

# Technology Demand Survey

## 1. Project objectives and contents

Project Title	Method for generating electricity using both waterpower generation and pumping-up power generation of low head, equipment for generating electricity, and flood control system using these method and equipment.
Objectives	Developing method for generating electricity using both waterpower generation and pumping-up power generation of low head, equipment for generating electricity, and flood control system using these method and equipment.
Contents	<p style="text-align: center;">Domestic</p> <ul style="list-style-type: none"> <li>◦ The researcher is to develop and produce hydraulic model based on purpose and to install it in Korea and supply hydraulic model to 3 foreign institutions. Research and development items for producing hydraulic model are as follows. <ul style="list-style-type: none"> <li>· Additional research and development for siphon pipe line (We did fundamental research for 30 years)</li> <li>· Additional research and development for water tank of vortex generation (We did fundamental research for 5 years)</li> <li>· Additional research and development for advanced concept of water jet engine (We did fundamental research for 3 years)</li> <li>· Additional research and development for advanced concept of Hydraulic Turbine (We did fundamental research for 2 years)</li> <li>· Selection and improvement of dynamo and electric condenser (We did fundamental research for 1 year)</li> <li>· Outsourcing production of distribution and control panel (We did fundamental research for 1 year)</li> </ul> </li> <li>◦ Kinds of system for hydraulic model are as follows and required flood control system will be decided by domestic and foreign institutions after a discussion. <ul style="list-style-type: none"> <li>· Hydraulic model of flood control system which controls amount of drainage by waterhead energy of rainfall <ul style="list-style-type: none"> <li>- Hydraulic model for prevention system of reservoir overflow</li> <li>- Hydraulic model for waterway system having up and down curve</li> <li>- Hydraulic model for securing water resources and for increasing dissolved oxygen</li> </ul> </li> </ul> </li> </ul>
	<p style="text-align: center;">International</p> <ul style="list-style-type: none"> <li>◦ The role of foreign institution is to select multipurpose hydraulic model after having a joint meeting with a domestic institution deciding 3 kinds of hydraulic model system and to select a site to install the hydraulic model system.</li> <li>◦ Then, the role of foreign institution will be to design layout and to carry out field installation of the hydraulic model and the flood control system selected. <ul style="list-style-type: none"> <li>· Sub-structures for equipment to be installed for the hydraulic model are an open channel, siphon pipe lines with cavitation prevention holes, a circulating water tank, velocity increase equipments, waterwheel generating equipments, condensers and distribution and control panel. Additional structures may be added based on purposes of the systems. For example, in case of main production of electric generation, transmission facilities will be included.</li> <li>· Choosing kinds of systems based on its purpose will be co-selected by foreign and domestic institutions after discussing with local nations considering the site.</li> <li>· Kinds of systems based on its purpose and system structures under purpose of these kinds of systems include an advanced concept of drainage controlling system, a motor control circuit of water jet engine that is operated using water pressure of the drainage controlling system, an advanced concept of water pipe line system and atmospheric siphon pipe line (comprised of water pipe line, cleaning opening, siphon pipe line, and cavitation prevention hole), and securing system for water resources and automatic aeration device damper and air nozzle.</li> </ul> </li> </ul>

## 2. State of the art in research and development

<p>Necessity of the proposed project</p>	<p>There exists water resource energy of large streams that run by low speed or by low head, largely at the river, stream, dam, reservoir, and shore. However, this energy is barely used except for partially small hydraulic power generation. The reason for little use of large stream water resources in large scale is slow speed of the water or low water head.</p> <p>In order to make use of the slow speed hydro energy, there is a desperate need to develop equipments and method to make water flow fast. And, in addition, with the need from the following 2 aspects, development for the technology of the present suggestion is important and needed by every country.</p> <ul style="list-style-type: none"> <li>◦ Due to the danger of the global warming and radioactivity, thermal power plant and nuclear power plant construction are avoided. Even though building a water power plant should be continued in Korea which has many mountains and a great deal of precipitation even though it requires high costs. With nature and ecosystem destruction emerged as a major problem, currently the construction plans of an additional power plant are mostly cancelled. Accordingly, instead of building a high waterhead large volume of power plant, there is an increasing need for technology development for building water power plant and pumping up power plant with low costs using existing hydraulic structures.</li> <li>◦ In addition, recently, abnormal climate change, flood, severe rain storm, El Nino, and localized heavy rainfall due to global warming make the maximum precipitation exceed the drainage design value of all the hydraulic structures and cause all kinds of flood problems like overflow, collapse, flood, and inundation, etc. However, even with expensive flood prevention plan in order to build overflowing prevention construction, it is hard to say that sound prevention facility exists (really existing problems in Korea), because it is impossible to forecast amount of heavy rainfall, time and zone.</li> </ul> <p>Hence, with highly increasing of the severe torrential rains, there are urgent needs arising for development of the new flood drainage system, new waterway system, and new water resources securing system that enables controlling the drainage according to the amount of rainfall, using the waterhead energy of the rainfall.</p> <ul style="list-style-type: none"> <li>◦ Its purpose is to increase the reliability by winning a contract in <u>power plant and plant construction of multipurpose hydraulic system</u> from the ordering organization by installing the hydraulic model which is the prototype of the development and is installed at the river site, by experimenting hydraulic model and by developing the design that are more optimized to the law of similarity.</li> </ul> <p><u>Korea</u></p> <ul style="list-style-type: none"> <li>◦ Looking into domestic technology development trend and literatures that are related to waterpower generation and management of water resources which are the bases for this technology proposal, the number of domestic patent literatures is about 1,229 and non patent literatures (thesis, report) are about 4723. The trend of new and renewable energy technology development in water power field can be largely distinguished and divided into technology considering environment and ecosystem, and technology securing economic feasibility and efficiency enhancement through combining or improving existing technologies. Also, these kinds of technology developments were commonly about components related to waterpower, technology of coating raw materials for life extension of materials, improving control algorithm and enhancing efficiency through automation, and securing reliability.</li> <li>◦ When looking at the field of waterpower generation into tidal power generation, pumping up power generation, and small hydraulic power generation, there are limits in proceedings tidal power generation and pumping up power generation, due to the environmental problems arising out of location condition and large scale of public works. On the other hand, research in technology development of small hydraulic power is active in that it can easily be applied to stream, water pipe, heated effluent of a thermoelectric power plant, agricultural reservoir, and terminal disposal plant of sewage.</li> </ul>
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Current Research Activities	<p><u>International</u></p> <p>° Looking into international technology development trend and literatures that are related to waterpower generation and management of water resources which are the bases for this technology proposal, the number of international patent literatures is about 3,119 and non-patent literatures (thesis, report) are about 32,392. The trend of new and renewable energy technology development in water power field are very similar to that of the domestic (Korean), when looking at the technology difference level with Korea, in case of small water power generation, there is small technology difference between international and Korea resource investigation and utilization technology. However, the technology level difference in core technology or waterwheel design technology, performance measurement and certification technology field are comparatively outstanding in international rather than Korea.</p> <p>° Among the fields of waterpower generation including tidal power generation, pumping up power generation, and small hydraulic power, there are difference in the concentration field according to the each country condition. For instance, in small water power generation, compared to the developed country, developing countries (especially, China) are more actively developing and applying. And in case of countries where there is a big tide, research and development for tidal power were active.</p>
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### 3. Administrative Information

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