

Can Electricity Be New?

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Abstract

A new electrical power transmission system using a single wire only is described. One hundred and twenty years on the globe, two or three wires systems work. The new method does not use the ground to transmit energy. The wire may be in air, in land, or in water. One-wire method will reduce the cost of lines several times. The global changes like these will require to change the long-established of scientific and technical approaches. Even considering that the single-wire method has tremendous economic and technical advantages, changing concepts and consciousness is always a long and painful process. In article is shown all new blocs, necessary to go to one wire method. All methods and blocks were checked by simulations and system models developing.

Keywords

One-Wire, Single Line, Zeroing, Nullifier, Three-Phase, One-Phase

1. First Introduction

Several years ago, was proposed a new method for transmitting electrical energy using a single wire [1]. There are some negative responses. Their main objection can be expressed in one phrase: “The whole world has been using a three-phase system for 120 years, who are you?”. Pondering this virtual debate, I decided, as an introduction to this article, to take excerpts from the articles of N. Novikov and Molostova “Einstein and Dostoevsky” published in.

<https://proza.ru/2015/03/07/2020>. However, I’m not trying to compare myself with these great geniuses. But from who else to learn if not from them? Maybe from popular Russian comedian writers Ilf and Petrov (see the quote at the end of the article)?

The most famous physicist of our time Albert Einstein said that the writer Fedor Dostoevsky gave him more for creativity than all the mathematicians in

the world. This mysterious phrase about the influence of literature on the creative process helps us look for the key to the success.

What parallels in the works of these great people can we find? Dostoevsky discovered in his works a new method of looking at the world, new facets of comprehending the world, a new approach to creativity, a different or “creative” view of the structure of nature and spirituality, as we say today. As if from a different angle, he began to look at events and facts.

Dostoevsky, apparently, was close for Einstein in the harmony of the narrative, in that his world, in which the most unexpected turns take on some logical justification, was “non-Euclidean”. While working at the patent office in Bern, he mastered the principle of comprehending the world and anticipating filter applications for inventions or discoveries.

As a result of a detailed study of the work of Dostoevsky, we come across a key to unraveling the statements of Einstein. So, in the work “Crime and Punishment” at the beginning of the work, the question is asked: “What is the person most afraid of?”. The writer through Raskolnikov from Prestigious and punishment gives the following answer: “He is most afraid of the step, but he is most afraid of the new word”.

Einstein, apparently, deeply studied and comprehended the work of Fyodor Mikhailovich Dostoevsky and took it as a basis not to be afraid to put forward a new own word, a new own approach to the problem. This key phrase is traced through the whole work of a talented scientist.

When approaching any physical problem, he uses a different strategy, a different view of the essence of phenomena. An example is the concept of a quantum of light. Many scientists recognized the insufficiency of the theory of light. In 1905, Einstein derived the law of the relationship between mass and energy and showed that mass is a measure of the energy of bodies. This theory, together with quantum physics, constituted the foundation of 20th-century physics. In 1905, he discovered the law of the relationship between mass and energy. Here a new approach is being made to solve the problem of the finiteness of the speed of light propagation. Here he says a new word, takes a new step assuming the motion of particles of matter with a boundary speed equal to the speed of light. The following step hypothesizes that light is distributed in portions or quanta.

Ivan Karamazov says: “Even if parallel lines converge, and I will see it myself: I will say that they have converged, but still I won’t accept it.” It is amazing: Dostoevsky seemed to foresee the creation of the theory of relativity and its rejection not only by the people of Ivan Karamazov’s warehouse, but also by many scientists and politicians. He foresaw the persecution that caused Einstein to leave Germany forever. Dostoevsky showed a new facet in the knowledge of the world. This facet was noted by the outstanding physicist Albert Einstein and applied a new look when constructing a theory that reflects the structure of matter.

The literary work of Dostoevsky helped mankind takes a new step towards comprehending the multifaceted structure of the world and led to the discovery

of new laws of the world.

2. Second Introduction

During more than a hundred years of existence of electricity, there were many opinions of how to transmit it. Today the main method is three-phase system. Its advantages are method energy generation and using as a load three-phase engines. The transmitting lines in three-phase system have serious disadvantages.

Long time is known that in all systems using wires for transmitting energy or information the most expensive part is wires. It is known now that it is possible to transmit energy using one wire system. This system is more profitable and useful for nature. The ratio in cost can be three times and more. And this is hundreds of millions of dollars.

