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Energy Sources Today

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Abstract: The paper intends to go through some major energy sources that need to be further developed in order to provide the energy needed for an indefinite period of time. It is proposed that both water and solar energy, as well as wind energy together with nuclear energy, are important, but other modern energy sources capable of generating energy directly or indirectly will be considered. The possibilities of saving energy will be taken into account by the general reduction of the energy consumption, with the development of the generalized software in almost all the industrial fields but also in the case of the equipment used daily in the houses of the people. The paper will briefly list alternative energy sources available today, but also the possibility of implementing other unknown or untested energy sources, generally unconventional energies.

Keywords: Energy, Water, Solar, Wind, Wave Energy, Tidal Energy, Nuclear Power, Energy From the Stars

Introduction

We believe that tomorrow's energy means innovation today, innovation and technology being vital to guarantee a wider and more substantial mix of energy resources for the world's growing population. Hundreds and thousands of Shell specialists, reseaarchers and engineers from around the world are collaborating with experts from other fields to develop a future solution for energy consumption (Aversa *et al*., 2017).

By 2060, energy demand will increase by two-thirds, according to Shell theorists. Innovation and collaboration will play an important role in finding a sustainable solution to increase energy demand. For the solutions to be impactful, radical changes have to be made in this regard.

Shell has been and continues to be a pioneer in innovation for over a century. Today, it is the largest investor in the field of research and development, along with other companies in the field. There are 43,000 technicians and engineers in the company. And the costs were over $ 1 billion each year, to turn ideas into viable and commercial technologies.

Energy means life - without this propulsion engine or source of dynamics of any kind, there would be only a bleak, amorphous and dull universe like a colorless picture, or maybe not even that one.

Scientists have routinely turned their attention to alternatives to conventional energy sources, given that the future of mankind is indisputably linked to the identification of such solutions.

There are variants that propose the use of renewable energies or others that advance the formula of nuclear energy (Petrescu and Calautit, 2016a-b; Petrescu, 2011; 2012; 2014; 2019; Petrescu and Petrescu, 2011; 2012; 2014; 2019; Petrescu *et al*., 2016a-c; 2017a-f), leaving aside the aspects related to serious accidents registered in the past and the extremely dangerous situations that this last solution can involve.

What constitutes a truth unmistakable in this context, however, is that humanity agrees in accepting the idea that the future of energy is not related to oil, coal or natural gas.

Currently, these sources provide about 87% of the total energy consumption globally, but they are toxic to all environmental components, which is an alarm signal with a view to ensuring a healthy life for our planet and civilization in the future.

Realizing that in their turn, oil reserves are depleted and correlated consumption records impressive rates, statistics prepared by specialists in this field have revealed that in less than a century, humanity risks reaching the bottom of the sack, oil wells around the world. The planet is going to become completely destroyed.

On the other hand, today, more than ever, new gas and oil deposits have been discovered which, at the current consumption level, could provide the planet's energy for at least 2000 years, which eases the tense situation created with the onset of the crisis energy from the 1980s, when the classic resources seemed to run out of time.

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At the top of the new classical resources are the gases of the system about the existence of which was known for a long time but which could not then be extracted due to the lack of advanced technologies, which today exist and bring us daily huge quantities of gases extracted from the deep. Only these reserves and it would be sufficient to maintain an energy balance for mankind for another 2000 years, but we cannot rely solely on this aspect today after having energy problems, being permanently obliged to discover new alternative sources. In fact, researchers from all over the world are discovering new possible energy sources every year. Classic fuels can be industrially re-engineered or synthesized today so that they will run out even if not fast but slowly no longer an imminent danger to the planet. British researchers have long been able to produce classic fuels from the air by using atmospheric carbon and so much in the air today. A group of prestigious scientists from a Swiss university recently managed to obtain high-quality gasoline fuels usable in the aeronautical industry by using atmospheric air and photovoltaic solar energy. A plant of this kind spread over several hectares would be able to produce kerosene in industrial quantities sufficient for the needs of the planet not only for aviation but also for the total consumption of motor vehicles even if they would remain all on classic engines and this only from air and energy photovoltaic solar. There are already three large plants installed in the world today that transform the existing gas for at least two thousand years into kerosene, petrol, diesel, oils, etc.

So we can have in the future any type of classic fuel either made from the air or obtained from gases extracted in large quantities from the depth.

