

# HUMANITY'S GREATEST UNSALABLE ITEM OF POWER ENGINEERING.

*“A discovery of some ingenious heating system is more important for humanity than the discovery of a new planet”*

*(Albert Einstein)*



**Foundation HOME&ENERGY**

I would like to enlighten you, the reader, for how long and with what consequences we have been using – as probably an averagely educated civilization – a perpetual physical phenomenon which is gravitation. This phenomenon (gravitation) and situation (explanation forthcoming) exists on every planet. Life on inhabited planets, including the Earth, existed, exists and will exist only thanks to the sun. Via sunshine, sun radiates and heats up the surface of each planet. On Earth we live in various geographical latitudes, in various climate zones and in changing seasons. Already for ages humanity has taken advantage of the Sun, which is shining and heating with its rays. In various cold climate zones and various seasons people were warming themselves up by burning open fires, and later via ovens and fireplaces. This process, which is still in use, is direct heating – the radiance of burning wood emits electromagnetic waves that heat objects which they come across, such as a partition for people and/or animals, and only secondarily from them (the encountered objects) air gets heat up.

This lasted until the first half of the 18<sup>th</sup> century, when during the years 1716-1744 the first water boiler and the first water heater were constructed, back then still by riveting and connecting lead pipes. In this manner began an era of **central indirect water heating**. This process made use of gravitation, which is a phenomenon, in which warm water or air from the lowest level where the boiler is, was rising to higher stories. That method was employed until the moment of the discovery of electricity, which was not until the year 1830. At that time began the era of the development of metallurgical industry. 160 years ago the first cast-iron radiator was cast. Over time pumps and compressors were constructed, which people started to use for central water or air heating in order to increase or reverse gravitational circulation. In such a way was born the most expensive, least efficient, energy-consuming, non-ecological, acting against the laws of nature, heating system that uses gaseous or liquid raw energy materials and which has been in existence for almost 250 years. The majority of people think that **heat rises upwards** – which, since the dawn of history was the biggest and the most harmful **nonsense**, including all its economic and climatic consequences.



A photo of a statue on the occasion of 150 anniversary of casting the first water heater (Samara, Russia).



*Please, take a look at a photo taken on an over-pass (Szczecin area, zachodniopomorskie) on a rainy and foggy winter day at noon. The light-board shows that the roadway is warmer (2,6 °C) than the air (0,2 °C). One doesn't have to have a technical education in order to understand how the age long process of direct heating works (of course we don't include here such factors as friction heat created by vehicles which are traveling on the road, which raises the temperature of the roadway by anywhere from ten to twenty percent). This phenomenon demonstrates humanity's obligation to put it to good use in a simple yet*

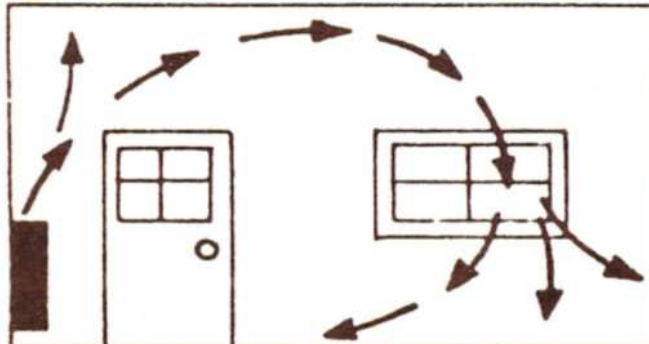
*inexpensive manner by heating of closed spaces.*

Theorizing – I think that if it were possible to confront how this problem was solved on other civilized planets, we on Earth would be disgraced in their eyes because due to the present manner of heating. Why did this happen and why is it still going on? I am of the opinion that we have forgotten what we were taught during our Physics classes. We allow the companies that produce central heating installation, and the architects – who are the least likely to reform and the least educated on that subject, but have the greatest respect of the investors – to manipulate us. Another possibility, due to the fact that electricity was discovered too late, and that 60 years ago people certainly didn't listened to an authority, a Nobel Prize winner, A. Einstein, who appealed on that subject, and who was of the opinion which proves true already in many structures, that:

