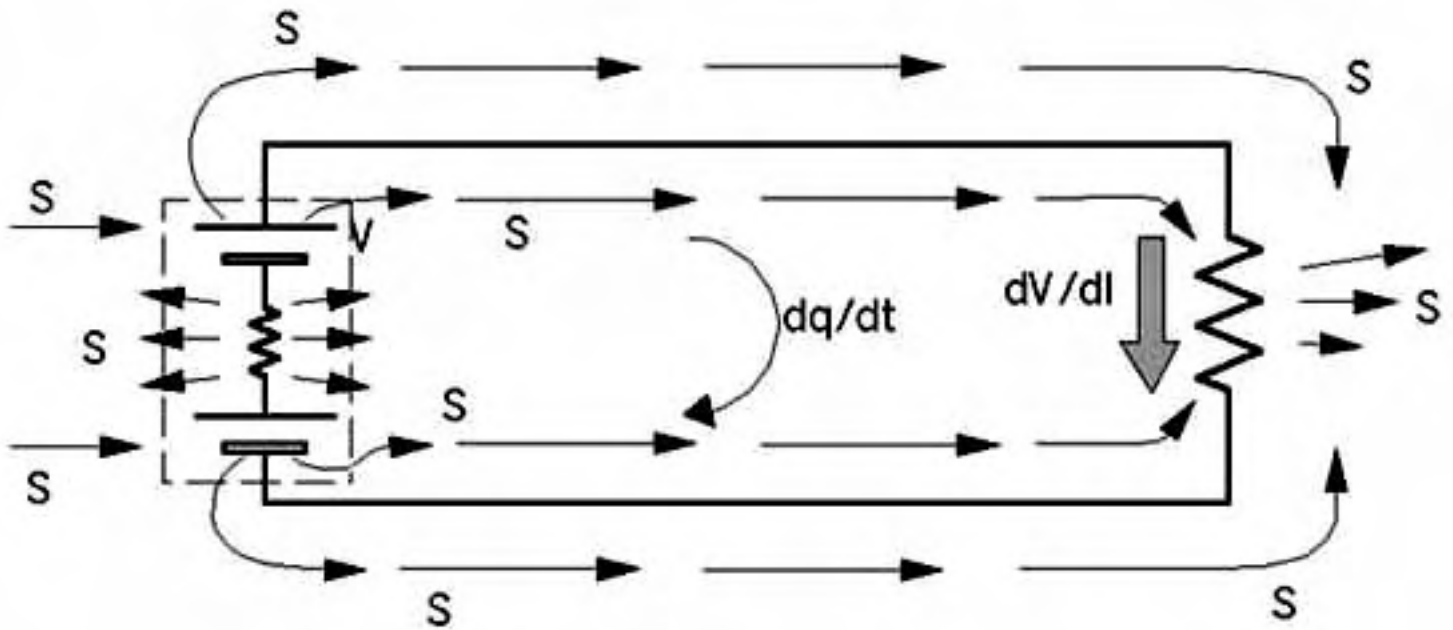
[78] Note that the patent contains an error, stating at first that the torque and rotation are counterclockwise, then showing it moving correctly clockwise from figure to figure in the series.

[79] E.g., the Kawai engine is much more symmetrical and straightforward than the Magnetic Wankel engine. No costly array of stator magnets is required. The stator need not be a costly spiral buildup. Maintenance, reliability, and reduced cost of production should be much improved as compared to the Magnetic Wankel engine.

[80] More prosaically, they have simply applied the standard methodology so successfully utilized by Japanese businesses. First, start with the up-to-date, state-of-the-art product base. At this point one is now competitive. Second, search intensely for new, more advanced technology applicable to the product line. Third, when you find a new technology, focus intense effort on it, to finalize its development. Fourth, with the new technology in hand, produce new and advanced products and aggressively market them. The new products are now superior to the competing products of one's competitors, and one can easily gain a dominant market position.

Table 1: Asymmetry and Modern Physics.