The ethical problem is now if we can afford to spend a lot more time burning classic fossil fuels, knowing that they pollute the planet's atmosphere a lot, producing among other things the effect of greenhouse and global warming.

These are the premises that underlie the intense efforts of an increasing number of world leaders in the field of alternative energy options, meant to gradually replace everything we know today as fuel-based energy sources.

According to expert estimates, by 2035, renewable energy will supply about 25% of the world's energy - judging by the global consumer reaction following the tragic nuclear accident in Fukushima, the process could even register a considerable acceleration.

With a view to identifying viable alternatives, scientists do not step aside from the advancement of some of the most surprising solutions, starting from a few already tested and recognized as efficient, such as hydropower, wind power or that provided by solar parks and continuing with others, less familiar, but worth mentioning: kinetic energy, wave energy, tidal energy, geothermal energy and other such proposals that even if today might seem bizarre, in the future could turn into truly miraculous solutions.

By devoting much more attention to the slightly more common variants, we could say that they continue to arouse the interest of many teams of researchers involved in the work of identifying new energy sources.

Kinetic energy - a proposal as interesting as it is controversial, is a topic of controversy, considering that it proposes the fruition of the movements of the human body for the purpose of producing energy, as happens when pedaling is used, for example to generate the energy needed for the dynamo that lights up the light bulb of a bicycle. Opinions are divided: if some consider that fitness centers around the world can use this kind of energy to their own advantage and that this model can be extrapolated to the global level, others are skeptical, although they do not deny the possibility of equipping the pavements with facilities to its extent; it captures the energy produced by the people who pass on their surface. Even though it would seem hilarious to rely on the energy obtained in this way because we are no longer in the stone age the idea can be somewhat twisted and used quite differently in a higher way. In fact, starting from the observation that plants and humans (including animals) have a superior way of producing and using energy, bioenergy models can be created in the future to be used successfully in various fields. Never will a human-sized robot be able to create so much force with the energy that a human does today. Basically, the bioenergetic model of the total upper human uses the cellular energy of the ATP molecular chains produced by the mitochondria, all the energy of a human being based on the equivalent of two small AA or AAA batteries (Aversa *et al*., 2016i). With such an energization a robot the size of a human could not run or even walk, lift heavy weights, jump and do gymnastics, but could at most light two lights in the robot's eyes and those with led and for a little time (Aversa *et al*., 2016a-o). The idea is that if we could use the bio-human energy system in the future, the energy required for the planet would be reduced billions of times, the planes would fly with electric motors and everything would it could only be moved with solar energy or transmitted wirelessly.

Geothermal energy - is a spectacular alternative, which proposes the use of the energy source that has its origin at the Earth's core, more precisely somewhere about 4000 m deep in the Earth - a source "with an indefinite employment contract", as stated , not without the trace of maliciousness, James Warwick, from the Department of Alternative Energy at NASA (USA).

Iceland is the land where this resource is fully exploited and with the help of five geothermal plants, it is possible to cover approximately 25% of the national energy needs.

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At the other extreme, however, also the specialists from NASA, also propose the variant "import" of energy from space, produced on the moon, Mars or another planet, where the danger of nuclear power plants could not affect humanity - this is the project called "Kilopower", thanks to which the earthmen could benefit in the future from safe energy not only for space exploration missions but also for the concrete needs at planetary level.

The energy brought from space could also be obtained directly from the stars including from the sun by directly capturing the source in huge quantities and then transmitted directly or indirectly to the earth through the use of the path and other planets and satellites, therefore concentrated through a laser beam.

Materials and Methods

Biological energy used in computers, biomechanisms and other biotechnologies and later even in vehicles and robots, could bring huge energy savings billions of times less energy consumption than today, so energy consumption would be much higher compared to the one achieved in the last 50 years by introducing modern software and through computerization and automation, digitization and computerization.

An obscure compound known as pyrophosphate could have been an energy source that allowed the first life on Earth to form, New Theory for the First Energy Source of Life, Corey Zah (Aversa *et al*., 2016 i).

The author suggests that pyrophosphate would have been relevant in the transition from basic chemistry to complex biology when life on earth began.

They have even provided further evidence of the importance of this molecule and intend to further investigate its role in abiogenesis - this is life on Earth that came from the raw materials billions of years ago. In fact, there are several conflicting theories about abiogenesis, each trying to bring something new about the way life on Earth appeared.

Finally, what is essential is energy. Living matter needs constant energy to exist and function.

The main energy source of living matter is manufactured in molecules known as ATP (Adenosine Triphosphate).