*“in the future heating should be by radiation”  
(Albert Einstein)*

In those times, the economic situation and needs were very quickly taken advantage of by fuel distributors and producers of heating devices. Great family-run companies producing central heating boilers were created, whose production already should have been minimized 80 years ago. We should not allow that in the 21<sup>st</sup> century we are heating air in a house and losing energy contained in it under a ceiling through infiltration and ventilation (~40%) and increased investment costs in many cases for unnecessary increased forced ventilation and superfluous dry regeneration. It is time that we stop, for example, heating water for tea using gas on the 10<sup>th</sup> floor and waiting for more and more frequent gas explosions. Especially we should stop the installation of old-fashioned home heating using imported energy-producing raw materials, such as gas or oil (which is rationed on a global scale), and utilizes the least efficient system, which is water, indirect, boiler central heating, which heats the air in our homes indirectly, rather than finally achieving this with the help of radiators cost-effectively heating partitions, objects and people in houses. Mentioned above, raw materials today are – as one can see – a bargaining card, and at times a blackmailing card in the hands of politicians of many countries. On our planet, the only other older devices than a boiler are probably only a wheel and a crowbar.

Humanity has, in all other realms, for ~250 years made unparalleled progress. If someone would like to prove, that in current universal heating systems a lot was also achieved and would like to corroborate it by stating that currently there is a wide range of various colorful boilers, for example condensation, “thinking” of high efficiency. This efficiency, please remember, relates only to the hearth, and the heat circulation itself remained without changes for 250 years.



Drawing 1. Indirect convection heating

In an **indirect** convectional system (drawing 1.) heating takes place because of upward circulation of the warm air, which most often happens in a heating circulation as follows:

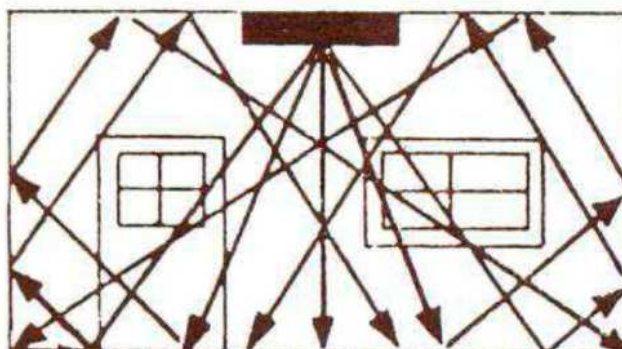
*raw material burned in a hearth → metal water coat of the boiler → pipelines with that water and fittings → radiator or floor with warm water → warm air flowing in the direction of the ceiling → only, arranging in layers downwards toward the bottom, “heat” reaches a person*

and in addition to this, without electrical energy this system doesn’t work, not to mention its **rolling costs** to produce this process.

In contrast to the above, the general rule of **direct radiant** heating through exchange of each raw energy material into electricity, including electricity from renewable and distributed sources, is as follows:

*raw material in the hearth of the boiler → steam in a turbine or in an engine with a current-generating generator → electrical cable → converter of electrical energy → radiator → human being*

In comparison to the first process, it is always less expensive and more efficient considering the fact that to this electrical energy we are adding energy from renewable sources.



Drawing 2. Direct radiant heating

By using direct radiant heating, heat is transmitted through radiation. After coming into contact with objects (walls, floor, furniture) although heat radiation undergoes a partial reflection, nearly 85% is absorbed and converted into heat energy – objects heat up (drawing 2). This “heat” is stored up longer in hard molecules than in water, and certainly more than in the air. The heat in the form of radiation is conducted back by convection, so the air is also heating up from objects. By using radiation heating we are reaching the same heat comfort level by a temperature 3°C lower than by convection heating, and this is a large savings on a global scale.

