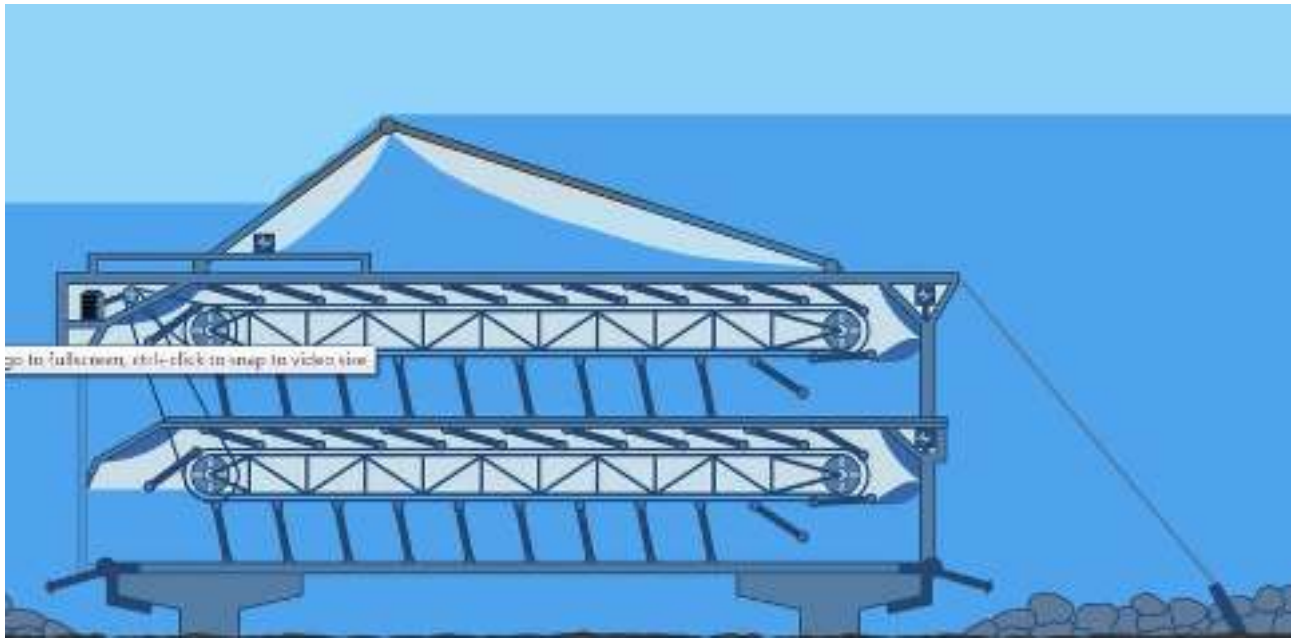
TESLA TECHNOLOGIES

BRIDGE TO THE FUTURE

Our Innovative Cascading HydroPower Plant Technology



2019

The field of technology to which the invention relates

The innovation presented here is a new concept of the tidal power use, the energy potential of the lowland rivers and the high waves that are splashing the seas or ocean coasts, and for the electricity production needs. Innovation predetermines the setting of a cascading hydroelectric power plant between the bottom of the river or the sea, two coasts or along the coastline, and the surface of the water. Such positioned cascading hydropower plant would have a barrier, which controls the slowdown and the flow of water through innovative hydro-turbines where the achieved water flow is used for the production of electricity, efficiently and economically. This way is achieved a technological system or an innovative technical wall, which with the barrier achieves the useful height of the water level "H." The technology is further used for waterway regulation, high water flow regulation, flood protection and against soil erosion. Technology allows automatic river self-cleaning from surface waste, permanent melioration of the wetlands and irrigation of fields and greenhouses without additional energy consumption.

Technical problem

The current technology of using the potentials of water level difference is already known, where high water is used, and faster water flow speed is achieved. Today, tidal hydroelectric power plants and hydroelectric power plants on lowland rivers are insufficiently used because there is no commercial technology.