<p>Per T. D. Lee, <u>Particle Physics and Introduction to Field Theory</u>, Harwood Academic Publishers, New York, 1981, p. 378-390.</p>	<p><i>STRONG LOCAL ASYMMETRY (CONT'D)</i></p> <p>Local spacetime is curved Lorentz invariance of vacuum violated May be local sink or source EM gravitational/inertial effects Translation between virtual and observable Electrogravitational solitons Action at a distance Transmutation effects may exist Scalar/pseudoscalar field translation</p> <p><i>WHEN SYMMETRY IS VIOLATED</i></p> <p>A "non-observable" turns out to be an observable An invariance is broken A conservation law or selection rule is broken</p> <p><i>COMMENTS:</i></p> <p>A virtual object becomes an observable object Local spacetime becomes curved, at least to some potential involving that object</p>
<p><i>SYMMETRY AND MODERN PHYSICS</i></p> <p>Missing symmetry of matter Symmetry only of mass and vacuum Vacuum excitation Vacuum structures Spontaneous symmetry breaking Interaction between matter and vacuum Possibility of vacuum engineering</p> <p><i>SOME PROVEN ASYMMETRIES</i></p> <p>Positive and negative signs of electric charge Time reversal Right/left handedness</p> <p><i>STRONG LOCAL ASYMMETRY</i></p> <p>Properties of object may differ appreciably for:</p> <ul style="list-style-type: none">▪ Different observers▪ Different detecting means▪ One time to another▪ One position to another	