Please understand the magnitude of expense one incurs by engaging electrical energy in order to produce and put into service all the devices of the first chain. If we were today to put a boiler in a sequence with other surely more efficient energy converters and compare them, then, according to my modest knowledge, it would end up in last place; for example, nuclear reactor, heat pump, fuel cell, steam engine, internal combustion engine, electrical engine, solar cell, boiler, etc.

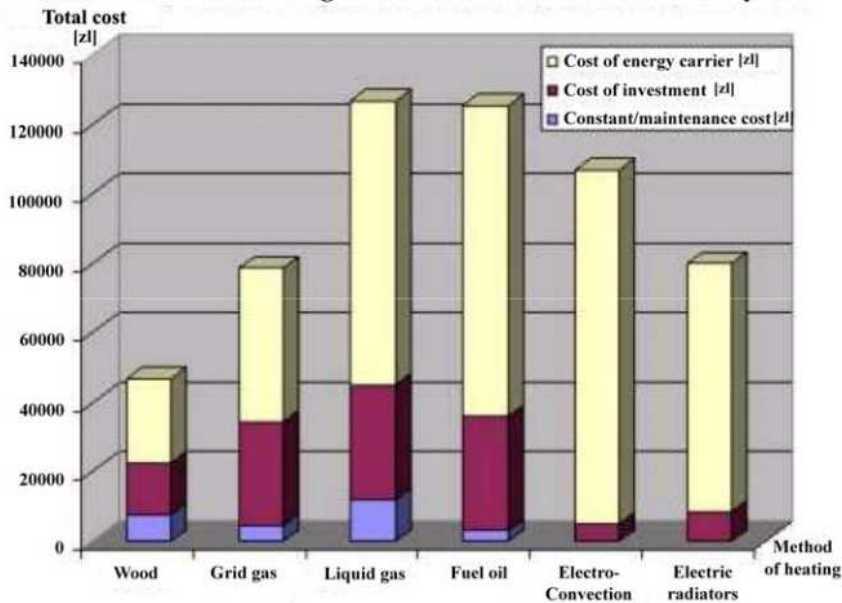
It is not difficult to notice, that I prefer electricity, even at a time when its price is increasing in an uncontrollable manner. Yes, this is true. But I would like to again direct the reader’s attention to the fact, that the **largest component in rolling costs** in the production of a boiler and the rest of the necessary elements for the current water central heating and its functioning is **electricity**. An additional gain would also be the fact that until now, ineffectively burned raw materials (such as gas and oil) in boilers, already for many years should have been burnt most dutifully in cogeneration (electrical-water generators), **but only for the needs of warm sanitary water**, and not for central water heating. In city agglomerations raw energy materials should be burned in heat and power stations. Electricity from cogeneration would be generated by radiant central heating, and the rest of the electrical energy would be sent to a grid, preferably to an island system grid, and warm water would be sent for sanitary purposes.

Even over 40 years ago one had to solve the problem of providing heating for people in the most extreme conditions, that is, on the orbit stations in space, where there is a lack of access to various traditional energy systems, and the most important thing is, that certainly indirect central heating systems don’t work efficiently, because there is no gravitation. This problem was solved by the Americans and later by the Russians and others, by heating up those objects directly by radiators using electricity from solar cells and fuel cells. At the beginning of the eighties, Americans began using this heating system on Earth.

In 1992 I established contact with a heating center in the USA. It was a company called AZTEC in Albuquerque, New Mexico, where electrical radiators were produced. They demonstrated to me then the superiority of radiant heating over other methods, including – popular in that area – air conditioning. To my question, “why do they employ only 40 workers,” they answered that “everybody must make money” – because they have their own gas and oil from Alaska. Nowadays, certainly not many heads of state, for example European or even Americans can answer in such a way. In Poland we also have our own liquid and gas (and coal) energy raw material. If our energy policy would be more thought-out and directed, and not driven by free market, and these raw materials obligatorily exchanged into electrical energy, and certainly if one would have returned to the old internal diversification, which is the production of gas from coal – we would probably also be self-sufficient and we would not banter with others about CO<sup>2</sup> emissions and about turning off our gas valve from the east.