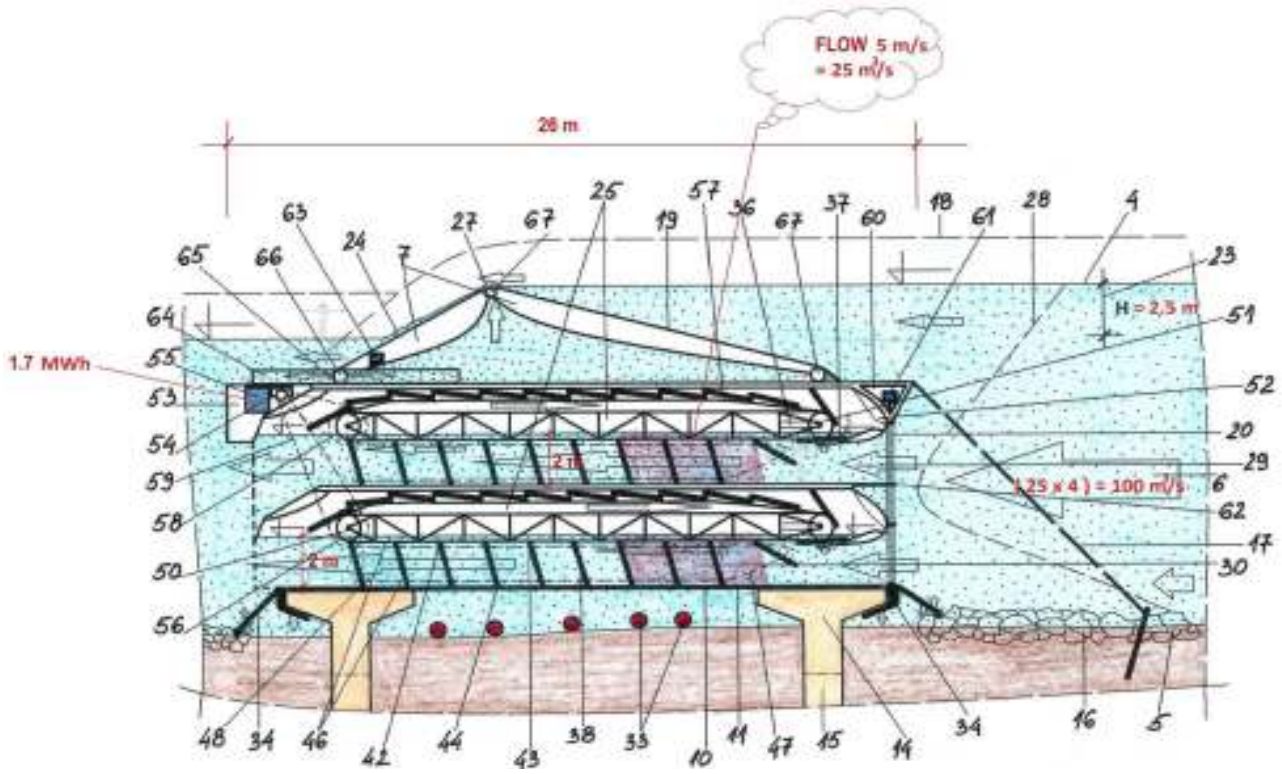
The existing hydro-turbine technology requires operation with at least a few meters of water height. Therefore the lowland rivers remained unused with the existing technology. Mostly, today are used the tidal hydroelectric plants using the classic dam to separate the suitable bay and capture the required water level.

As for the innovative solution for the lowland rivers, there is a patent WO/2013/136132 which deals with a similar problem of using low- speed water flow.

The technology is insufficiently worked out in the integration and working mode and is not commercially usable. So this innovation addresses the shortcomings of the existing solutions. Where the developing and advancing with an innovative approach is done, so that future technology is efficient and cost-effective in the application, maintenance, and overhaul. Innovative technology makes it possible to use a high amount of low-speed water flow in the best possible way.

Innovation resolves the position of the cascading hydroelectric power plant, which with the integration of the fixed innovative hydro turbines uses the minimum water flow for the efficient production of the electric power. At the small water difference and low water flow, the negative resistance that occurs during turbine operation is reduced this way. Among other things, this was achieved with the air pocket setting, the captured air at the position of the turbine paddle backflow.