But not only transmitting lines must change. The systems for distribution energy in town, the systems for fast charging electric vehicles and for heating greenhouses must be cheaper and have smaller losses. It is known for example that in many large towns three-phase signal is distributed by one three-wires cable. The consumer systems cannot be balanced. So, there are losses in these systems.

Below is a description of a possibility of modernization of electrical systems. New methods should drastically reduce electrical systems cost. Possible candidate for future electrical systems is one wire system. When considering three-phase systems, one always pays attention to the advantages of these systems compared to single-phase (two wires) systems. But there can be other systems. If we talk about the generator's part (see [Figure 1](#)), then these advantages are undeniable. In electricity generation, a generator is a device that converts motive power (mechanical energy) into electrical power for use in an external circuit. The simplest three-phase current generator is similar to a single-phase current generator, only its armature has not one, but three windings, 120 degrees shifted in space relative to each other. Obviously, a three-phase generator is much cheaper than three single-phase generators having the same total power. There's the same situation on the part of a consumer. If a consumer has large power washing machine, then obviously three-phase currents will be preferable.

3. One Wire Transmitting System

As it was said above the biggest cost of each wire system is wires. It is well known that a three-phase system can transmit more energy than one phase (two wires) systems. There are plenty of these posts on Wikipedia.

Because other systems are not applicable yet, it is believed that three-phase system has maximum efficiency. But today it is known, that it is possible to

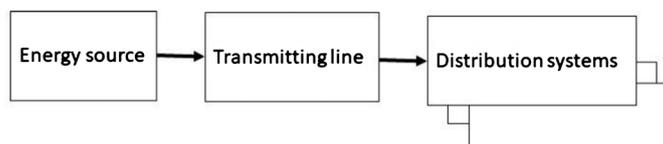


Figure 1. Common scheme of electrical transmitting system.

transmit a large quantity of energy by one wire. Wherein one wire system has important advantages even in comparison with three-phase system.

Let us consider the main principles of one wire method.

It is known that active electrical power is transmitted from source to load and doesn't return to source. This suggests that it's maybe possible to build electrical transmitting system using one wire only. One-wire system was proposed and checked by simulations and pilot systems. The main idea is as follows [1] [2] and [3]. The one-phase (two-wire) transmission system shown in **Figure 2**. The currents in two wires have opposite polarity.

Therefore, it is impossible to combine both wires because signals will cancel each other out [2]. But if we will change polarity in one wire, so both polarities will be the same, then we can combine both currents. This combining can be done using two inverters, as shown in **Figure 3**.

In this example, the one-wire system consists of a single transmission wire and two inverters. The inverters can be done by various methods. For example, by using a half wave delay line, or delay line by using phase shifters. At frequencies 50 or 60 Hz is very convenient method by using it as an inverter transformer with opposite windings. This inverter can be used to invert one phase for the one-wire system as shown in **Figure 4**.

This method was implemented in simulation and then in a proof of concept implementation of the one-wire one-phase system working at a voltage of 6 kV. This scheme and the measurement results are shown in **Figure 5**. This system is working in Tal Shahar, Israel [1]. The measurement results are fully consistent

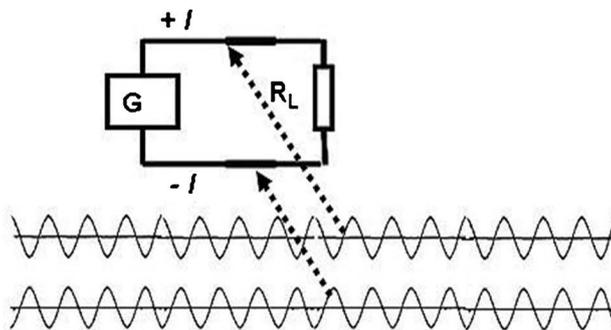


Figure 2. The polarities in one-phase systems.