From both our own and our foreign partners experiences, after almost 17 years of production and installation, we have proved, that with respect to electrical heating – **direct radiant is less expensive** in

**The full cost of heating a house with an area of 130m<sup>2</sup> for 15 years.**



comparison to indirect, universally-used water heating. As an investment, there is a 1000-1100 zł/kW cost of installation and assembly of radiators (1/3 of costs of indirect central water heating), and even if costs of utilization are presently equal to this, then according to our already many years of long experience, electrically driven direct radiant heating is still 30-50% less expensive than gas heating, not to mention oil heating and also electrical heating from convectors.

Our neighbors to the south, the Czechs and probably also the Slovaks were already able a long time ago to reform their outlook on this topic and introduce preferential tax rates for users of direct electrical heating. Also, the current Czech president, W. Klaus demonstrated his knowledge on this subject during his last heated public debate with representatives of the European Union. A few years ago, as Prime Minister, W. Klaus stated in private, that if he would build his house all over again, he would have heated it by electric radiation.

#### **Where do you get electric energy for that heating?**

The amount of electrical energy involved nowadays in production of all the central heating equipment – convectional, and its functioning is, as I already mentioned, **greater than the energy required for direct radiant electrical heating**. Even electric energy obtained from all renewable sources doesn't fully satisfy those demands. Please, verify that by charging someone with the task of calculating "rolling costs" of electrical energy consumption for manufacturing and operation of devices used for current, universal central water heating systems with the purpose of heating, and especially now, when in E.U. countries the demand for heating power is supposed to be only 35 W/m<sup>2</sup>. By good insulation of a building, central heating would then need only elevate the temperature in it by just a few degrees, and this is most simply and least expensively done by using electricity. One needs to contrast these costs against the costs of manufacturing of heating devices – electrical radiators. We could demonstrate for the reader an electrical radiator, which does not contain even a gram of metal, except some copper electrodes and a little wire powering a graphite resistor element. Also the damage risk of radiators is in the fractions of a thousand. One ought to cover the cost for the above calculation at an institution of higher learning or a science institute, from European Union funds, which are currently wasted for hundreds of reports, conferences and congresses. One ought to believe a person, who least of all needs to worry about heating; Bill Gates, when he twice attended meetings with Polish

decision-makers and industrialists affiliated to Biznes Centrum Club in Warsaw, said, “if all the money in the world, which comes in the form of taxes would be allocated for production of devices producing energy, then there would be an abundance in the world and there would be no unemployment.”

The conclusion of the above is very controversial – in order to lower the consumption of electrical energy and to reduce the greatly controversial harmfulness of the CO<sup>2</sup> emissions, one must give up the current production and operation of central water heating equipment – of course not in entirety – and instead transition to electrical heating, specifically to a radiant one.

