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To whom it might concern

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Dear Sir/Madam,

I believe that in future the energy will be primarily obtained by clean procedures[1]. In this field, I obtained three US Patents:

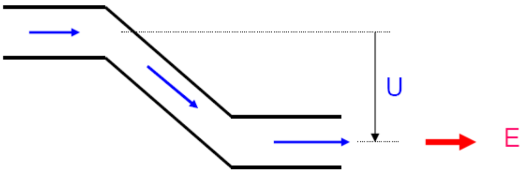
1. LONGITUDINAL QUANTUM HEAT CONVERTER, US20090007950 (US Patent Office, 01-08-2009), http://www.faqs.org/patents/app/20090007950 ;
2. TRANSVERSAL QUANTUM HEAT CONVERTER, US20100019618 (US Patent Office, 01-28-2010), http://www.faqs.org/patents/app/20100019618 ;
3. QUANTUM INJECTION SYSTEM, US20090007951 (US Patent Office, 01-08-2009), http://www.faqs.org/patents/app/20090007951 .

This is a semiconductor device converting the environmental heat into coherent electromagnetic energy, and further into electric energy. A quantum heat converter is a device with two electric terminals, as a semiconductor chip (probably a $GaAs\text{-}Al_xGa_{1-x}As$ heterostructure) in intimate thermal contact with a heat absorbent, providing energy by heat absorption from the environment. For a smaller load, as a mobile phone or a computer, this electric energy is used to charge an accumulator, which regulates the energy consumption. For a larger load, as a house, a car, or a pump for extracting water from the underground, this electric energy could be used to produce hydrogen by water electrolysis. In this case, a motor working with hydrogen will be used instead of the classical motor with oil. I believe that a car will have a hydrogen motor supplied by its own equipment for the hydrogen production on the account of the environmental energy, and also the possibility to be supplied at a hydrogen pump. Such motors will not produce carbon any more, as the present motors, but they will produce water (not so dangerous!), that in fact will be re-circulated.

[1] I am a research professor at the Center of Advanced Studies in Physics of the Romanian Academy (http://www.csafar.ro/). I am an ordinary member of the Academy of Romanian Scientists and of the German-Romanian Academy. I worked in various fields of research as electronic circuits, physics and technology of semiconductor devices, automation, quantum optics, and physics of open quantum systems. I am a doctor in theoretical physics.

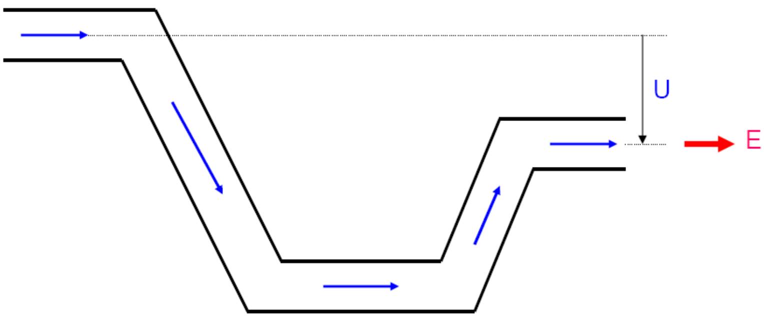
It is like a hydro-electric plant, but instead of water using electrons in a semiconductor structure, and taking advantage from the coupling of these electrons with a coherent electromagnetic field when they decay between two quantum levels (superradiance).

A fall of water between two potential energy levels



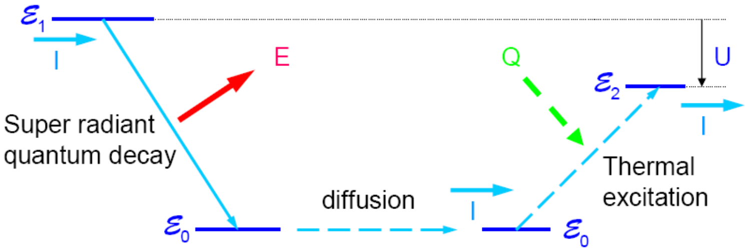
produce an energy E approximately equal to the potential energy difference U between these levels.

If we have a fall of water between the same potential energy levels, but with a much deeper intermediate level,

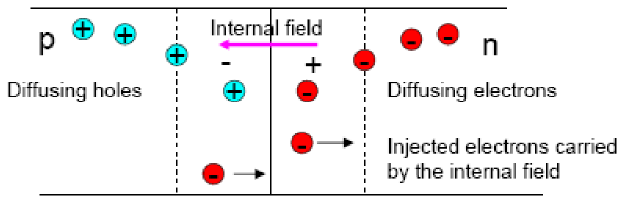


nothing happens – the usable energy E obtained from the system depends only on the difference U between the initial and final potential energies.