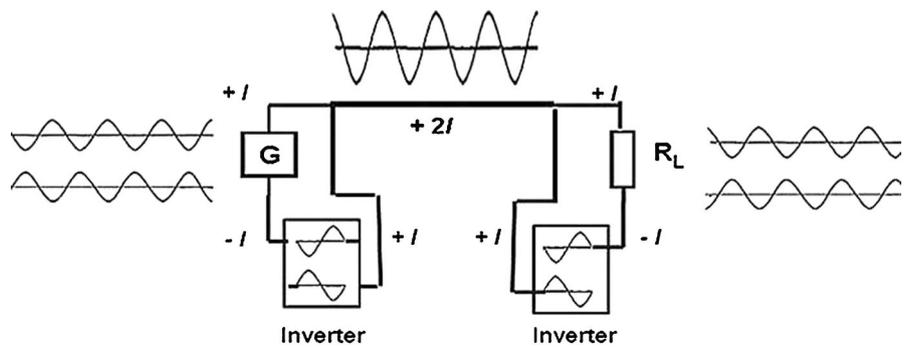


Figure 3. Two wires combining.

with the simulation results of this circuit.

The transmission of the three-phase signal by one wire can be made also. The explanation of converter 3 - 1 principle was given in Patent [3]. The possible schema of this converter is shown in **Figure 6** [4].

Two of the three-phase vectors V1 and V2 have phases +60 degrees and -60 degrees. Sum of these vectors has zero phase. Vector V3 after inverting has zero phase also. Therefore, we can combine all vectors and receive one-wire signal. In

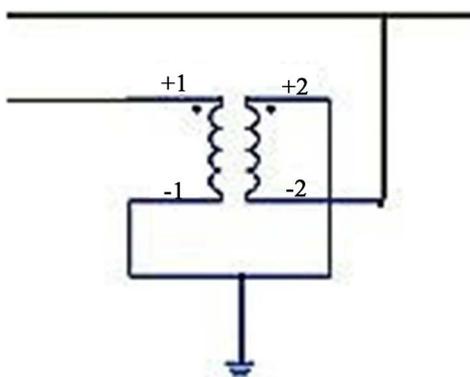


Figure 4. Converter 2 - 1.

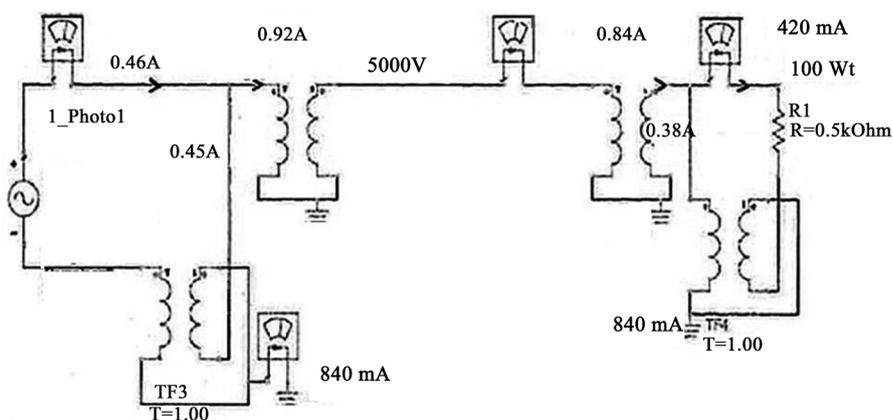


Figure 5. Pilot of one wire system example.

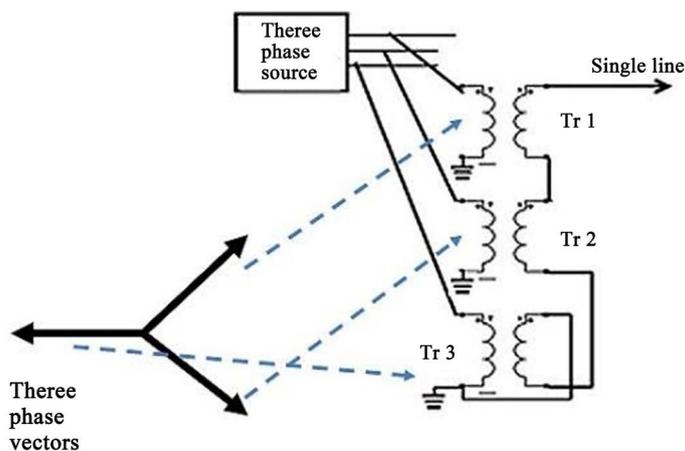


Figure 6. Converter 3 - 1.

