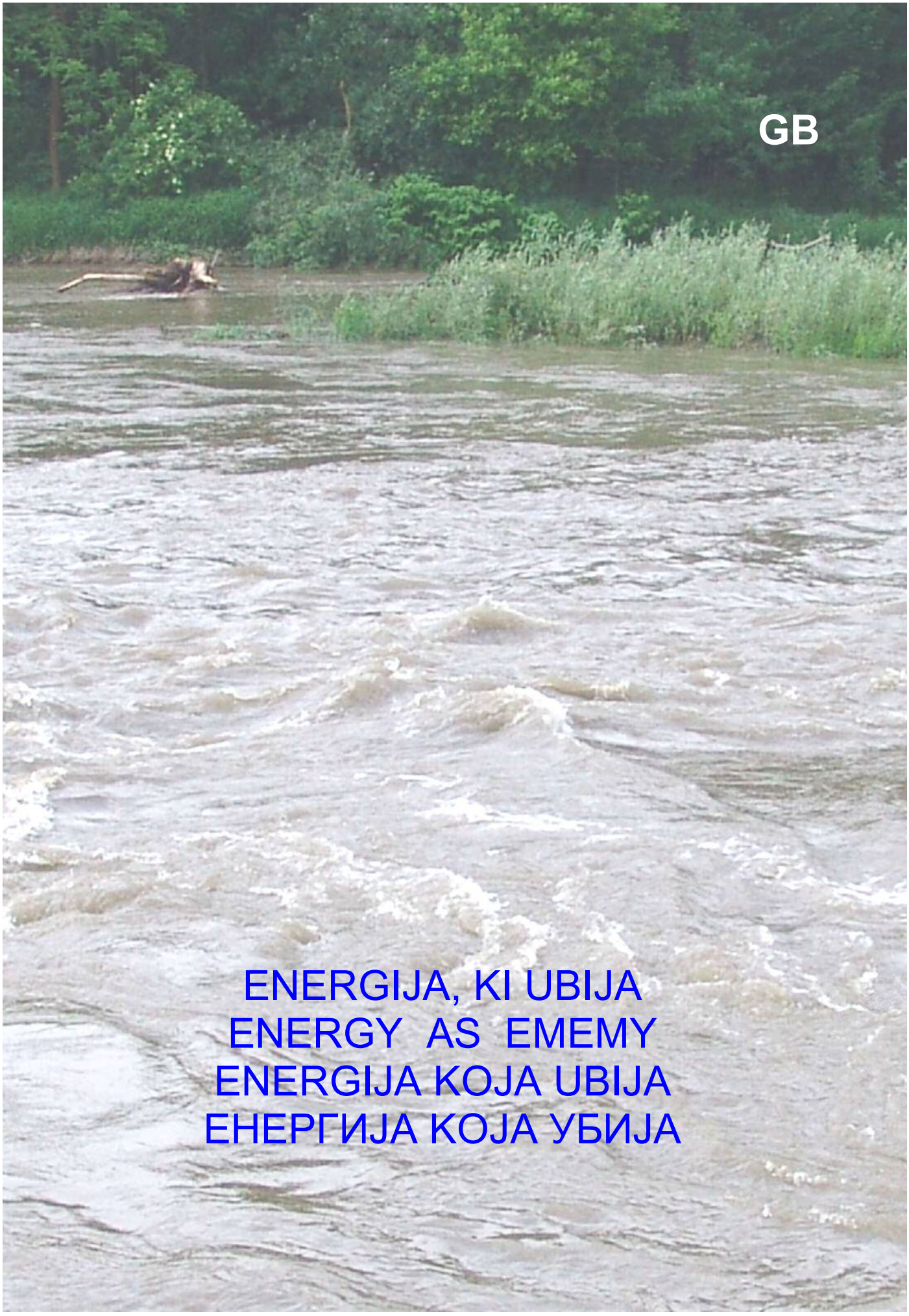


ENERGIJA, KI UBIJA
ENERGY AS EMEMY
ENERGIJA KOJA UBIJA
ЕНЕРГИЈА КОЈА УБИЈА

ENERGY AS ENEMY

In the past 150 years, combustion based power plants, cars, aero planes, and other human activities have pumped enough CO_2 into the atmosphere to raise its levels higher than they have been in at least - last 800,000 years. Regarding that, many governments are taking measures to limit emissions of carbon dioxide and other greenhouse gases. One way is through the Kyoto Protocol – which is an agreement between countries that they will cut back on CO_2 emissions. But more countries with highest emissions of carbon dioxide reject to sign it. Another method is to put taxes on carbon emissions or higher taxes on coal and gasoline, so that people and companies will have greater incentives to conserve energy and pollute less. But both methods will increase the common living expenses and between the people, they will not be popular.

The main human activity that emits CO_2 is the combustion of fossil fuels (coal, natural gas, and oil) to produce electric energy, although certain industrial processes and land-use changes also emit CO_2. So, the main source of CO_2 emissions for instance in The United States (a second largest CO_2 polluter - right after PR China) is electricity. Combustion of fossil fuels to generate electricity is the largest single source of CO_2 emissions, accounting for about 38% of total U.S. CO_2 emissions in 2011. To produce electricity, coal will produce more CO_2 than oil or natural gas.

