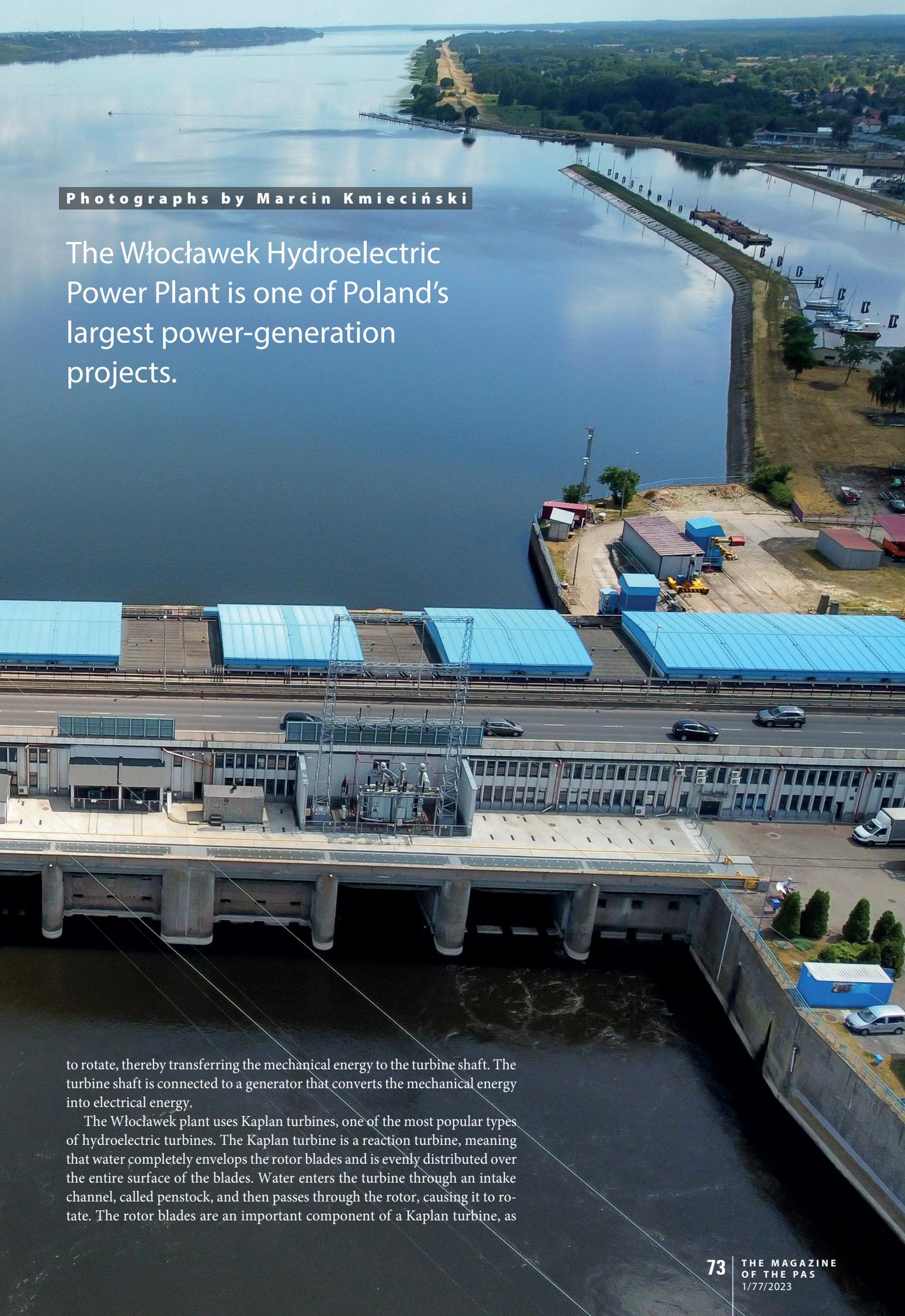


# FLOWING ENERGY



The Włocławek Hydroelectric Power Plant, the largest run-of-river power plant in Poland, has a significant role to play in ensuring the country's energy security. By harnessing the power of the water flowing in the Vistula – Poland's mightiest river – the power plant contributes to the production of electricity in a sustainable, reliable, and environmentally friendly manner.