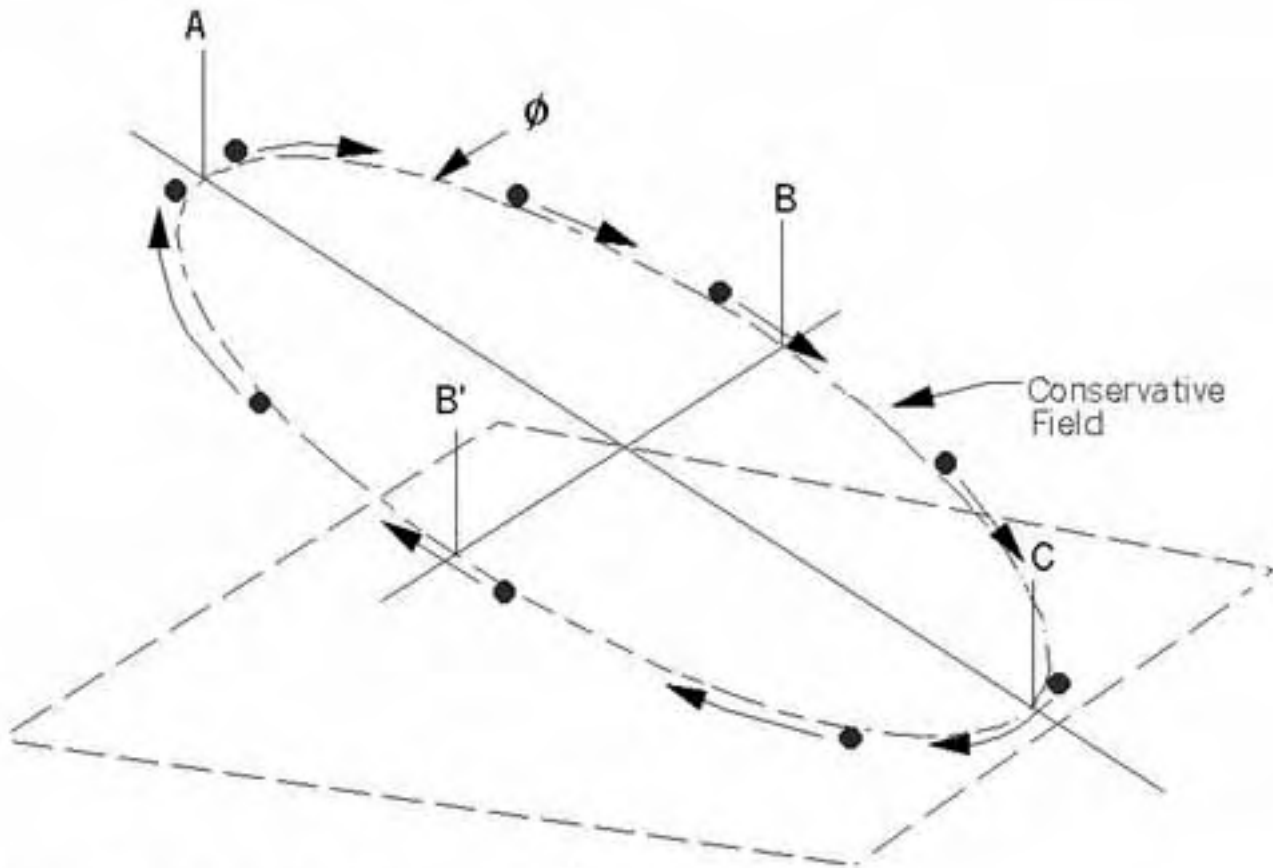


Note: EM texts err in showing the battery "gate" as the source of energy.

Note: From particle physics, opposite charges -- such as are on the ends of a dipole -- constitute a proven asymmetry in the fierce virtual photon flux of the vacuum. So a dipole absorbs virtual photon energy from the vacuum, transduces it to observable photon energy, and pours out real observable EM energy