[1] it is shown that voltage in one wire line equals linear voltage between two phases in three-phase system. The linear voltage equals 1.7 of phase voltage. Therefore, current in one wire will be by $1.7^2 = 3$ smaller than in one phase. This explanation shows that in one wire system one can use the same wire, as an equivalent to the three-phase system. This converter scheme can not only make a transformation to one wire signal, but also it can increase the voltage. So in one-phase system one does not need a separate transformer for increasing voltage. Therefore, using converter 3 - 1 does not increase system price. In case of receiving three-phase signal one can use converter in **Figure 7** [5].

And in case of receiving a DC signal one can use converter like in **Figure 8**.

4. Zeroing in DC systems [6]

The problems, which are being created by direct current flowing in ground, include:

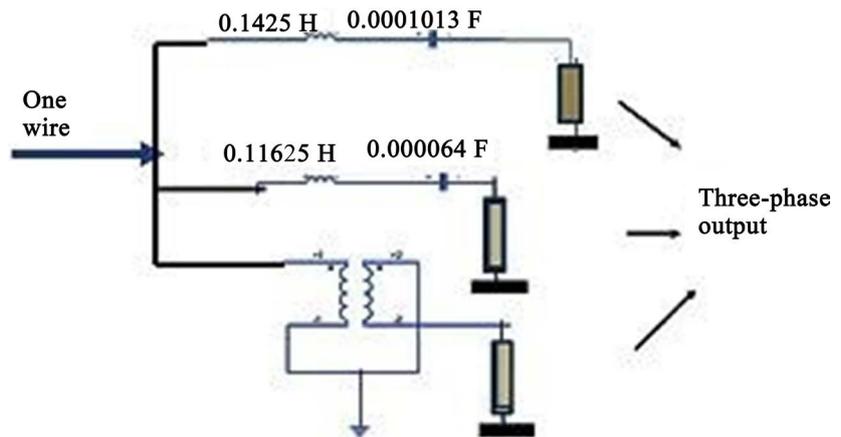


Figure 7. Converter 1 - 3.

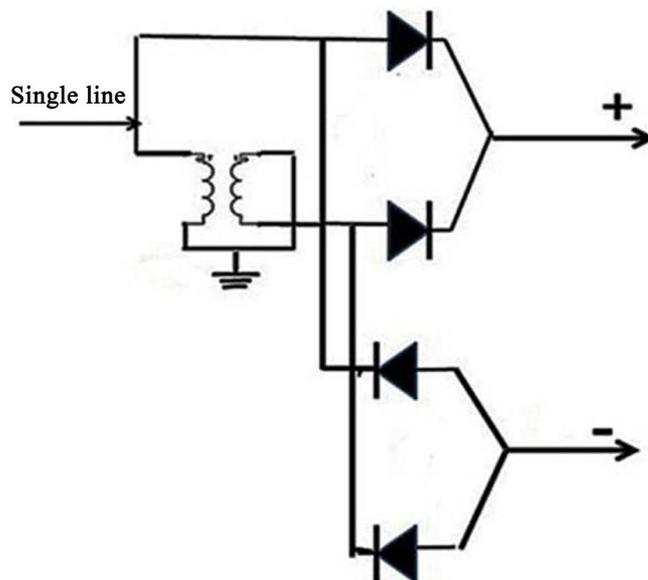


Figure 8. Converter 1 - 4 DC.

- Electrochemical corrosion of the long metal objects lay in the ground, such as pipelines.
- At usage of water as the second conductor, the current flowing in sea water can produce chlorine or somehow differently affect water structure.
- The current in water can lead to appearance of a magnetic field, which can affect magnetic navigation compasses of the ships sailing over the underwater cable.
- One more serious problem is the wandering currents.

The sources of wandering direct currents usually are ways of electric trains, groundings of direct current lines, installations for electric welding, systems of catholic protection and installations for deposition of galvanic coverings. The example of an appearance of wandering direct current because of a tram line, where steel rails are used for current returning to generating station.

Owing to bad contact of rails on the joints and insufficient isolation from ground, a part of the current enters into soil and finds ways through objects of low resistance, for example, through underground gas pipes and water pipes. If the pipe is protected by a nonmetallic covering, it aggravates the corrosive destruction, because in this case all wandering currents go out through defects in the pipe coating what causes the current density increase on the limited areas of the surface and accelerates pipe destruction.

In many sources, for example in

<http://forca.ru/stati/energetika/osnovnye-nedostatki-setey-vysokogo-napryazheniya-postoyannogo-toka.html>.