At the heart of the power plant are six hydroelectric turbines that utilize the potential of a nearly 13-meter drop to generate electricity. Water flows into the turbine and then onto the rotor blades. The flow of water causes the rotor

An aerial photograph of the Włocławek Hydroelectric Power Plant. The image shows a large concrete dam with several spillways, situated on a wide river. The dam has a long, low profile with a road on top. Several large buildings with blue roofs are visible on the dam's structure. In the foreground, there are industrial buildings and a road with cars. The background shows a vast reservoir and a forested area on the opposite bank.

Photographs by Marcin Kmiecinski

The Włocławek Hydroelectric Power Plant is one of Poland's largest power-generation projects.

to rotate, thereby transferring the mechanical energy to the turbine shaft. The turbine shaft is connected to a generator that converts the mechanical energy into electrical energy.

The Włocławek plant uses Kaplan turbines, one of the most popular types of hydroelectric turbines. The Kaplan turbine is a reaction turbine, meaning that water completely envelops the rotor blades and is evenly distributed over the entire surface of the blades. Water enters the turbine through an intake channel, called penstock, and then passes through the rotor, causing it to rotate. The rotor blades are an important component of a Kaplan turbine, as

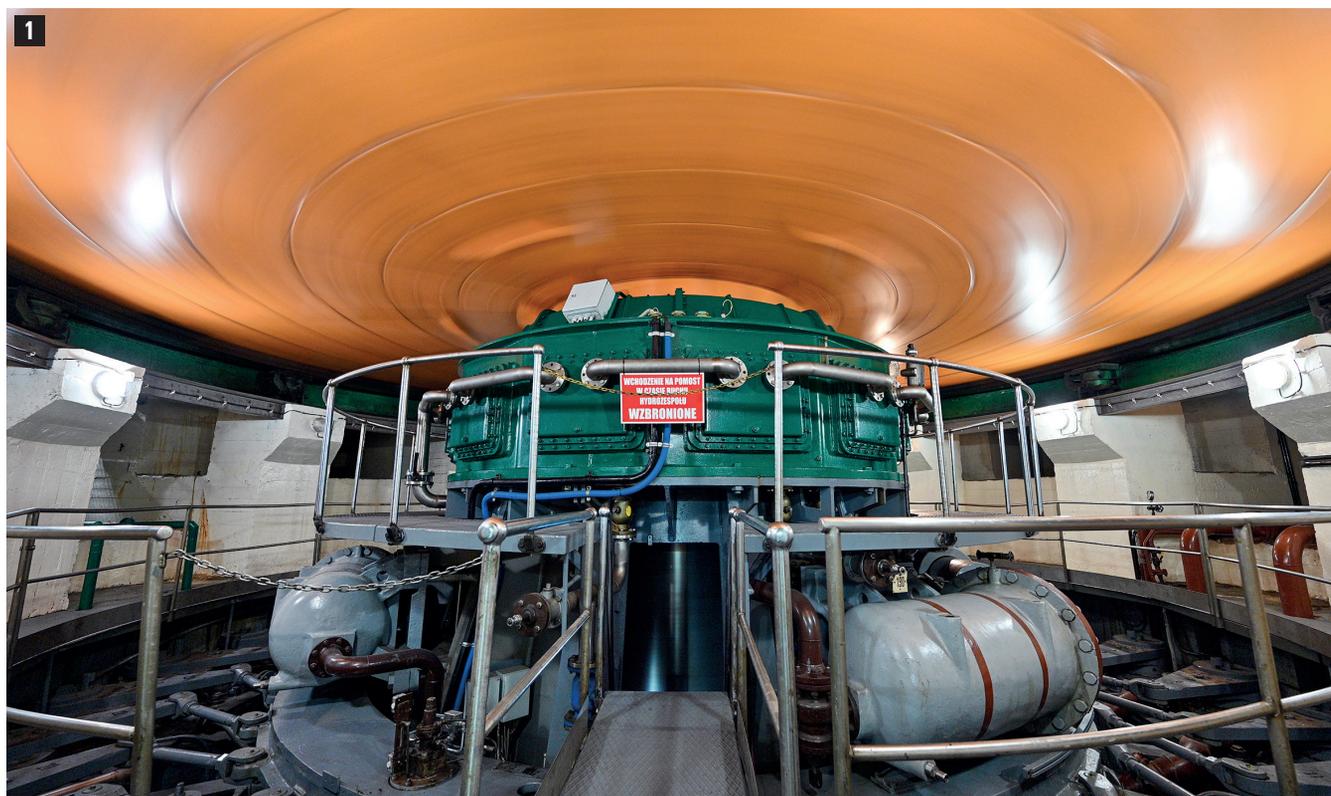


Photo 1  
A working hydropower unit (showing the support bearings and generator rotor)

they can be oriented to optimize water flow and ensure maximum efficiency. Each turbine has a set of blades on the rotor, as well as guide vanes. The blades on the rotor transfer the water's energy to the turbine shaft, while the guide vanes adjust the flow of water into the turbine.

An important feature of such turbines is that their power can be regulated, allowing output to be adjusted to the current demand for electrical energy. This makes it possible to effectively manage the power grid, to prevent overloads, and to maintain a stable power supply. The average annual output of the Włocławek Hydroelectric Power Plant is 739 GWh/year.