in all directions, continuously. In short, every dipolarity already freely "extracts" and gates EM energy flow from the seething vacuum, continuously.

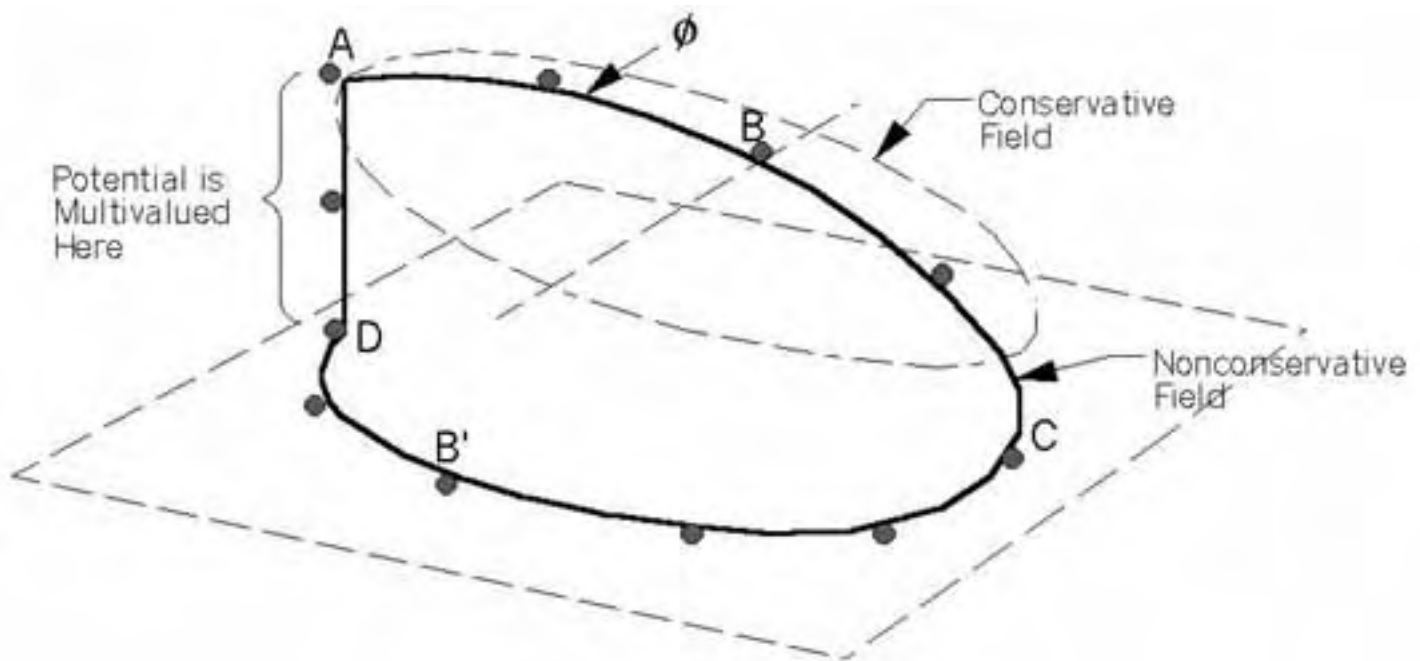
Every battery and generator is already a "free energy" source of extracted and gated EM energy from the vacuum! All EM fields and potentials and their energy are established by the flow of energy from their associated source charges.