Part of the patent, the mode of operation of the cascading HPP



In this solution, the hydropower plant can operate as a local generator connected to a local power grid. Production of electrical energy from cascading hydropower plant is realized in this way: Pylons (15) are fixed to the riverbed (5), on them are laid stripe foundations (14). Two cascading turbines are interconnected (10) and laid on stripe foundations. (14).

Achieved water height difference "H" (23) creates pressure to cascading power plant. Regulators (20), gradually leak water (6) towards pipes (29) of the turbine with rate of inflowing water (6) Water (6) inpipes (29) accelerates, paddles (38) of the turbine utilize it to convert to mechanical energy. A pressure of trapped air (25) prevents water penetration (6). This way, flowing water (6) is directed through a turbine pipe (29) where it is utilized on turbine paddles (38). The turbine paddles (38) on return path are moving through the air almost without any undesirable

resistance. A direction of the movement of a turbine paddles (38) is achieved by "U" profiles (46) and guides (47). Such a relation is balanced and stabilized with overflowing (27) water over the barrier (19). In this way, we accomplish stable RPM on electric energy generator (55). In total, pipes (29) have several times bigger volume than planned utilization of water flow (6) per second in the river. This enables that water flow potential (6) is maximally utilized almost to the turbine standstill by using software control.

When a cascading plant is in operation, one can observe overflow of a small amount of water like a waterfall, while the majority of water is directed through the turbine. The cascades are regulated by the building of an embankment made of metal net filled with locally sourced stone. A reduction is not necessary; energy is transferred directly to a generator shaft .

If it is a river flow in question, the water is used towards the drop of the river. Respectively, from a place at a higher altitude, towards the lower altitude. Today in the world through the use of this principle, many dams and locks have been built, which are mainly integrated into the river flow. Then the accumulation lake is made with the essential difference in the water height level, which is then mainly used for the production of electricity. The work of classic hydropower plants is being upgraded with the use of innovative cascading hydroelectric power plants, which are placed on the free positions in the downstream part of the river basin. With the downstream hydropower plant setting, the water level falls further below the dam, as water flows at a faster speed over the artificial water slope. Then the water height is leveled in the existing riverbed, just below the dam. Classic hydropower plants with this innovative technology are gaining greater productivity with the setting of a new artificial waterfall below the dam.

In proportion to the water flow in the observed river (m^3/s) !

Water flow in the river	Height of the cascade	1.5 m	2 m	2.5 m	3 m	3.5 m	4 m
5 (m^3/s)			0.07 MWh	0.08 MWh	0.10 MWh	0.12 MWh	0.14 MWh
10 (m^3/s)		0.10 MWh	0.14 MWh	0.17 MWh	0.21 MWh	0.24 MWh	0.28 MWh
20 (m^3/s)		0.21 MWh	0.28 MWh	0.35 MWh	0.42 MWh	0.49 MWh	0.56 MWh
30 (m^3/s)		0.31 MWh	0.42 MWh	0.52 MWh	0.63 MWh	0.73 MWh	0.84 MWh
40 (m^3/s)		0.42 MWh	0.56 MWh	0.70 MWh	0.84 MWh	0.98 MWh	1.42 MWh
50 (m^3/s)		0.52 MWh	0.70 MWh	0.87 MWh	1.05 MWh	1.22 MWh	1.40 MWh
60 (m^3/s)		0.63 MWh	0.84 MWh	1.05 MWh	1.26 MWh	1.47 MWh	1.68 MWh
70 (m^3/s)		0.73 MWh	0.98 MWh	1.22 MWh	1.47 MWh	1.71 MWh	1.96 MWh
80 (m^3/s)		0.84 MWh	1.12 MWh	1.40 MWh	1.68 MWh	1.96 MWh	2.24 MWh
90 (m^3/s)		0.94 MWh	1.26 MWh	1.57 MWh	1.89 MWh	2.20 MWh	2.52 MWh
100 (m^3/s)		1.05 MWh	1.40 MWh	1.75 MWh	2.10 MWh	2.45 MWh	2.80 MWh
150 (m^3/s)		1.57 MWh	2.10 MWh	2.62 MWh	3.15 MWh	3.67 MWh	4.20 MWh
200 (m^3/s)		2.10 MWh	2.80 MWh	3.50 MWh	4.20 MWh	4.90 MWh	5.60 MWh
250 (m^3/s)		2.62 MWh	3.50 MWh	4.37 MWh	5.25 MWh	6.12 MWh	7.00 MWh
300 (m^3/s)		3.15 MWh	4.20 MWh	5.25 MWh	6.30 MWh	7.35 MWh	8.40 MWh
400 (m^3/s)		4.20 MWh	5.60 MWh	7.00 MWh	8.40 MWh	9.80 MWh	11.20 MWh
500 (m^3/s)		5.25 MWh	7.00 MWh	8.75 MWh	10.50 MWh	12.25 MWh	14.00 MWh
600 (m^3/s)		6.30 MWh	8.40 MWh	10.50 MWh	12.60 MWh	14.70 MWh	16.80 MWh
700 (m^3/s)		7.35 MWh	9.80 MWh	12.25 MWh	14.70 MWh	17.15 MWh	19.60 MWh