Since the Industrial Revolution began – around year 1750, human activities have contributed substantially to climate change by adding CO_2 and other heat-trapping gases to the atmosphere. Whole process is not so simple because other heat-trapping gases (Methane, Nitrous oxide, NFC 23, HFC 134 a, etc) are not always created during combustion processes. But, consequently, due to temperature growing, melting of polar ice can very soon raise sea level for 2 to 5 meters or more. Most of the light energy from the Sun is emitted in wavelengths shorter than 4,000 nanometers. But carbon dioxide doesn't absorb the energy only from the Sun, because it does absorb heat energy released also from the Earth. When a molecule of carbon dioxide absorbs heat energy, it goes into an unstable state. It can become stable again only by releasing that energy. Some of the released energy will go back to the Earth and some will go to the highest layers of atmosphere. Increased temperature in very high layers of atmosphere, on the most of places on Earth surface is not easy even to measure. But, increased temperature on high atmosphere will course much faster local winds and super storms and with high winds displacements around the Globe it will ends on the coldest places - first of all on both poles where melting of polar ice is already raising local see level. Such scenario, which is no longer part of science fiction, but cruel reality - New York will turn to Venice – a flooded city. Knowing and expecting that catastrophe, in the State of New York they announced official plan to spent 50,000.000.000 US$ to built 4 to 6 meters high and up to 1.000 kilometers long wall against penetration of Sea to the city area. But what will be with other parts of the World or with islands like Maldives or other similar petite islands – simply, they will vanish. Emissions of CO_2 just in the United States were already increased by 10% only between 1990 and 2011. And today, CO_2 emissions are increasing a global temperature on North pole in the minimum range of 0,1º C in each single year.

Since the combustion of coal and other fossil fuel is the largest source of greenhouse gas emissions in the United States, changes in emissions from fossil fuel combustion have historically been the dominant factor affecting total U.S. emission trends. Changes in CO_2 emissions from fossil fuel combustion are influenced by many long-term and short-term factors, including population growth, economic growth, changing energy prices, new technologies, changing behaviour, and seasonal temperatures.

Between 1990 and 2011, the increase in CO_2 emissions corresponded with increased energy use by an expanding economy and population, and an overall growth in emissions from electricity generation. Atmospheric CO_2 concentrations have increased by almost 40% since pre-industrial times, from approximately 280 parts per million by volume (ppmv) in the 18th century - to 389 ppmv in 2010, 392 ppmv in 2013 and are to be expected as minimum 520 ppmv in 2050.

Prior to 2002, the incremental annual increase had never reached 1 billion new metric tons of CO_2. Since 2002, 1 billion incremental tons have been added three times: In 2003, 2004, and 2010. In fact, 2010′s addition of 1.58 billion new tons globally is the largest annual increase on record. The incremental increase over the past decade was at least 0.87 billion new tons on 4 other occasions. Fact is that global coal consumption is the largest contributor to rising CO_2 emissions. Asia Pacific is the source of 45% of global CO_2 emissions, and is on a growth trajectory to reach 50% by the end of the decade. In the U.S., coal consumption is on the decline because new supplies of natural gas are displacing coal in power plants, but there is question about large reserves of coal in U.S. which is in those days exported to other countries.

In the last decade, cheap gas in the US is forcing more US coal into export markets - to Europe and Asia. The shale revolution has catapulted the US to a cheap manufacturing centre, with "implications for Europe", which is increasingly uncompetitive especially with high energy prices. Europe is struggling with the high level of subsidies required to sustain its renewable energy sector, in areas such as wind and solar energy. Spain is nearly bankrupt due to subsidies on renewable energy. With the US benefiting from falling energy prices, electricity prices in the rest of the World will rise further, unless renewable energy schemes are revised. After replacements with gas, US coal export capacity could more than double to about 400 million tons by the end of the decade, with most of that growth aimed at the European markets. There are about 6,597 power plants in the U.S., 589 of which are coal-fired. Last year, coal plants accounted for 38 % of electricity produced in the U.S., followed by natural gas (29 %) and nuclear power (20 %).

Cutting of all global market negative interests between US, Europe, China, Russia, Australia and undeveloped World could not be possible because of egoistic interests of powerful multi national companies which are sharing their interests between profitable coal production, oil production, gas production and investments in renewable energy solutions. Simply speaking, they are not interested in for cheaper production of renewable energy systems because lower prices of renewable energy may disturb their prices and profits from coal, oil and gas. Therefore, every year, they are even investing a huge capital but, only to the most expensive renewable energy systems like TIDAL power plants, big Windmills and even in Photovoltaic because

electricity gained from such energy sources has much higher prices than energy gained from Thermal - combusting power plants.

Facing and recognizing that situation for which the rest of the human kind are powerless to do anything even in the situation that we know to which kind of catastrophe they are driving our future and the future of our entire Planet. Due to all mentioned reasons, many years ago, we found out that the only possibility and solution is to invent something different - renewable and ecologically acceptable energy system which will be able to offer much cheaper power then Thermo combustion power plants and even existing Hydro power plants can. Only in such case, market respond will be very easy: “Take cheaper because it’s cleaner too”.

Since year 2009th when we made first series of really good prototypes, to all big investors and producers of known energy technologies, we had sent more than 200 written information and invitations for cooperation based on our, much cheaper and much more efficient solutions for gaining cheapest and clean energy. Reaction? **We remained without any kind of – single, negative or positive - answer.** Simply speaking, apart from many others, this is additional prove that in fact, they actually do not want to produce any cheaper renewable energy but only to protect their profits which are coming from high prices of coal, gas and other combusting fuels.

Picture from October 2009th year: Smaller unit SP 1 on a concrete basement plate, during assembly on the bottom of a slow river stream near Ljubljana.

ENERGY AS FRIEND

Have you ever stood on the river coast, watching unbelievable quantities of water flowing near you every second, each minute, in hours, days, months and years? Can you imagine how much power we would need to stop this water moving, or how much energy we would need to move such water quantity by machine power?