An ATP molecule can convert any solar heat into a form of energy that can be used by plants, humans and animals.

An ATP molecule contains these four vital elements: oxygen, hydrogen, nitrogen and phosphorus (thirteen oxygen atoms, eight hydrogen atoms, five nitrogen atoms and three phosphorus atoms).
Practically important is how the atoms of the four elements are connected in an ATP molecule (Fig. 1).

ATP is constantly used and regenerated in cells through a process known as respiration, a process led by natural catalysts called enzymes.

ATP transports chemical energy into cells to carry out metabolic processes.

It is one of the respiration and fermentation of end cells and is used by structural enzymes and proteins in many cellular processes, such as motility, biosynthetic reactions and cell division.

One ATP molecule contains three groups of phosphates, which is produced by a variety of enzymes, including ATP synthesis in adenosine diphosphate (ADP), adenosine monophosphate (AMP) and various phosphate donors.

The metabolic processes that use ATP as a partner in energy supply then transform it into its precursors. In this way, ATP is continuously recycled into organisms.

The human body contains, for example, approximately 250 g of ATP simultaneously (the equivalent of a single AA battery).

ATP is used as a substrate in signal transduction pathways by kinases that protect phosphorylates and lipids. In addition, adenylate cyclase is used which uses ATP to provide the second cyclic AMP molecule of the traveler. The broad relationship between ATP and AMP is used in a way for a cell to understand what proportion of energy there is and to manage the metabolic pathways that produce and consume ATP.

Except for its roles in signal and energy metabolism, ATP is additionally incorporated into nucleic acids by polymerases in the transcription method.

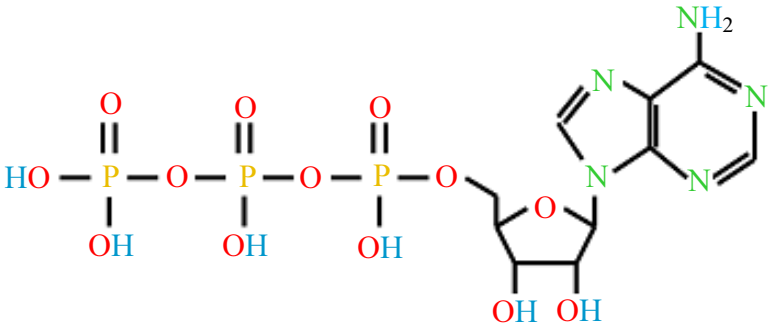

Fig. 1: How the atoms of the four elements are connected on one ATP molecule

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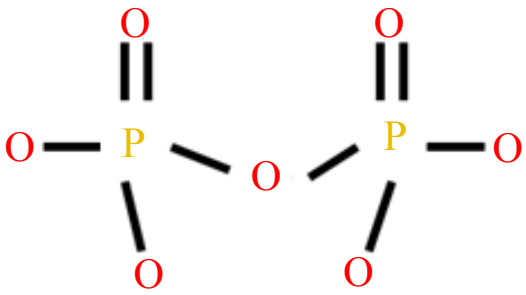

Fig. 2: A pyrophosphate anion having structure “P2O74−”

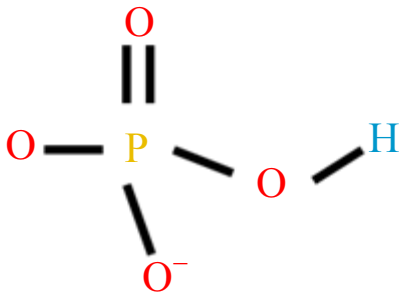

Fig. 3: Hydrogen phosphate, HPO42− (notted with Pi)

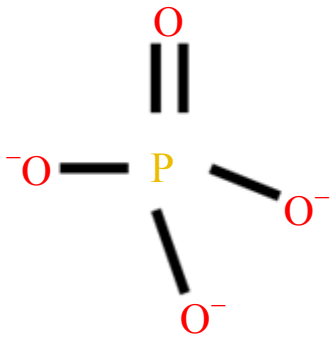

Fig. 4: One phosphate ion

Moreover, ATP is the fact that neurochemistry believed to signal the sense of taste.

An important reaction (biochemical reaction) is the hydrolysis of ATP in AMP in cells: ATP → AMP + PPi.

Through this biochemical reaction (ATP hydrolysis), an ATP molecule becomes an AMP molecule and, in addition, results in pyrophosphate (PPi), which is an anion labeled P2O74 with PPi.