Figure 1. Poynting S-flow along a simple circuit



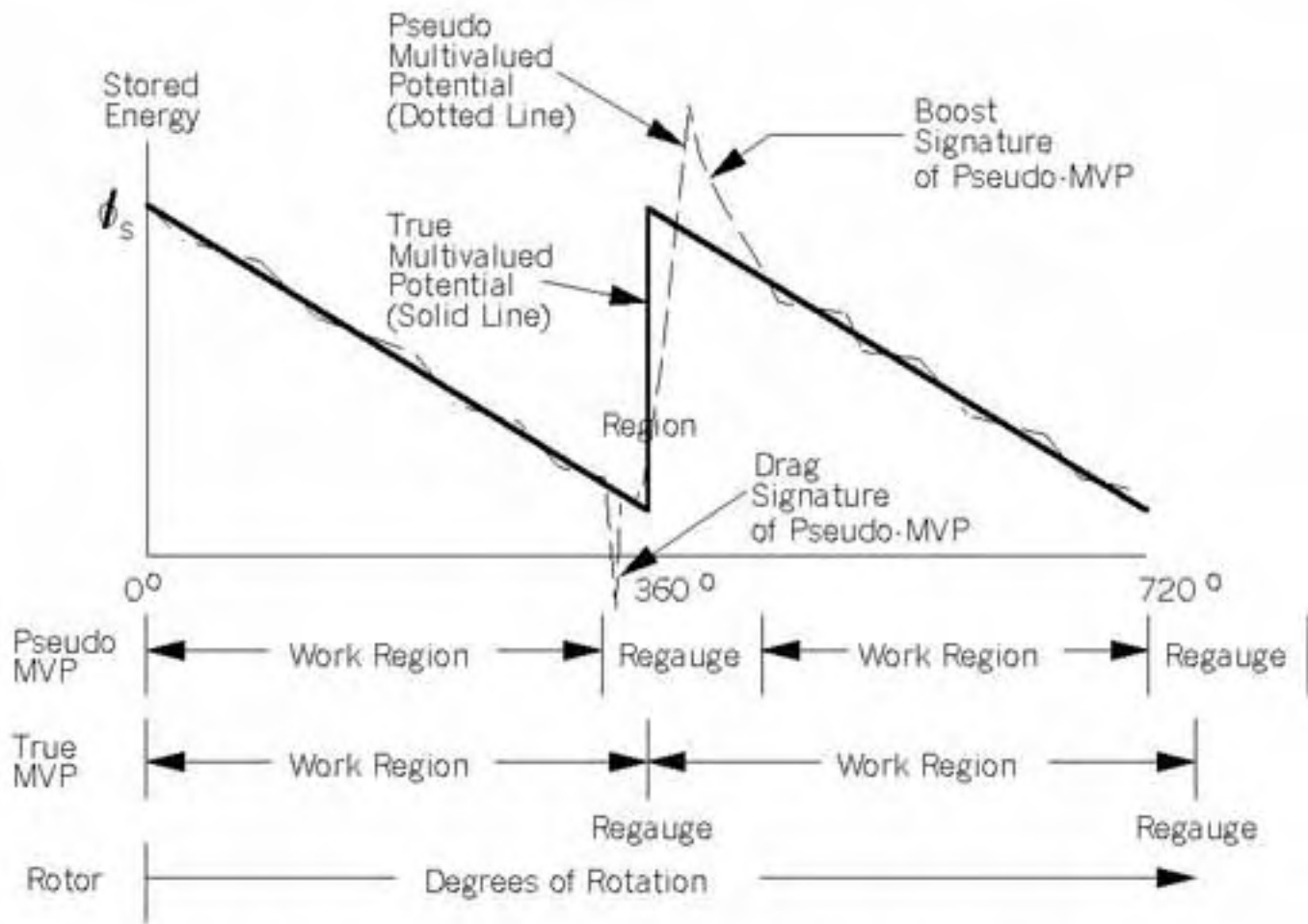
A circular closed path in potential ϕ is given by A-B-C-B'-A.
Line integral from A around any closed path back to A is conservative.
Along path A-B-C, work $W(1)$ may be extracted from rolling ball.
Along path C-B'-A, must do work $W(2)$ on ball, where $W(2) = -W(1)$.