As the first, let us check if slow river flows have enough of power and what is a volume of it. All following numbers belongs to known and "traditional" Physics:

Energy Density of Flowing Water - the water is treated as incompressible medium - has in Hydrodynamics very well known formula: EDFW (kW/m^2) = 0.5 x v^3. Regarding that, every square meter of cute section of river flow carries a power of:

7,8 kW – by water stream speed 2,5 m/second
13,5 kW – by water stream speed 3 m/second
21,4 kW – by water stream speed 3,5 m/second
32 kW – by water stream speed 4 m/second

Practically it means that in medium large river, with cross section of 75 meters and water depth of 3,5 meter, in any place of its cut area it is available for "capturing":

1,78 MW of power by water stream speed 2,5 m/second
3,41 MW of power by water stream speed 3 m/second
5,61 MW of power by water stream speed 3,5 m/second
8,40 MW of power by water stream speed 4 m/second

For example, if inside of mentioned river we place a solid Wall with dimension of 37,5 meters and high of 3,5 meters, water with stream speed of 4 m/sec will press on that Wall with Power of exactly 4,20 MW ! If we allow slow movement of that Wall (caused by water stream) its movement can be mechanically converted to produce a Power in range of 4 MW. Of course, this is only theoretical possibility because for longer movement together with water stream, mechanical designing of such "wall"-mechanism is nearly impossible. But described example is showing that, inside of slow water streams is more than enough of Power. Problem is, that traditionally known sources (turbines) for "capturing" of such – slow and "displaced" Power, are completely inconvenient. Regarding that inconveniency, the most of Hydrologists are not prepared to recognize that reason is in technically wrong "capturing" sources. For Hydrologist and even for many Physicists, is much easier to repeat (again and again), known rules which belongs to efficiency of known turbines which says, that Power depends from water quantity and "Head" (a height from which water is "falling down" on classic Turbine). So, if Head is very small, there will be no any significant Power. Therefore, by their opinion, in natural river body, water Head is very small and exploring of huge Energy which exist over there – is simply - not possible. Without having a proper "capturing" source, they are even prepared to say, that in slow moving streams, any kind of Energy does not exist at all.

But they know that Energy and Power are present. The only missing element is a proper technical source for "capturing" (and they are without any idea how to do it). In last decades, they started to use classic known turbines to get Power from slowly

moving water streams. Of course, those kinds of attempts are so expensive and low efficient that they will never be competitive sources as Renewable Energy alternatives. For example, Windmill propellers immersed in the water stream are total "joke" regarding Hydrodynamics because for several reasons:

- It needs very deep water (15 to 35 meters),
- Back sides of each propeller is acting like a "brake" against rotation,
- Very high design needs extremely strong and expensive fundament,
- Vertically placed turbine uses very short time of "touch" of the same molecules of water to turbine wings and in the meantime (between the wings), more than 15 times larger quantity of water remains unexploited and out of any use,
- The circular shape of Windmill propeller is definitely not offering any serious possibility to exploit energy from larger percentage of river stream (cut) area .

Therefore, by opinion of Hydrologists, huge amounts of energy which causes slowly movements of water masses we could not use – at least not with high efficiency. This is forcing them to build expensive and ecologically always very delicate dams and artificial lakes.

Often we do not realize that there are also other sources of energy much more expensive than conventional water resources. Let us compare some EU prices:

HYDRO POWER PLANT (HPP)

Investments required for kW of Power: approx. € 1,500 to over € 6,000
Production price obtained for each kWh of ca. € 0.03 to € 0.04
DISADVANTAGES: Often negative impacts on groundwater and the environment, the big Lakes are changing global landscape design and functionality, and above all, due to the configuration of the land, cannot be built on the most places where we need them. Present are also 6 -10 grams of Carbon footprint pollutions for each kWh.

PHOTOVOLTAIC

Investments required for kW of actually gained Power: approx. € 12,500
Production price obtained for each kWh of energy: € 0.5 to € 1.2
DISADVANTAGES: 16 to 30 times higher price for kWh comparing HPP, very low efficiency of photo cells which average do not exceed 17% of the theoretically possible, a large variation of energy gain as a function of the position of the Sun, changing the appearance of the global environment, and so on. Although the European situation we have available up to 750 W of solar energy from every square meter of surface (when a Sun is vertically above the cell) divided throughout the year and at all 24 hours a day, from a square meter of installed photocells we can receive in average only between 5 W and 9 W of constant power. Also, their production is polluting the atmosphere with ca. 60 grams of Carbon for each kWh.

WINDMILL

Investments required for kW of actually gained Power: up to € 8,000
Production price obtained for each kWh of ca. € 0.3 to € 1.2
DISADVANTAGES: 4 to 20 times higher price for kWh comparing HPP, ugly for environmental, a threat to birds, causing uncomfortable noise in particular, have a very low efficiency - for example, in most installations above the surface of the Sea does not exceed 18% in relation to the declared or installed capacity. So, installed 1 MW is giving 180 kW ! Their production is polluting the atmosphere with ca. 20 grams of Carbon for each kWh.

BIO POWER PLANT

Investments required for kW of Power: approx € 2,600
Production price obtained for each kWh of ca. 1 - 2 €
DISADVANTAGES: 20 to 35 times higher price for kWh comparing HPP, the investment is very huge, highly controversial due to environmental pollution of gas in particular, negative influence to hungry humanity because we are destroying organic agricultural products to reach very expensive and not really clean energy.

THERMAL (COAL-FIRED) COMBUSTION POWER PLANTS

Investments required for kW of Power: approx. € 1,200
Production price obtained for each kWh of ca. 0.08 to € 0.11
DISADVANTAGES: 2 times higher price for kWh comparing HPP, the greatest disadvantage of Thermal Power Plants is in the disastrous Earth pollution and especially in the atmosphere by CO_2. Present are also 270 grams of Carbon pollutions for each kWh, Similar are pollutions generated by the gas-fired Power Plants (180 grams) or liquid fuel-fired Power Plants (200 grams) for each kWh.