The initial construction of Włocławek plant was completed in 1970. During the most recent refurbishment of the dam in 2015, a fish pass (also known as a "fish ladder") was constructed, allowing certain species of fish to migrate through it to upper stretches of the Vistula River. Moreover, a monitoring system scans and records all fish passing through the bypass, collecting data on their numbers and species.

One of the key advantages of hydropower is its renewable source: it harnesses the kinetic energy of water, which is continually available, making it independent of depletable resources such as fossil fuels. Another important aspect of hydroelectric power generation is that it does not emit greenhouse gases or other harmful substances into the atmosphere. This is certainly significant in the context of efforts to combat climate change.

Advanced monitoring and security systems have been implemented to secure the Włocławek plant, ensuring continuous monitoring of technical parameters and swift detection of potential failures. Regular inspections and maintenance help keep the infrastructure running smoothly. The power plant collaborates with nearby emergency services to ensure an effective response in the event of a crisis situation. Thanks to these preventive measures, the plant guarantees safe operation and minimizes the risk of failures.

The Włocławek Hydroelectric Power Plant is an important component of Poland's energy system. The use of hydropower contributes to the provision of reliable, sustainable, and environmentally friendly supply of electricity. The power plant's renewable, energy source, low greenhouse gas emissions, and ability to flexibly adjust its output are all factors that contribute to its importance in the context of Poland's energy security.

Investments to further develop hydropower are essential for boosting Poland's energy independence, reducing greenhouse gas emissions, and protecting the natural environment. The Włocławek plant serves as an example of how the potential of hydropower is harnessed in Poland and is important for the country's sustainable development.