Figure 2. A conservative field requires a single-valued potential.



- A circular closed path in potential ϕ is given by A-B-C-B'-D-A.
- Potential ϕ is multi-valued from D to A.
- Line integral from A around this closed path back to A is nonconservative.
- Along entire path A-B-C-B'-D, work may be extracted.
- No work is required to go from D to A. When ball arrives at D, it also arrives at A simultaneously. I.e., the potential ϕ "jumps" in magnitude.

Figure 3. Field may be nonconservative for a multivalued potential.



Note: Single regauging per rotation shown. Can easily use multiple regaugings per rotation.

Figure 4. "Refueling" an electromagnetic engine by regauging.

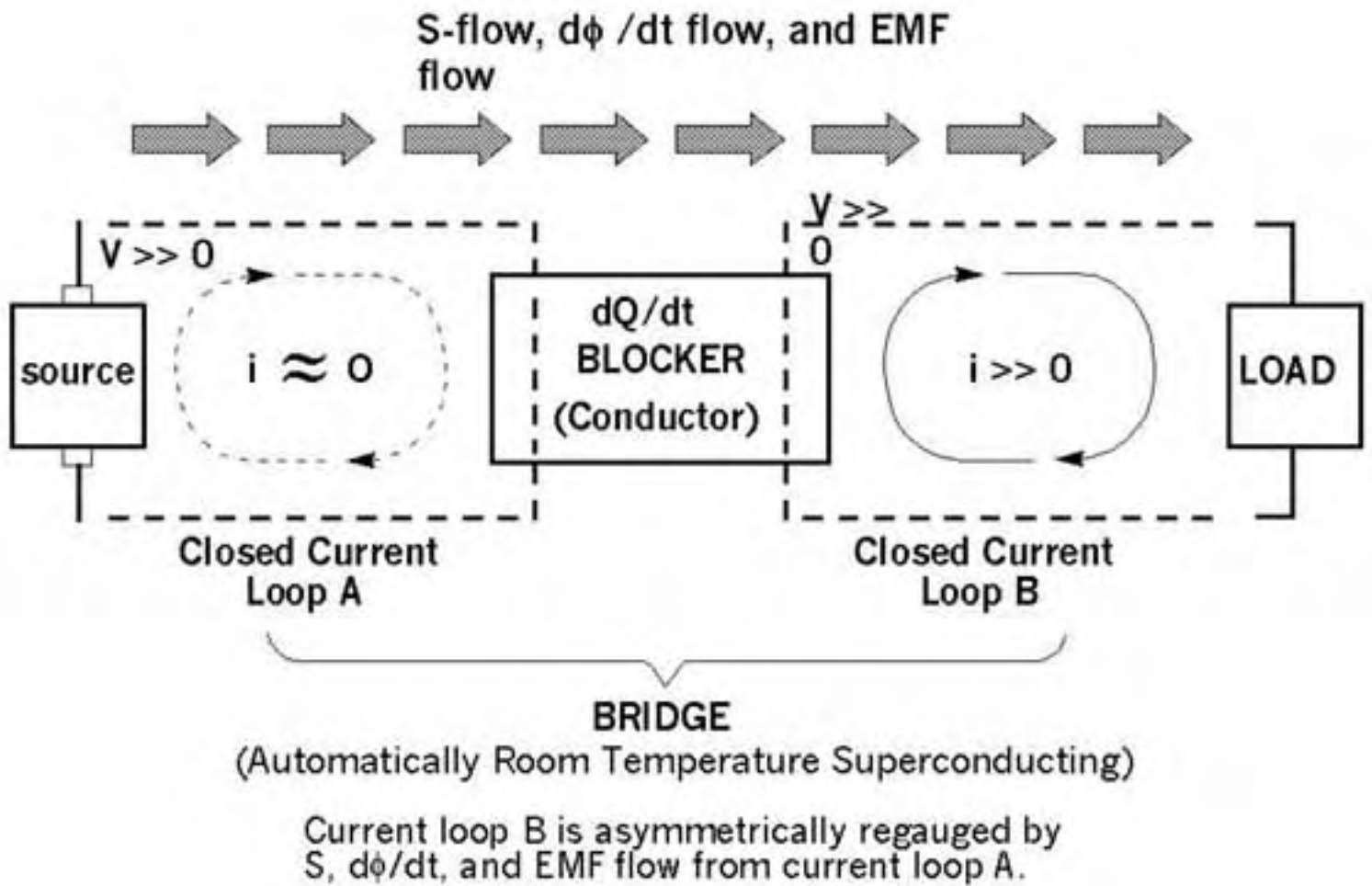


Figure 5. Bridging to enable room temperature superconductivity.

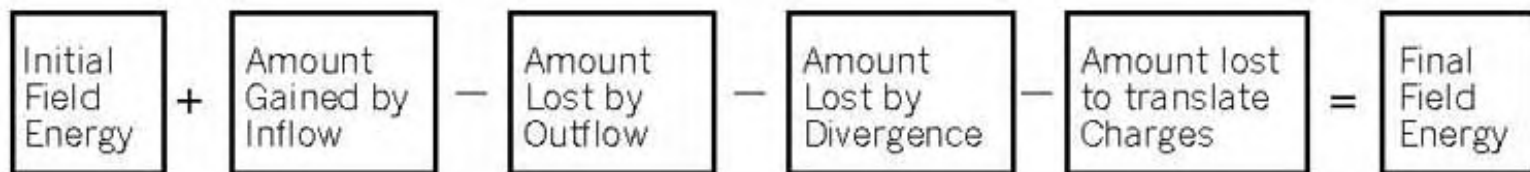


Figure 6. Accounting of Poynting-related energy change.

$$\boxed{\begin{array}{l} \text{Rate of} \\ \text{Gain by} \\ \text{Inflow} \end{array}} - \boxed{\begin{array}{l} \text{Rate of} \\ \text{Loss by} \\ \text{Outflow} \end{array}} - \boxed{\begin{array}{l} \text{Rate of} \\ \text{Loss by} \\ \text{Divergence} \end{array}} - \boxed{\begin{array}{l} \text{Rate of loss} \\ \text{in translating} \\ \text{Charges} \end{array}} = \boxed{\begin{array}{l} \text{Net} \\ \text{Rate of} \\ \text{Change} \end{array}}$$

Figure 7. Accounting of Poynting-related rate of change of stored energy.