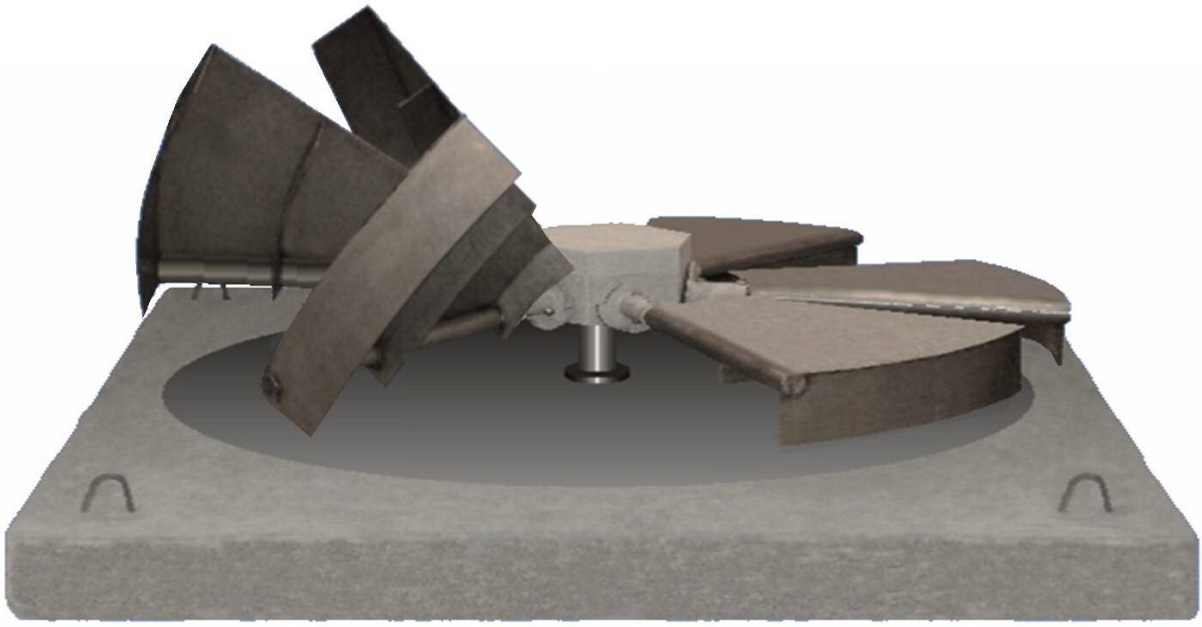
Regarding all mentioned facts, our only solution was to design **completely new type of capturing turbines**, able to extract energy from slow moving water streams. Using Idea (mentioned above) about “moving Wall”, after many years of experiments and development the SP turbines (Stagnation pressure turbines) were designed. On this project we have been working nearly 20 years (http://www.izumi.si).

The basic idea was very simple: The above mentioned "a big wall inside of water current" should be produced from two separate parts. Both parts would be placed on opposite sides around common vertical axis, but, each of them would have a possibility to rotate (for up to 90 degrees) around his own horizontal axis. Than, one “wall” will turn against water stream a very large surface area (coming from its high) as propelled area until opposite “wall” (which has movements against water stream) will turn against water stream the smallest area which is resulting from its thickness.

Complete design consists from at least three pairs of described "moving walls" and all of them are attached to one – main and vertically placed axle, which is fixed on the big concrete plate – placed on the river bottom. On described way, and regarding synchronized partly rotational movements (for 90 degrees) of each opposite placed “wall”, as result we are receiving a slow but continuous rotation of complete design around main and vertically placed central axle. Of course, with very large torque.

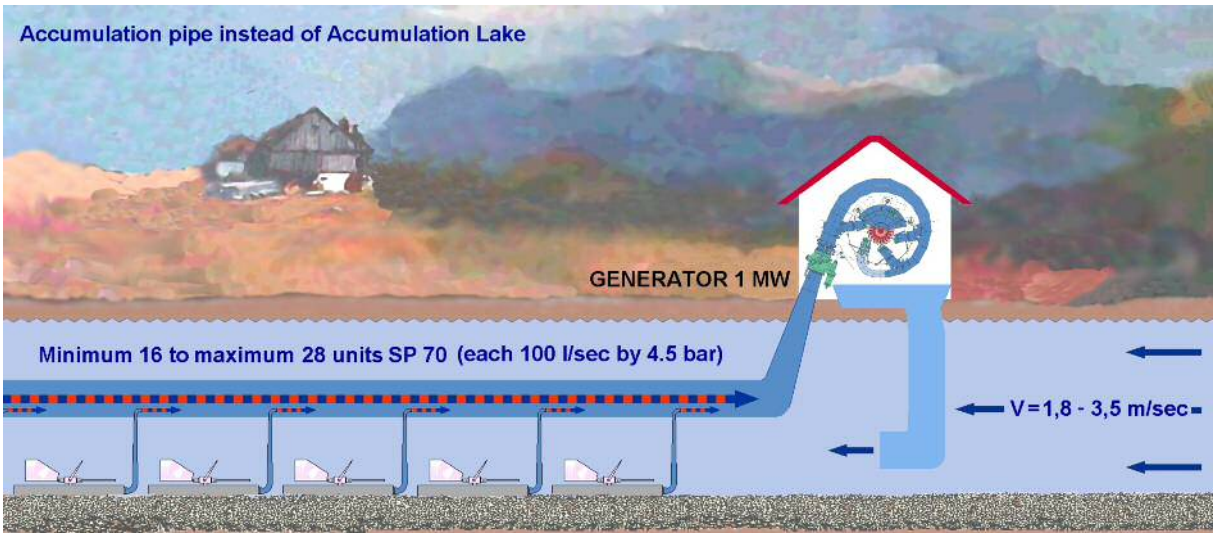
On described way, on the main vertically placed axis we are receiving a huge torque whose size depends on the speed of the water stream, surface of the "walls" and of course, the differences of surfaces of opposite “walls” - the propelled one and opposite one, which has rotation against the water current. On described way we received a possibility to convert a huge Power from water stream to rotation of main axle of SP system.