Pyrophosphate anion (diphosphate or polyphosphate) having the structure "P2O74-" is an acid anhydride of phosphate (Fig. 2), (Aversa *et al*., 2016i).

The pyrophosphate is unstable in aqueous solution and hydrolyzes into inorganic phosphate (Hydrogen phosphate, see Fig. 3) HPO_4^{2-} (notted with Pi) by reaction: $PP_i + H_2O \rightarrow 2\ P_i$

One phosphate ion (Fig. 4) is a polyatomic ion having the formula PO_4^{3-} and a mass molar of 94.97 g/mol. It is builded from one central atom of phosphorus which is surrounded by four atoms of oxygen (in a tetrahedral arrangement). A phosphate ion carries a charge negative-three and is the conjugate base of the hydrogen phosphate ion, HPO_4^{2-}, who is the base conjugate of H_2PO^{4-}, the dihydrogen phosphate ion, which in turn is the conjugate base of H_3PO_4, phosphoric acid.

The bio era has already begun, but probably the time for the realization of bioenergies will be very long.

Bioluminescent jellyfish: a certain species of bioluminescent jellyfish is provided with special proteins, able to provide energy when used in combination with aluminum electrodes and exposed to ultraviolet light - the process generates electrically generated electron movements.

Insects that produce oil: these are genetically modified biological structures, in the form of "working insects", meant to digest agricultural residues and produce oil-like hydrocarbons - not an SF-type scenario, but an advanced solution by a group of researchers British, who support the multiple advantages of the alternative - not only would the working insects produce fuel, but they could fulfill an additional task no less important, constituting in the substantial reduction of the amount of carbon dioxide present in the atmosphere.

Wave energy - this solution does not only refer to the waves of the seas and oceans, although the concept also includes their variant - the world is full of multiple waveforms, as a phenomenon consisting of the propagation of oscillations in a certain environment, reflecting the oscillation mode of a physical size according to a sinusoidal model fitted in a cyclic matrix of values. Although the expression seems quite complex, the wave can be represented graphically as a wave-like oscillation and is perfectly associable with energy from the point of view of interactive patterns.

Scientists appreciate that the energy produced by the waves of the seas and oceans, as well as the special waves obtained from the interaction of a magnetic field with an electric one (electromagnetic waves), or solar radiation, considered generators of separate waves, which characterize light propagated by an amazing speed, could be alternative sources of energy in the near future.

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The first experiment that demonstrated the efficiency of such a concept was carried out in 2008, in Portugal, in the form of a dedicated energy park, located about 5 km from the coast, which uses the huge potential of the Atlantic Ocean waves.

Tidal energy - similar to the previous one, the energy generated by the tide phenomenon that occurs under the action of the monthly attraction, is a considerable source of alternative energy, although accessible only at certain coastal points of the globe. The tidal amplitude, however, is truly impressive, being able to reach elevations of 14 to 18 meters, which generates water level oscillations onshore - an opportunity that can be exploited in the form of gigantic "accumulation lakes", like artificial estuaries (or natural), meant to store water in the short term and to capture the energy generated by it both at the inlet and at the outlet of the basin, respectively at the flow and at reflux.

Experts estimate that such a solution could provide electricity about one hundred thousand times greater than the total of existing hydroelectric plants on the surface of the Earth today.

Near the western coast of Australia, near the surface of the ocean, three beacons float, resembling some huge jellyfish, tied with a rope at the bottom of the sea (Fig. 5). Due to the ingenuity of the Australians, these machines produce electricity.

The steel machinery, with a width of over ten meters, are balanced by the waves of the Indian Ocean. By constantly processing water movements, beacons generate about 5% of the electricity used by a nearby military base, located in Garden Island, a suburb of Sydney's capital, the New York Times reports.

The huge buoys are part of a pilot project by Carnegie Wave Energy in Australia, which is trying to develop alternative energy methods.

These machines began to generate 240 kilowatts each for Australia's largest naval base, HMAS Stirling. They also contribute to the operation of a desalination plant, which converts seawater into drinking water for the respective base, providing approximately one-third of the necessary.

Renewable energy is not an emergency in Australia, given that the country has rich fossil fuel resources, especially coal. But this project addresses the populations on the islands that have to import expensive fuels for electricity, but also the military bases in Australia, which are trying to increase their energy security.

"All populations on the islands are looking for sustainable alternatives," said Michael E. Ottaviano, executive director of the Carnegie Institute.