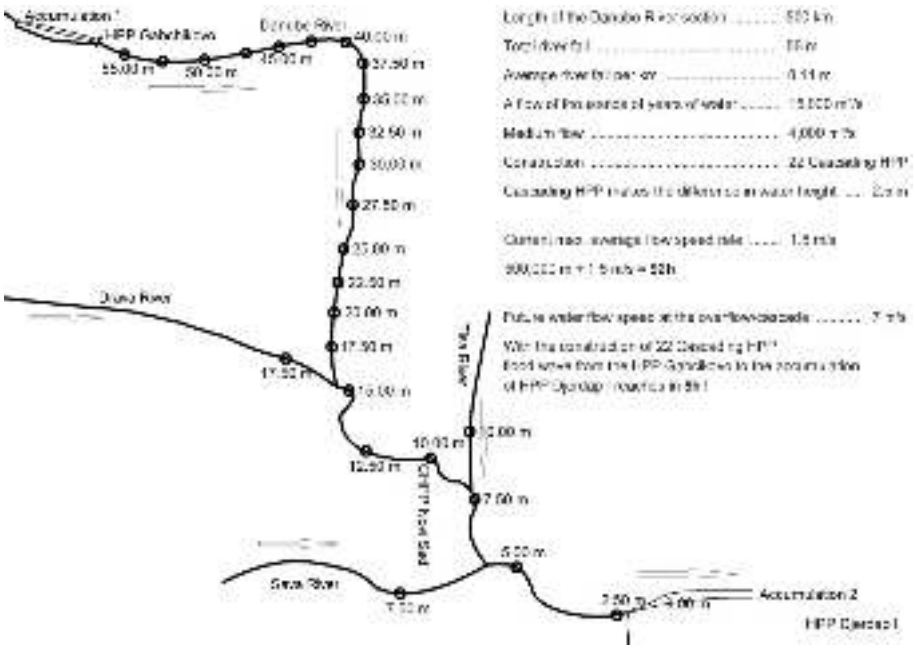
Cascade Hydroelectric Power Plant produces electricity in one-hour mode (MWh) !

Today's use of water resources on the planet is mainly at the place of residence and work of a highly-developed society, which also requires a large amount of electricity. The disadvantage is that suitable locations have already been exploited and that there are less and less available water resources. This innovation is partially solving those issues, where the insufficiently exploited resource of tides, lowland rivers, and high waves, are used in harmony with nature and for the environmental improvement and nature preservation.

With the addition of the innovative technology described above, besides the primary purpose of the hydroelectric power plant, it opens the possibility to technically adjusts for the solving of flood waves in the river basin and flood protection. Respectively, for the regulation of the uninterrupted navigability in the river basin during the year as well as the necessary measures, where the designed and implemented barriers then set their lines to protect the cities on the coast from the effects of high waves and floods. Example, the coastline of New York, Shanghai, Tokyo, and the Netherlands. So caught high-waved water is periodically collected along the shore when the waves are pouring over the set barrier and then its used to produce electricity.