Differences in the area between largest and smallest “wall” by devices SP1 were relatively small - up to 10:1 and due to structural limits of this device we were unable to produce the overall diameter larger than ca. 7 m. Between 1993 and 2012, we have produced a large number of experimental prototypes, but because of structural constraints their greatest Power was realistically limited to ca. 80 kW.



Stagnation pressure turbine SP1 with diameter 2,4 meters

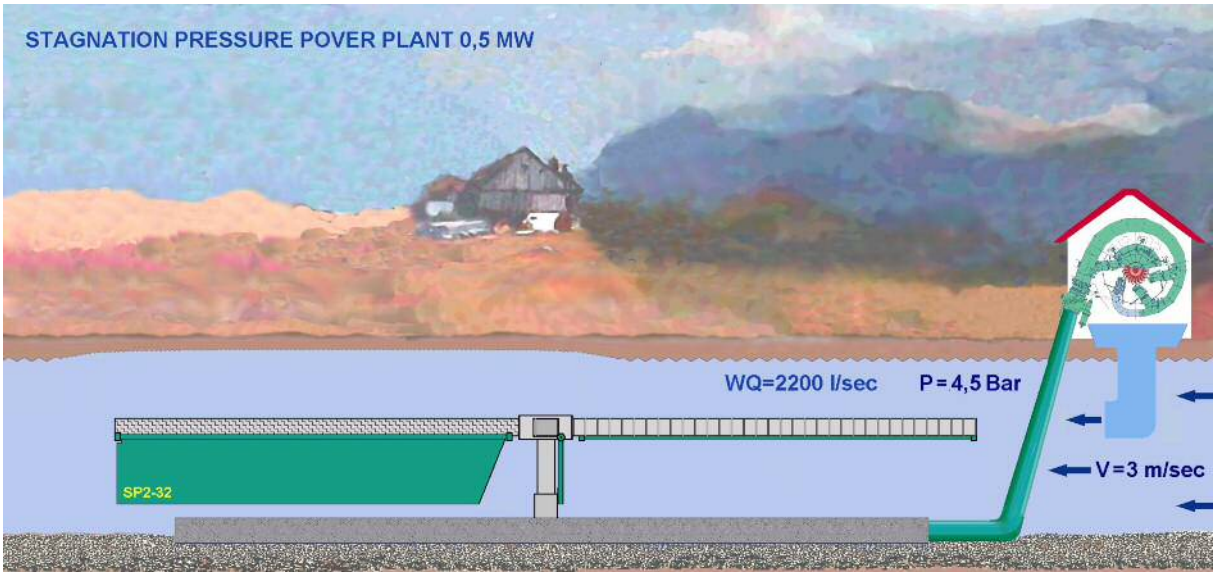
Apart from submergible (inside) generators, connecting more SP1 units equipped with water pumps we were able to connect more units in integrated system to produce even much larger Power installing classic driven Turbine and Generator in the small building on the coast.



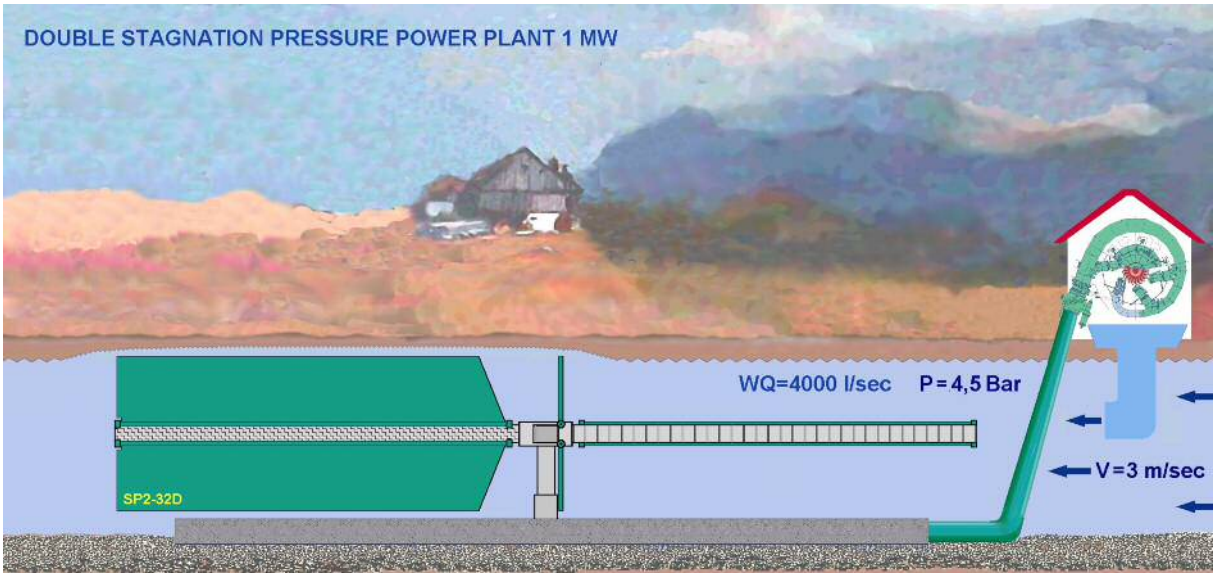
The newest SP2 units are extremely cheap, technically simple and designed to operate in river or see streams with life time - longer than 50 years. The units are placed on the bottom of the river or Sea, they are only 3 m high (instead of 15 to 30 meters - by known TIDAL units), but their horizontal diameter is large because SP2 are propelled on radial way and not like the most of other TIDAL turbines which are axially propelled. In that moment, let us remind you that European price (to public grid) is nearly in all countries at minimum 0,06 € for kWh. At the same time, price for Power from newest TIDAL units oversize unbelievable 3,5 € for kWh! Therefore, apart from smaller units for river streams, we made calculations and planes for large SP 2 units with 22 and 32 meters of diameter – very convenient to be used in larger rivers or as SP - TIDAL units:

SP 22 (1 single turbine); 300 kW of Power; costs 1 Million €; price for kWh - 0,018 €
SP 32 (1 single turbine); 500 kW of Power; costs 1,2 Million €; price for kWh - 0,020 €
SP 32 (2 single turbines); 1 MW of Power; costs 1,7 Million €; price for kWh - 0,024 €
SP 32 (1 double turbine); 1 MW of Power; costs 1,5 Million €; price for kWh - 0,022 €
SP 32 (4 double turbines); 4 MW of Power; costs 7 Million €; price for kWh - 0,021 €

In all described cases the Power generators are placed on the coast. Simply speaking, high tension electricity do not belongs in to deep water.