The energy obtained from the waves is an excellent alternative, especially for the islands where tropical clouds affect solar energy or where the wind spoils the spectacularity of the tourist destinations.

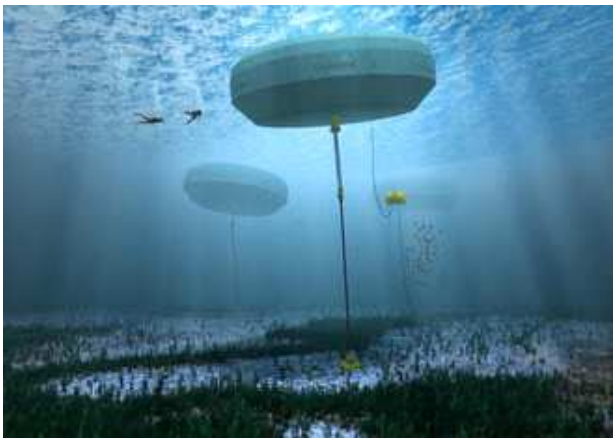

Fig. 5: The steel machineries, with a width of over ten meters, are balanced by the waves of the Indian Ocean

Australia could extract the necessary energy from the waves in the future 3 times.

Given that the waves of the Indian Ocean are strong, the renewable energy obtained with their help seems a promising source, although the work of the engineers is still in an experimental stage.

The equipment currently used is easily destroyed due to storms and strong waves. In addition, being at the beginning, important investments are needed to define new and more efficient concepts. the big challenge is the creation of more resistant types of machinery in time, the reliability of the current ones being the painful problem, together with the financing of the projects otherwise.

"The biggest challenge is financing (...). Every time you want to test an idea, it costs you millions of dollars." Today's widespread energy technologies, such as nuclear facilities, have been developed for commercial purposes with government funding.

For his pilot project, Carnegie started with over $ 50 million and the money came from several sources, including the Australian Government, investors and the Renewable Energy Agency of Australia. The Institute has been working on this technology since 1999 and the total investment exceeds $ 100 million.

Carnegie is already planning to use larger and more efficient beacons from 2017, which can generate one megawatt of electricity, i.e. four times more than the current version.

Tidal energy is the energy that can be captured by exploiting the potential energy resulting from the vertical movement of the water mass at different levels or the kinetic energy due to tidal currents. The energy of the tides results from the gravitational forces of the Sun and the Moon, as well as from the earth's rotation. It is a form of renewable energy.

Tidal energy is the only renewable energy source with a high degree of predictability.

The energy of the tides does not depend on the atmospheric or climatic factors as is the case with the energy obtained from solar or derived sources.

The energy produced by the tides is influenced only by the motion in orbit of three planets that exert one on another force of gravitational attraction: Earth, Moon and Sun.

Because these planets move in orbit after very exact physical laws, the result of their action - the energy of the tides also has a very well defined character.

Use of Kinetic Energy of Tidal Currents

The method is cost-effective when the energy density developed by the tidal currents exceeds 500 W/m^2 (corresponding to a speed of 1 m/s), on a surface of at least 0.5 km2 and depths greater than 5 m.

In areas with such characteristics, turbines with the horizontal axis (similar to wind turbines) or vertical axis are available. In order to channel the energy of tidal currents into these turbines, structures similar to the dams are constructed that have the role only of channeling the tidal energy and not of accumulation.

This variant of obtaining the tidal energy is taken into account for future projects in this field.

Use of potential energy accumulated as a result of rising water levels during the tide

The method is cost-effective when the height of the tide exceeds 8 m. In this case, dams are built that allow the extraction of energy both during the flow and during the reflux.

During the flow, the water filling the dam drives the blades of the turbines. During reflux, when the tide reaches minimum levels, the water from the dam is allowed to flow in the opposite direction through turbines, also producing electricity. Unfortunately, there are only two such functional projects worldwide at the moment.

La Rance located in the estuary of the Rance River, France. The plant produces 240 MW with the help of 24 10 MW turbines. It was inaugurated in 1966 at an updated price of 800 million euros. The investment was amortized in 1986 after 20 years. The dam has a length of 750 m and a height of 13 m. The boiler produces energy both during flow and during reflux with the help of reversible turbines.

Sihwa Lake - South Korea, inaugurated in 1994, with an installed capacity of 254 MW.