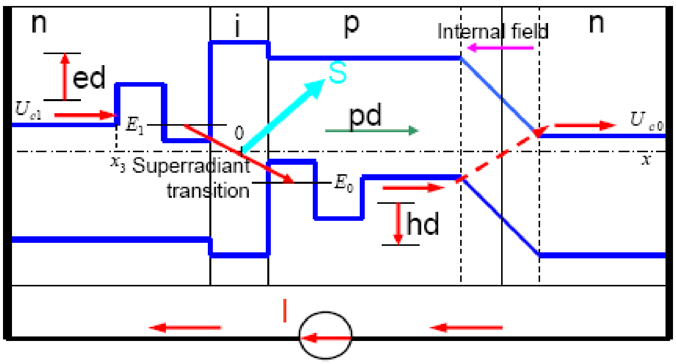
However, if instead of the classical system with water, we imagine a quantum system of electrons, while an electric current I is injected in the device, something extraordinary happens:



While the electrons decay from the upper energy level ε_1 to the much lower energy level ε_0, a coherent electromagnetic field E is generated (superradiance). It is remarkable that this motion of electrons from the initial energy level ε_1 to the final energy level ε_2 is determined by the energy difference $U = \varepsilon_1 - \varepsilon_2$, which is much smaller than the superradiant energy E. The most part of this energy comes by a heat absorption Q of the electrons trying to remake their statistical distribution when a flow of electrons I is leaving the upper energy level ε_2 , while this flow of electrons I is invading the lower level ε_0 . A certain temperature means a certain distribution of electrons on the energy levels. A smaller population of the upper level and, correspondingly, a larger population of the lower level (the total population being conserved) mean a lower temperature. Thus, a heat exciting the electrons from the lower level ε_0 to the upper level ε_2 is attracted from the environment that is at a higher temperature.



The operation of this system is based on the physical effect usually called "superradiance" and on particular properties of the internal field region of a semiconductor junction. This field is an essentially thermal effect: due to the thermal energy, the quasi-free electrons of the n-region diffuse to the p-region, leaving behind a positive charge, while the holes of the p-region diffuse to the n-region, leaving behind a negative charge. At equilibrium, the internal field between these two charged layers of the crystal lattice has the necessary energy to cancel the two diffusion processes. When an electron current is injected in the internal field region, these electrons are carried out by this field that, in this way, looses energy. However, in a stationary regime, when the electric current is constant, the internal field is also constant. That means that the internal field, ceding energy to the incoming electrons, must recover from somewhere this energy. Since this field is constructed by the thermal effect of the electron/hole diffusion, its energy is recovered also by a thermal effect, in fact by heat absorption - while the field energy decreases by carrying out the injected electrons, the temperature of this region also decreases, absorbing energy from the environment. Thus, one could imagine an n-i-p-n semiconductor hetero-structure. While a current of electrons I is injected in the device, these electrons undertake superradiant transitions from the energy level E_1 to the energy level E_0, generating a superradiant energy flow S.



Further, these electrons are carried out from the narrow p region to the second n-region, thus closing the circuit. Since the difference between the conduction band lower margins of the two n-regions satisfies the condition $U_{c1} - U_{c0} << E_1 - E_0$, the electric power provided for the current injection $P_e = (U_{c1} - U_{c0}) I / e$ (e is the electron charge) is much lower than the superradiant power S that is not much lower than the transition power $P_t = (E_1 - E_0) I / e$. The power difference $P_d = P_t - S$ is due to dissipation processes that are mainly three: (1) transitions of electrons in the conduction band of the first n-region (ed), (2) transitions of holes in the valence band of the p-region (hd), (3) phonon creation/annihilation processes of the crystal lattice vibrations (pd). Other dissipation processes are also present.

I have been studying quantum dissipation during about 20 years[2]. I studied basic problems of the quantum mechanics[3] with very interesting applications in quantum optics[4] and nuclear physics[5,6]. Mainly, I obtained a quantum master equation of a system of fermions with explicit microscopic coefficients[7,8]. In general lines, I proposed a device for transforming the environmental energy in usable energy[9]. In this framework, a complete description of such a device is possible. For instance, for the coupling to a conduction n-region with a concentration N_D of donors, I got the decay rate[10]

$$\lambda_{01}^{(n)} = \frac{4\alpha^2 c^2 \sqrt{2M_n}(\varepsilon_{10}+\frac{T}{2})|c_{01}^{(x)}|^2 \mu_{01}^2}{3\left(\frac{N_D^{-1/3}}{2} - x_3\right)^3 \varepsilon_{10}^{3/2}(e^{-(U_c+\varepsilon_{10})/T}+1)}$$

as a function of the transition energy $\varepsilon_{10} \equiv E_1 - E_0$, the transition dipole moment μ_{01} and the overlap function $c_{01}^{(x)}$ on the x-coordinate, the margin of the conduction band U_c, temperature T, the coordinate x_3 of the separation barrier boundary, and the effective mass M_n of the electron. For the coupling to the vibration modes α, I got the decay rate

$$\lambda_{01}^{P} = \sum_{\alpha} \frac{E_e^2 \varepsilon_{10}^5}{\pi \hbar^6 c^4 v^3 D} \cdot \frac{(\vec{r}_{01}\vec{1}_\alpha)^2}{1-e^{-\varepsilon_{10}/T}}$$

as a function of the electron rest energy E_e, the sound velocity v and the density D of the crystal. I obtained a model essentially describing the dissipative superradiant dynamics of the device[9].