It is said that grounding of a direct current transmission line is connected with complicated and labor-intensive installation, as it is necessary to create reliable and constant contact with ground to provide the correct work, and for elimination of possibility of occurrence of the dangerous “pace voltage”.

The application examples of single-wire DC systems are power supply systems of amplifiers of optical cables, including and the amplifiers for underwater lines. For zeroing in the coastal zone, the drilling of some deep boreholes up to ground waters is performed. After that, the good conducting rods are being inserted into these boreholes. The more difficult schemes exist too. In

<http://forca.ru/stati/energetika/osnovnye-nedostatki-setey-vysokogo-napryazheniya-postoyannogo-toka.html>. It is given an example, that for the current of 225A it is necessary to use the rod of 33.54 m long.

Let us note that in various sources it is indicated that resistance of grounding on alternating current can be of the order 10 Ohm.

Zeroing at DC is a more difficult problem than at AC [1]. But proposed here the rectifier in **Figure 8** is working without zeroing. Its use will make city electric transport (trams, trolleybuses, autocars) much cheaper and will reduce their harmful effect on the space under the rails.

5. The Objections and Conclusions

It is obvious that principal change of a method of a widespread use can cause

numerous objections. In addition to just loud statements as for example a Chekhov's statement "It cannot be because it never can be" or "This is a perpetuum mobile". There were also correct questions as well. Sometimes we heard the following opinion: "You transmit all current through one wire. Therefore, it must have a big diameter and must be more expensive". However, this is not so.

Above and also in [1], it is shown that we can use a wire as one wire in a three-phase system, with which we are making the comparison. In a three-phase system, there is a linear voltage (between phases) and there are phase voltages. The linear voltage at the root of three is greater than the phase voltage. In the single-wire system, you can transmit through one wire a current with voltage equals linear voltage. That is, transmitting current with a linear voltage, we can transmit power three times more than in one phase wire.

So comes another interesting question. "In real three-phase systems, there are intermediate stations for compensating reactive power. How you can do this in one wire system." But in one-wire system, these expensive stations are not needed [1]. The proposed system is balanced despite the fact that it is single-wire. On each load, the phase difference regardless of the line length is always 180 degrees.

There are other questions as well, for example: "Why you are saying that a single-wire system can be an underground system, but a three-phase system cannot be an underground system?" Yes, a three-phase system cannot be an underground system because in the three-phase system a great distance must be provided between the wires. That is, for underground wiring, it would be necessary to build an underground expensive trench. For this reason, only single-wire system can completely free our planet from wires over our heads.

Another important problem can be solved in one-wire system. If you need giving all receiving to one-phase loads, you can give to all loads one wire signal and using convertors 1 - 2 like in Figure 4 but in the opposite inclusion. Each load will get own power. This method will not give losses from system disbalance.

But there are always people who always disagree as a well-known in Russia literary character. "On the mezzanine lived a draw grandmother who did not believe in electricity". Ilf and Petrov, Golden Calf.

Acknowledgements

Of course, one wire system is a drop in a bucket compared with the Theory of Relativity, but even a small improvement can be very practical and useful. The author thanks the experienced engineers Dov Eger, Igor Smakovsky and David Waiman for constructing models and testing the system and this text. I am also grateful to numerous opponents of the method for sharing their remarks, doubts and disagreements. I sincerely appreciate their input, which contributed a lot to the efficiency of our work.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

References

- [1] Bank, M. (2017) It Is Quite Another Electricity: Transmitting by One Wire and Without Grounding, Patridge.
- [2] Novikov and Molostvova, I. (2015) Einstein and Dostoevsky. <https://proza.ru/2015/03/07/2020>
- [3] Bank, M. (2012) Single-Wire Electric Transmission Line. US Patent No. 9608441B2US9608441B2441B2.
- [4] Bank, M. (2017) Phase Converter for Vector Conversion of Three Phase Signals. US Patent No. 10305289.
- [5] Bank, M. (2018) Electrical Energy Transmission by Several Wires and Reactive Power Problems. *Engineering*, **10**, 329-335. <https://doi.org/10.4236/eng.2018.106023>
- [6] Bank, M. (2020) Zeroing Instead of Grounding. *Journal of Energy and Power Engineering*, **14**, 33-37. <https://doi.org/10.17265/1934-8975/2020.01.004>