SP 2 units can be single or (when water is deep enough) double.

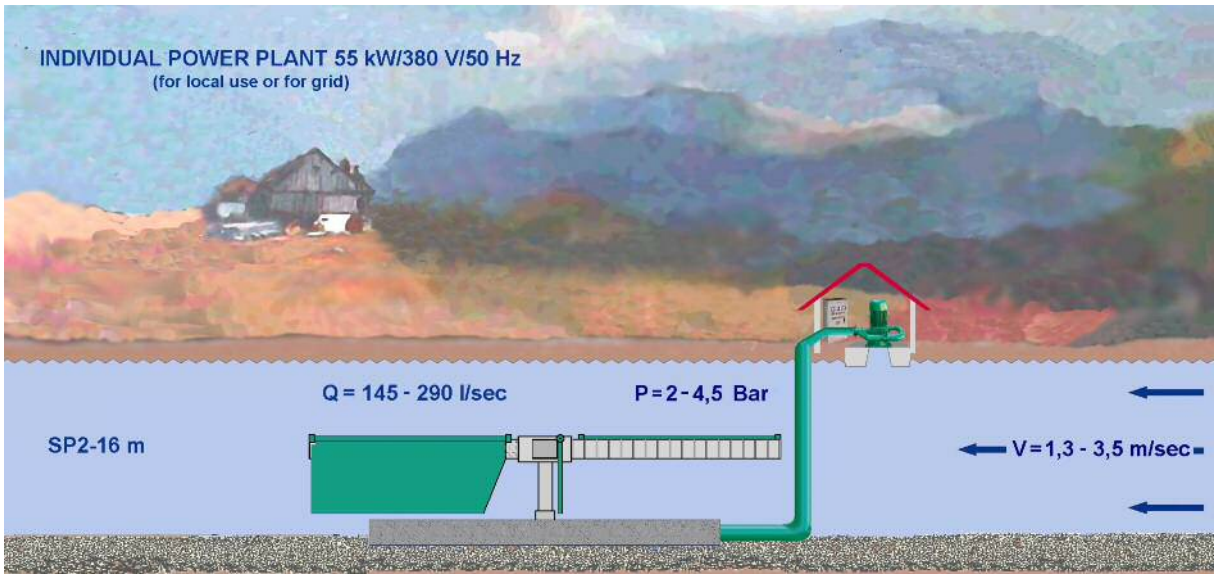


As an example, let us mention an interesting possibility: After the nuclear accident in Japan, Germany has decided to shut down all Nuclear Power plants which today produce nearly 13 GW of their power. All these plants are (due to cooling needs) always placed near by bigger rivers. So, if near any power plant of ca. 1 GW of Power, on the bottom of a nearby stream in three or four columns and the length of ca. 10 to 17 km we place the required number of double SP 2 devices (number depends from local stream speed) and underwater pipeline system to deliver pressurized water to Power Plant, with replacement of steam turbines with water

turbines, the entire infrastructure of Power Plant (which includes 50% of total costs) can remain in function. At the same time we can remove all radioactive and environmentally destructive and even dangerous elements and after that, we can acquire substantially cheaper electricity.

Total costs of such installation would not exceed the sum of 800.000 € per MW of gained Power - what is much less than the price of conventional construction of hydroelectric Power plants, which (due to the configuration of the land and required huge lakes and dams) on the most of those locations could not be build.

For individual users, we can produce also much smaller units which can also be used for home consumption of Power (including electric heating in winter time) or, like bigger units, can be synchronized and connected to the local public grid.



CRITICISM OF SP SYSTEM DUE TO WRONG UNDERSTANDING OF PHYSICS

Second objection regarding efficiency of SP units from skeptical people is grounded because of mixing of data which belongs to Aerodynamics with data which belongs to Hydrodynamics. For example, the most of them do not understand that definition that the **velocity becomes reduced when we impose a load** is correct only for calculations for water flow inside of pipe systems or for squeezable media like Air is, but has nothing to do with movements of incompressible and not squeezable water in free and open water streams. Why ?

Measuring the flow value of total energy of a smaller river stream ca. 10 m before large Millwheel placed in the stream and ca. 10 m after Millwheel will give us very unusual but serious absurd: Although the Millwheel is propelling electric alternator that produces 10 kW of energy or more, the water flow value (and speed of water) measured before the Millwheel are completely the same as measured after the Millwheel! This means that the Kinetic energy of water masses before and after Millwheel remains exactly the same! So, if Kinetic energy of water remains the same, what is propelling Millwheel ?

According to the laws of energy conservation, Energy can not be spent or nullified. It also can not be obtained from 'nothing'. Therefore, Energy can only be transformed from one form to another - completely or partly.

So, what we got: If the energy of water flow before and after the Millwheel remains exactly the same, where the Millwheel is obtaining the energy for its rotation? If obtaining Kinetic Energy from water masses then speed of water after Millwheel must be reduced, but exact measurements are confirming that this is not a case!