For a chip of $GaAs - Al_x Ga_{1-x} As$ with the thickness of *2 mm* and the area of *4 cm²*, including *1045* "superradiant transistors" with reasonable values of the parameters, working at a minimum temperature of 10 *⁰C* in an environment at 20 *⁰C*, while a current *I=45* A is injected in this device with the series resistance R_S*=7.1 mOhm* dissipating a power of *14.4 W*, a superradiant power of *1.28 KW* is obtained, which means a power of *3.2 MW* available from a total active area of *1 m²*.

I believe that the above data are enough for a specialist to decide on the feasibility of such a device. Of course, there are many problems involved in its practical realization. However, they could feel that these problems have solutions. They would produce solutions to these problems. In comparison with similar devices existing on the market,

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[2] E. Stefanescu, Dynamics of a Fermi system with resonant dissipation and dynamical detailed balance, Physica A 350 (2005) 227-244.
[3] A. Isar, A. Sandulescu, H. Scutaru, E. Stefanescu, and W. Scheid, Open Quantum Systems, Int.J.Mod.Phys. E 3 (1994) 635-714.
[4] A. Sandulescu and E. Stefanescu, New optical equations for the interaction of a two-level atom with a single mode of the electromagnetic field, Physica A 161 (1989) 525-538.
[5] E. Stefanescu, W. Scheid, A. Sandulescu, and W. Greiner, Cold fission as cluster decay with dissipation, Phys.Rev. C 53 (1996) 3014-3021.
[6] E. Stefanescu, R. J. Liotta, and A. Sandulescu, Giant resonances as collective states with dissipation, Phys. Rev. C 57 (1998) 798-805.
[7] E. Stefanescu, A. Sandulescu, and W. Scheid, The collisional decay of a Fermi system interacting with a many-mode electromagnetic field, Int.J.Mod.Phys. E 9 (2000) 17-50.
[8] Eliade Stefanescu, Werner Scheid, and Aurel Sandulescu, Non-Markovian master equation for a system of Fermions interacting with an electromagnetic field, Annals of Physics 323 (2008) 1168–1190.
[9] E. Stefanescu and W. Scheid, Superradiant dissipative tunneling in a double p-i-n semiconductor heterostructure with thermal injection of electrons, Physica A 374 (2007) 203-210.
[10] E. Stefanescu, Master equation and conversion of environmental heat into coherent electromagnetic energy, Submitted to Progress in Quantum Electronics.

as the solar cells, our device needs no light to work, but only heat. This heat fulfills the role of remaking the electron distribution on the deep level path of the base-collector junction (heat absorption junctions) of the superradiant transistors. If this distribution deferred much from the normal distribution, the temperature of the base-collector junction would be much different, in fact much lower than temperature of the neighboring regions of the device, which is not possible – the heat from the surrounding regions invading the very thin layers of the base-collector junctions, with the tendency to level the temperature throughout the device. The heat absorbed by the device from the surroundings is totally converted into electromagnetic energy. Really, any energy loss in the superradiant process means heat production in the semiconductor structure, but heat is just the primary energy feeding the device – that means that the heat absorbed from the outside finally is totally converted into electromagnetic energy: no other energy reservoir exists, which could take a part from the flow of heat into electromagnetic energy. In principle, the heat produced by dissipation can flow only into two surrounding systems: (1) to the coherent electromagnetic field, which is the usable energy, and (2) to the environment. But the environment can not receive heat from the device, having a higher temperature – the environment can only deliver energy to the device.

This device is compact, needing only a thermal contact with the environment, which means that is rather light, easily transportable, and when it is installed, needs no maintenance.

I believe that, in this way, soon, every house, every farm, every car, every computer, and every mobile phone will have its own energy supply as a semiconductor chip taking this energy from the environment by means of a smaller or a bigger heat absorbent that, during its operation, becomes colder than this environment.

Of course, I consider this research only a beginning in the field, which might be also developed with other materials, or just with other physical structures (chemical?), working on the physical principle presented above. I believe that the new technologies developed in this way will replace other existing technologies based on all kind of mills, of water, of wind, of sea waves, etc., or on huge mirrors, which will remain as the Zeppelin balloon in comparison with a modern jet.

Thank you very much for your understanding,
With the kindest regards,

Eliade Stefanescu