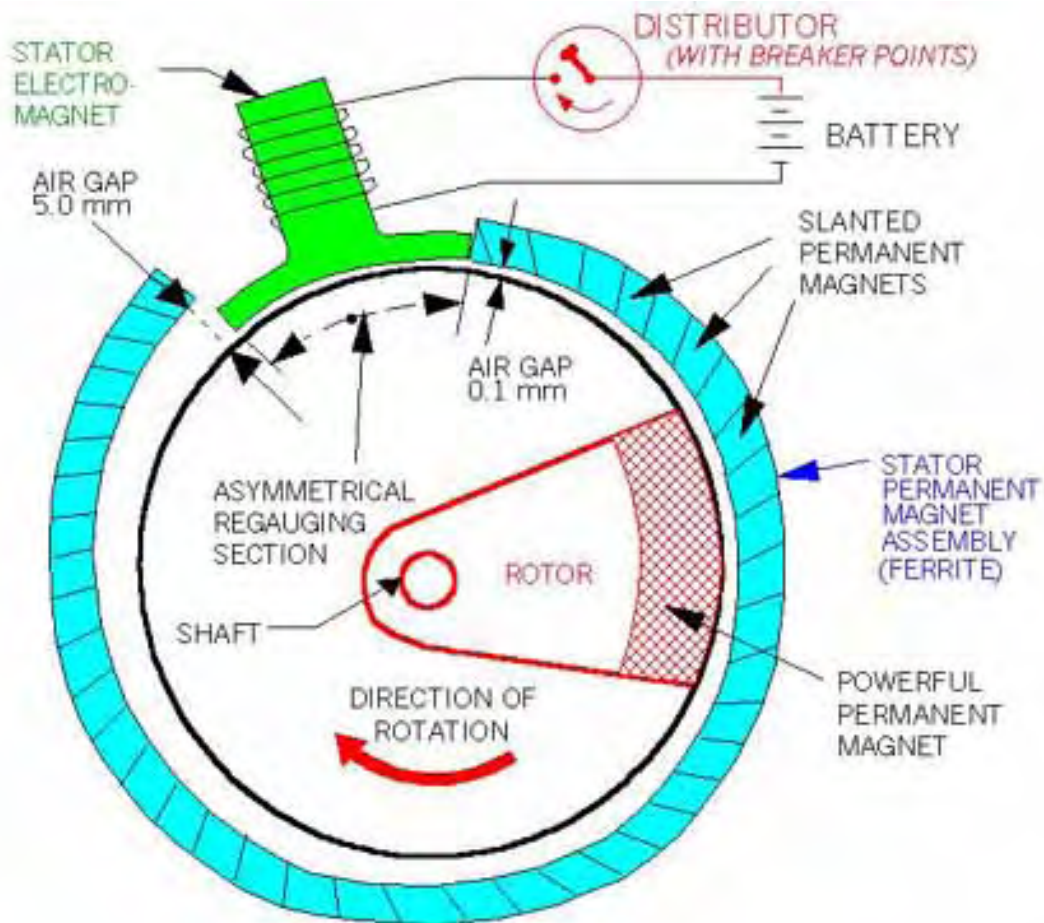


Figure 8. Magnetic Wankel permanent magnet engine with regauging section.



Fig. 9A.

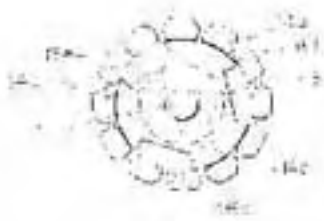


Fig. 9B.

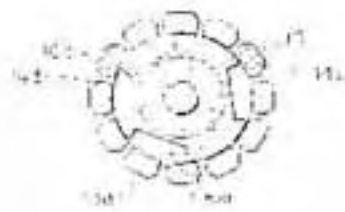


Fig. 9C.

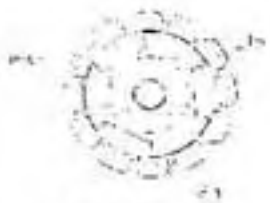


Fig. 9D.



Fig. 9E.

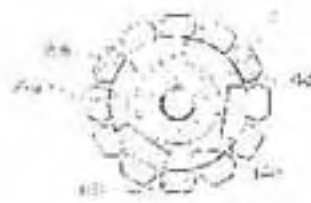


Fig. 9F.



Fig. 9G.

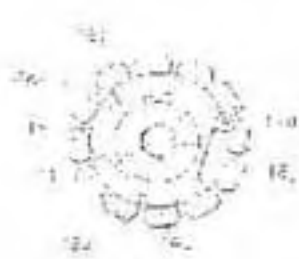


Fig. 9H.

Figure 9. Rotor movement in a typical Kawai engine.