By applying the innovative technology described here, nature is cleared of pollutants, the riverbed is automatically cleansed from the floating waste at the cascading dam position, as described further. The future of electricity generation is thus in ecological regimes, human and natural health is not disturbed, yet urban planning has been wholly regulated and improved.

Parts of the patent, flood control management



Picture 2. A view from the top of the Danube River Basin, a possible location for the construction of 22 cascading HPPs in the existing river bed, all per the invention. By building 22 artificial waterfalls in the riverbed, the water would be quickly shifted down the river where the use of technology would prevent the formation of a flood wave. The cascading HPP Novi Sad is highlighted, whit the detailed description. Such arranged riverbed does not have quick water flow, the eroding of the shoreline and the riverbed meandering is protected.

The Danube River Basin; a possible location for the construction of 22 cascading HPPs in the existing river bed, all per the invention. By building 22 artificial waterfalls in the riverbed, the water would be quickly shifted down the river where the use of technology would prevent the formation of a flood wave. Such arranged riverbed does not have quick water flow, the eroding of the shoreline and the riverbed meandering is protected. The HPP Gabchikovo is now working with a 17.5 m water column, due to future regulation of river beds, the water level further decreases by 1.5 m below the dam. This way Gabcikovo HPP would use the existing technology with a water drop of 19 m, where production would increase by 8% or an additional

200 GWh per year. The same is with the HPP Djerdap II, where the increase in electricity generation would be even more significant. The waterway is regulated, land melioration is done, the possibility of channel irrigation and drainage, water stops overnight without the necessary biological minimum flow.

An example of heavy rains in Austria, the Danube River collects water in the reservoir of the Gabcikovo HPP. The flood wave is now traveling towards the delta with the max. a speed of 1.5 m/s. On the river length of the 2,000 km, it is approximately 370 hours. By constructing the described 34 cascading hydropower plants, controlling the discharge into three existing reservoirs, the water would immediately be transferred from the cascade waterfalls to the other cascading waterfalls. The flood wave from Austria through the existing river bed in the length of 2,000 km travels to the Danube Black Sea delta in less than 24 hours.

Cascading Hydropower Plant advantages:

1. A significantly simpler and faster construction principle than a conventional hydroelectric power plant, typical construction with industrial parts
- the same or lower construction cost than the wind power plants, with higher electricity production, mainly during the day when its needed the most
- almost insignificant carbon footprint and other negative impacts on the environment in comparison with other technologies and their construction and production procedure
- much less disturbance of the neighborhood in which the building zone is located, which gives a better picture of the project and its contractors

2. Regulation of the water flow with precise water level height regulation throughout the river basin with a series of cascading HPP - flood prevention and protection
- a number of cascading plants are quickly and efficiently shifting and solving a flood wave, and in that way, the area is easily and without additional cost being protected from high waters.
- no more erosion of soil and loss of valuable agricultural land and natural birds (and other animals and insects) habitats along the river

- additionally, vulnerable fish habitats (due to drought or low water levels in the tributaries) and natural fish hatcheries can be provided with additional fresh water in the most urgent and needy times for the fish, and therefore improve the restoration of the fish fund
- the new river meandering is stoped, and therefore, the border areas where the river is a natural state border are better secured and regulated

3. Much more oxygen in the water that has a positive effect on the fish fund and other flora and fauna

4. Necessary water cleaning from the growing problem of plastic and pollution of nature by its decay and the toxicity it carries (extremely bad influence on fish that eventually mutate from male to female and this way we are losing fish stock and their natural balance that will have catastrophic consequences). An additional possibility of purifying water from other pollutants, whether it is about microelements or other bulky floating waste.

5. The possibility of simpler irrigation of surrounding agricultural resources

6. Possibility to use waterways with safe navigability throughout the whole year

7. Possibility to build tourist attractions with facilities and contents on the water such as kayaking, rafting, etc.

8. An additional option (with our patented technology) for organic fish farming in areas between cascading plants