Much of the planet's energy needs could come from capturing concentrated energy from the stars and bringing it to earth through concentrated laser beam transfer to the moon and then from the moon to the earth by dissipating energy and transmitting it using electromagnetic waves.

The demand for high-power energy installations on our natural satellite Luna would be multiple advantages in the future, as it could cause the colonization of the moon slowly but surely and on the other hand, it would allow the transmission of energy obtained on the Moon to the earth. The energy of the Moon could be initially massively obtained through nuclear fission plants, the risks of possible irradiation or nuclear incidents being lower than here on earth.

The start of such projects mainly depends on the funding and the political factor, but also on the desire of NASA to finally start a real Moon colonization project.

Results and Discussion

Accumulating energy balloons could be made in the future. A British company has developed a prototype balloon half-fast when one material is transparent and the other part of the film thin plastic and metal - the transparent surface allows the "harvesting" of light inside the balloon, while the metal receivers are responsible for to deal with the "practical" part of the energy transfer. The solution seems particularly costly and simple to realize, but the reluctant investor has hitherto prevented the proliferation of the method on a large scale.

The energy generated by the Sun is based on the thermonuclear fusion of hydrogen and its transformation into helium. This occurs in the core of the star using the proton-proton chain reaction. Since there is no convection in the solar nucleus, the results of the fusion process are helium accumulations. The temperature in the center of the Sun is too low for the nuclear fusion of helium atoms through the triple-alpha process, so these atoms do not contribute to the net energy production that is needed to maintain the Sun's hydrostatic balance.

Currently, almost half of the hydrogen in the middle of the sun has been consumed and replaced mainly with helium. In order to compensate for the constant reduction of the number of hydrogen atoms per unit mass, the temperature in the core of the Sun gradually increased, by increasing the pressure. This made the remaining hydrogen fusion proceed at a much faster rate, thus generating the energy needed to maintain a balance. The result was a steady increase in the sun's energy production.

When the sun became a star on the main sequence, it only radiated 70% of the current brightness. The brightness has increased in an almost linear way so far, i.e. about 1% every 110 million years. Also, in the next 3 billion years the Sun is expected to become 33% brighter. The hydrogen combustion in the nucleus will eventually be exhausted over 4.8 billion years when the Sun will be 67% brighter than it is today. Thereafter, the Sun will continue to burn on a hydrogen core in the core-shell, until the brightness increase reaches 121% of the current value. This marks the end of the Sun's lifespan on the main sequence and later it will turn into a giant red star (Petrescu and Calautit, 2016a-b; Petrescu, 2011; 2012; 2014; 2019; Petrescu and Petrescu, 2011; 2012; 2014; 2019; Petrescu *et al*., 2016a-c, 2017a-f).

Nuclear fission energy was a necessary evil and could still be used here for a while on the planet as an alternative source of energy when renewable energy from the sun, wind and water goes down for various natural reasons. As long as there is enough nuclear fission fuel, it is likely that nuclear fission energy will continue to be used, especially since some countries such as France, Canada are totally dependent on this type of energy. Such energy could be mounted and obtained in the future on our natural satellite, the moon, so that part of it will then be transmitted to Earth.

In the end we will still need to complete the process of obtaining fusion energy on an industrial scale and here on earth but in greater quantities on the Moon and then on Mars and in other locations outside the planet.

Conclusion

The paper intends to go through some major energy sources that need to be further developed in order to provide the energy needed for an indefinite period of time. It is proposed that both water and solar energy, as well as wind energy together with nuclear energy, are important, but other modern energy sources capable of generating energy directly or indirectly will be considered. The possibilities of saving energy will be taken into account by the general reduction of the energy consumption, with the development of the generalized software in almost all the industrial fields but also in the case of the equipment used daily in the houses of the people. The paper will briefly list alternative energy sources available today, but also the possibility of implementing other unknown or untested energy sources, generally unconventional energies.

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Author's Contributions

All the authors contributed equally to prepare, develop and carry out this manuscript.

Ethics

This article is original and contains unpublished material. Authors declare that are not ethical issues and no conflict of interest that may arise after the publication of this manuscript.

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Source of Figures:

Figure 1-4: Aversa *et al*., 2016 i

Figure 5: http://tb.ziareromania.ro/Cum-se-transforma-valurile-marii-in-electricitate--Cea-mai-mare-provocare/d3c051ec9ec30dd8f5/327/0/1/70/Cum-se-transforma-valurile-marii-in-electricitate--Cea-mai-mare-provocare.jpg