#### **How can you lower the costs of already existing water or air-convective heating?**

- In general, exchange convectors for water radiators. There already are several such European firms offering these radiators (water as well as electric) on our market, for example a Swiss company by the name of Zehnder or a Swedish company named Foko. In a water radiator, the efficiency of radiation's emission in percentage relation to convection is 65% / 35% at 60 – 70 °C heating water. Electrical radiators emit 80% of heating energy in radiation, and 20% in convection. This is a very large savings in investment and utilization costs from radiation on a global scale. Currently water heaters have exactly the opposite ratio (20/80)%.
- In hotels, schools, military barracks, sanatoriums, hospitals, and other such facilities with year-long and twenty-four hour a day occupancy and with constant energy needs – where there are boiler rooms – substitute them for heating-electrical blocks (cogeneration). Water heaters should be exchanged for water radiators with the temperature of heating water 35-40°C in conjunction with a daily-weekly schedule temperature programmer for electric radiators which heat an object at a rate of ~40 W/m<sup>2</sup> and air mixers under the ceilings. If there is already working air conditioning then you need to supplement it with electrical radiators in the amount of 20 – 30 W/m<sup>2</sup>, then unquestionably disassembling any existing functioning water heating. If there is not one or the other system, install electrical radiators with a power of 50 W/m<sup>2</sup> plus mixers.
- In single family houses and apartments in multi-family houses where they have their own boiler rooms – lower the water temperature in the boiler to 35 – 45 °C for convectors that were exchanged for water radiators, and hang electrical radiators which work at 35 W/m<sup>2</sup> in the rooms. The regulation of temperature happens proportionally in straight time with even a bimetallic regulator separately in each room.
- All high-ceilinged spaces, that is to say, sports, public, and production halls, churches, aqua-parks etc, which until now were heated in a manner that brings discredit to investors and designers (they should be paying fines for it) since they heat with a warm air from below upwards, no matter if it is from the floor, water heaters or from the propulsion of air. One ought to exchange that heating for electrical radiant in the amount of 40 W/m<sup>2</sup> + mixers. Let me remind you of the catastrophe in the hall in Katowice. We have sent a written analysis of this catastrophe to the public prosecutor in charge of this case, we wrote that the **cause of this catastrophe was indirect water or propulsion heating** – without air mixers and in addition to that, shut off at night. Ponds and later ice fields formed on roofs. Were there electrical cables in gutters and did they provide heating? Was there an energy audit done on that building?
- In greenhouses and chicken farms working above the polar circle is yet another example of a heating system in extreme conditions. In the USA and in Sweden (Kiruna) greenhouses are heated at 200 W/m<sup>2</sup> with electrical radiators. Our suggestion for these buildings is an energy source from cogeneration, 100 W/m<sup>2</sup> in electrical radiators and 100 W/m<sup>2</sup> in pipes with warm water, underground, under the tables, or inside floors.

- As far as contemporary (current) architecture is concerned, it is high time that people who have a mediocre general experience in that area should not decide about the form and type of heating. They are the people least able to be reformed, such as architects (after completing one college semester course about sanitary and central heating) and government employees who issue permits for construction. Precisely those people, as well as university lecturers whose teaching relates to that line of business, should **be required** to go through training in order to design and to approve for production buildings which are using up not more energy for heating purposes than 35-50 W/m<sup>2</sup> at -20 °C outside and +20 °C inside.
- Football fields with a heated up lawn need electricity (it is purchased from the grid) for lighting up of the stadium, and the lawn is heated up by using a boiler. One ought to exchange boilers for energoblocks with power necessary for warm heating water.

By analyzing the above we conclude that **energy policy needs to be dictated**, and especially that which comes from renewable sources. Renewable energy needs to be concentrated around villages and housing projects – it needs to work in island systems. For wind-farm investors, it pays off to set up one or several wind towers near the above mentioned housing projects, where previously one would have set up yet another gas cogeneration in containers near already existing transformer stations, though not necessarily together. In case of waning of wind, such hybrid system would more steadily power the national as well as inner electric grid and there would be less loss of transmission. Warm water would then be brought to houses by two pipes, and electricity would be sold to nearby residents with a small profit, below the current price.

Humanity still faces solving a massive problem of storing electrical energy on a large scale, as well as obtaining energy from distributed sources – air and geothermal waters – and transforming it specifically into electricity. Additionally the Americans should make it fully accessible, or at least the technology of neodymium engines created by the engineer Tesla, which produces electricity.

I took the liberty to write the above comments after almost 45 years of work as a practicing power engineer/heating plant engineer, working in the industries of construction and heat energy production. I would not want, as many of my domestic and international partners, that our future generations were ashamed of us because they inherited such ill-advised and short-sighted energy policies, especially when they will run short of gas and oil, and particularly the brains of government advisers will run out of gas, which was visible at the last world congress in Poznan, as well as more recently in the media.

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