Opinion of even top experts on Hydrodynamics says that there is such small power consumption by the classic Millwheel that is not even measurable, but they are wrong. Why? For example, in the above-described small stream with some meters of distance between each other, we can put 10, 20 or even 100 Millwheels. If every one of them is propelling 10 kW strong alternator we can obtain even higher total energy than exceeding the total Kinetic energy of the stream. Even in that case, some meters behind the last Millwheel we can measure the same quantity or flow and the same speed of water (i.e. the same kinetic energy of water) as we find it before the arrival of the water to first Millwheel. We can find described evidences in the concrete channels for melioration, where are placed hundreds of smaller Millwheels with diameters and width of about 2 m and gaining total production of relatively high levels of electricity.

Speed of the water and its flow rate remains exactly the same before the first and after the last Millwheel! One Italian producer from Ravenna raises its Millwheels at a distance of ca. ten meters (see Figure 1) and in some cases of just 2 or 3 meters of distance from each other (see Figure 2). Despite all “classic” explanations, power received from each of them is exactly the same and water speed after the installations remains the same as by arrival on the first Millwheel!

Fig.1-water wheels during maintenance

Fig. 2- activated water wheels

It is clear that between velocity of the stream and quantity of water on one side and Millwheel on another side, there are some reliable physical connections. It is also clear that, if Kinetic energy of the water mass remains the same, Millwheel is actually getting Energy for its rotation – somewhere else.

So, on more than two millenniums on known Millwheel, where the speed and energy of water remains the same before and after Millwheel, is nothing clear or we must accept the fact that the Law of conservation of Energy - simply said – here is not valid!

But, let us remain on validity of Law of Energy conservation. To understand the paradoxes described above without resources, testing facilities and due to total ignorance from professionals being active with Physics, Hydrology or engineering, we were forced to find out the most important answers by our own. Fortunately, we meet the answers only through close observation and analysis of seen effects. First, we recognized a known fact that liquid water on arrival at the obstacle placed in the stream - rises in the upward direction. OK, it is logical because water is relatively non-squeezable media and is retreating to the direction of squeezable air, above water top level.

Very similar to described effect we noticed in the moment of arrival of running water on Millwheel paddle - in the moment when paddle started to sink in to the water. This effect - very similar to described before is perfectly logical and not very interesting. But at the initial observation, we recognized something much more interesting and much more important: Local rise of water level when reaching obstacle was after it immediately turned back on the previous level. But reaching a paddle of Millwheel, water level remains to be higher for much longer time, actually for all the time when paddle was shifted beyond the vertical shadow of the entire Millwheel cycle! So, under the vertical shadow of complete Millwheel some kind of “dome” was formed on the top of the water and if there was place enough on the sides of the wheel, “dome” was lower. But inside of very narrow canal it was even visually clearly recognizable! So, we find out the fact that lifting of the water (to up) was not caused only from Millwheel paddle when started to sink in to the water but also for all the time until each paddle was under the water level ! Consequently, all that means that paddles of a Millwheel are temporary changing the gravitational trajectory of the part of the water masses – changing it direction and lifting it (against Gravity) in to the vertical direction. So, based on the “Action and Reaction” rules, exactly the same dynamic Energy which was needed for temporary lifting of water masses to up is propelling Millwheel inside of the water stream. When water comes out from Millwheel “shadow” it falls down from a “dome” and Kinetic energy remains the same – before and after Millwheel.

Soon after exiting the "vertical shadow" of the Millwheel, by act of Gravity, the water level suddenly dropped to the previous level and speed and energy of the total water stream remains the same - as they were before touching a first paddle (flap) of Millwheel. So, where the Millwheel, draws energy for its rotation? Actually by the Energy of Gravity field of our Planet. How? Simply speaking, disturbing inertial, very little inclined trajectory of water masses and redirecting a part of water to move vertically - directly against main Gravity effect - weight. Energy spent for lifting water masses to up (to direction of Air) is equal to propelling Energy which a Millwheel is receiving for its rotation.

Described also means that the classic and for centuries known calculation (via kinetic energy of water) for the Millwheels is not correct at all, nor gives the correct result - unless you continue to defend the bizarre claim that according to completely unclear

reasons, the Millwheel has only 12% of efficiency! Actually, their efficiency is more than double, only that 50 % is spent for lifting of water masses to up and 50 % for propelling of Millwheel.

I believe that my last Patent application of SP2 system (with our “LADLE HANDS” pumping system), which was locally applied as P-201300018 at 25th of January 2013 (it is not published yet and I intend to protect it by PCT before expiring 1 year of grace period), is the most important invention referring Renewable energy sources in our days. It is offering 2 to 5 times cheaper electric power than classic Hydro Power Plants (and without dams and artificial lakes), is for 40 to 70 TIMES cheaper than Photovoltaic or Windmill installations by investments and nearly with the same relation – **40 to 70 <u>times</u> cheaper for each received kWh.**

Proper consideration of described phenomenon as well as at least some other phenomena encountered in Hydrodynamics, allows a number of very important lessons. Those findings are very important, because they confirms our assumptions, that even in a very slow moving rivers is present extremely high level of Energy which is due to rivers lengths and by its volume for hundreds of times larger than Energy we are exploring by classic known dams and artificial lakes.

FURTHER EXPLANATION REGARDING HIGH EFFICIENCY OF SP DEVICES

Many people are often unsure about how it is possible that so simple and logical designs as SP devices were invented so late – by the end of twenty century. The answer to this question is relatively simple:

Technical and technological point of view is showing us, that production of SP units was possible even in the first half of the previous century. But, in those times there was still a lot of free space to build long artificial lakes and dams, and there was no need to search for new solutions. At the same time, due to the relatively low efficiency of classic Millwheels and false interpretation of their inefficiency, Hydrologists started to believe that the slowly flowing streams do not carry any kind of Energy.

Additional explanation of high efficiency on SP devices:

When running propeller or other axial turbines, back side of each wing acts as a brake, because the water flowing past the wings is actually pushed aside from its natural – strait lines. This significantly reduces the number of revolutions of the entire system. By SP turbine which operate on radial way and rotates very slowly, the water is always quicker then wings. This cause very positive effect: In addition to "incompressibility", water also can not be "stretched" (in comparison to air). Therefore, after "overtaking" the wings, from the back side, water is also “pulling” the wings to the direction of water flow. This effect is actually increasing propelling forces for 40% to 65% (depending on design parameters). The result of this effect is the same as - if effective surface area of each wing would be increased for approx. 50%.

In the case of axial turbines, water pressure is acting on all wings simultaneously and

its efficiency would therefore have to be larger than by SP system, where the drive is active only on half of the wings. However, due to the “brake” effect on back side of the propellers, this advantage is completely deprived. On the other hand, on the SP turbines in the propelling "part", all three wings are more than 100 % active. Exact power on them is depending from their angular position in relation to the direction of water flow. However, the calculations and in particular, measurements confirmed, that in relation to the actual effective surface of the optimum is at an angle of 90 degrees in relation to the direction of water flow. Described two effects are realistically caused that from all three wings we are permanently receiving larger propelling effect than from two wings placed on 90 degrees – regarding direction of water flow. Here is important to remember than surface area of only one single SP wing is usually much larger than surface areas on whole three propeller wings on axial turbine.

First prototypes of SP1 units from 1993rd and 1994th year we placed on the ramps fixed on the river bank. With that, we were able to move them to the bottom of the river or to operate them highly under water surface top level.

Left: smallest SP1 turbine with diameter of 0,9 m on lifting ramp.

Right: larger SP1 turbine with diameter of 1,6 m on lifting ramp.

In most of the water streams, speed at the bottom is even slightly smaller than the speed of the water flow at the top, but the first tests of SP devices showed that their operation is more effective at the bottom of the stream as in the higher layers. This apparent paradox dictated to investigate the Physical reasons. It was also shown that the action of wings as a "wall" that is "trying to stop" a stream, actually comes to a partial effect covered by Bernoulli's equation valid for incompressible media – known as “Stagnation pressure”. Stagnation pressure occurs when stopping hydraulic fluid but also by attempting to stop hydraulic fluid in open water stream. Basically it is the sum of the dynamic and static pressure, resulting from the vertical pressure of water - by its own weight:

$$(Pa = 1\ N / m^2\ Pascal = 1) = 0.5 \times \rho\ v^2 + Ps\ (Pa)$$

Where the ρ – is density of water in kg/m³ and Ps – is static pressure at the site of measurement

During the action of SP devices any part of the water flow does not fully stop, but we find their increased efficiency when they act at a greater depth because from there they are “lifting to up” much larger mass of water.

POTENTIAL IMPACT OF SP FACILITIES ON ELECTRICITY PRICES AND REDUCTION OF CO_2 EMISSIONS IN ATMOSPHERE

Despite the manufacturing price of electricity which is generated from various sources, we can see that between producer prices and consumer prices we can find very big differences. The first reason is grounded with various sources from which Electricity is coming, and due to the reason that is necessary to equate some kind of average price. Despite the price of electricity produced in Hydro Power Plants of only ca. € 0,03 per kWh, the gross cost of Power producer usually ranges in the order of magnitude of € 0,06 per kWh.

Retail price to be paid by the individual user, is considerably higher. In the EU countries is currently performing at average of € 0,194 for kWh. The biggest part of other increase is for maintenance costs of distribution (long-distance high tension) and local networks – public grid. The biggest parts in some countries are high state taxes and some other fees which partly or completely remain at distributor. Practically we can see that there is also a third price that distributors are used in international sales of electricity. This rate in this moment does not exceed approx. € 0,04 for kWh. This price actually covers the costs of electricity generated from Hydropower Plants. But to pay for electricity generated by Thermal Power Plants, this price is already too low.

In one of the smallest EU country – Slovenia, there are nearly 400.000 private houses or other buildings, which, at least 6 months per year, needs heating. Due to the high electricity local prices (around € 0,16 for kWh), the heating is not making by use of electric Power, because of the significantly cheaper heating with Oil or Gas (at € 0,073 for kWh). The only cheaper source is heating with solid fuels that do not exceed the price of 0,04 € per kWh. Unfortunately, the heating with liquid and solid fuels is ecologically not welcome, since the individual heating systems usually do no has filtering devices for containments of dust parts and other toxic combustion products. They also cause devastating pollution of the atmosphere with CO_2. Assessment of the pollutions by individual heating systems is just in small Slovenia resulting with total energy output in the range of 3 GW and this is significantly more than the power of all, in Slovenia operating Thermo Power Plants. Emissions of CO_2 are causing a global warming of whole planet, what means that only in the next few years, the global changes of average temperatures will start destroying the most of existing conditions for human life on our Planet.

REDUCTION OF CO_2 POLLUTIONS IS POSSIBLE ONLY AFTER RADICAL LOWERING OF ELECTRICITY PRICES

Common use of cheapest electricity – available for all kinds of use and also for heating purposes – in this moment can be achieved only with the power received by Hydro electric power plants. Increasing of quantity from that renewable source we can easily reach by exploring of energy from slowly moving water currents from SP2 – river and SP2 - TIDAL units.

Due to growth of human population, unfavorable configuration of the soil and environmental conditions, available locations for the construction of artificial lakes

and dams are in Europe in most cases already exploited. But, measured in terms of total length of slowly moving river currents, we still have at our disposal a few hundred thousand kilometers of medium and large rivers. By invisible and ecologically almost ideal SP devices, placed on their bottom, by spending the lowest possible investments, the cheapest renewable energy, can be easily achieved. Not to mention that quantity of such Power can oversize existing Power production for several hundred times. Instead of today's well-known Thermal Power Plants, dangerous Nuclear Power Plants and highly-expensive systems for the production of renewable energy we can provide to consumers the cheapest possible energy and after replacing the most of car engines (up to 1/3 from all pollutions) with electric powered driving systems, we can stop with incensement of CO_2 emissions – before year 2050.

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