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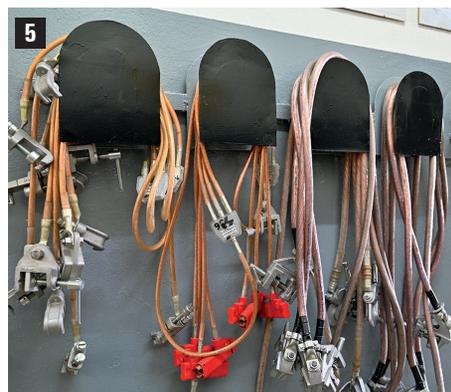
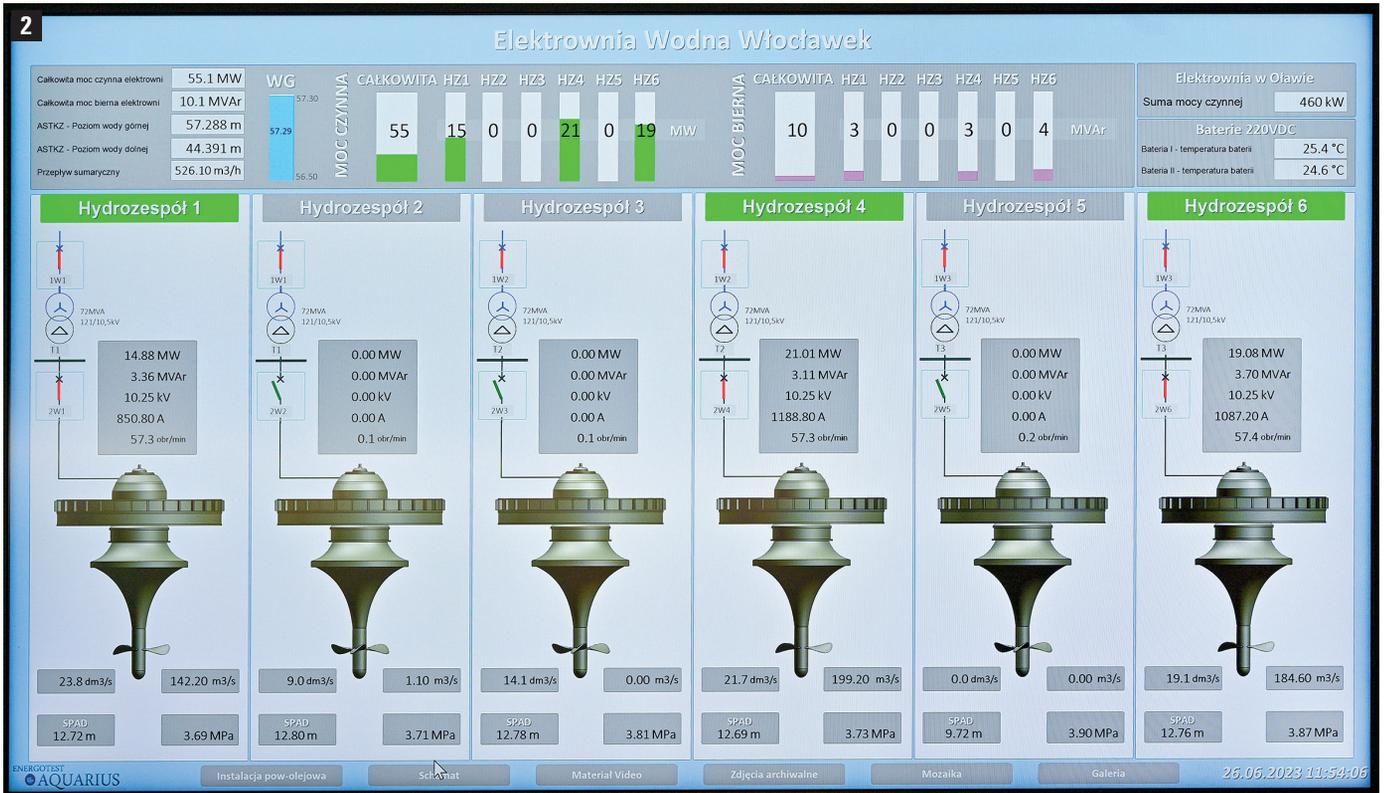


Photo 2  
Synoptic panel, showing which generation units are in operation

Photo 3  
A view of the downstream portion of the plant

Photo 4  
Cross-section diagram of the hydropower plant

# ACADEMIA INSIGHT

Photo 6  
Repair tools used  
at the plant

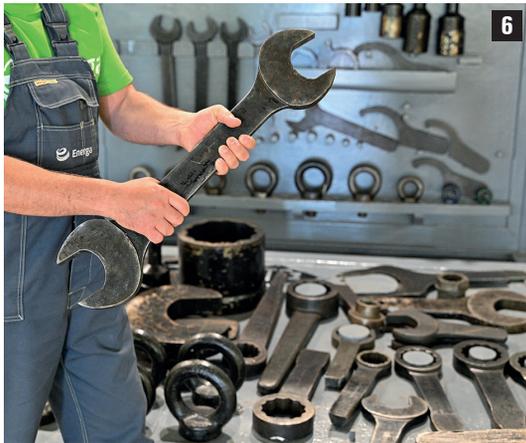


Photo 7  
10.5/110 kV step-up  
transformers



Photo 8  
Power-generation  
machinery



Photo 9  
Generation unit  
control panels

Photo 10  
Technical-water  
installations



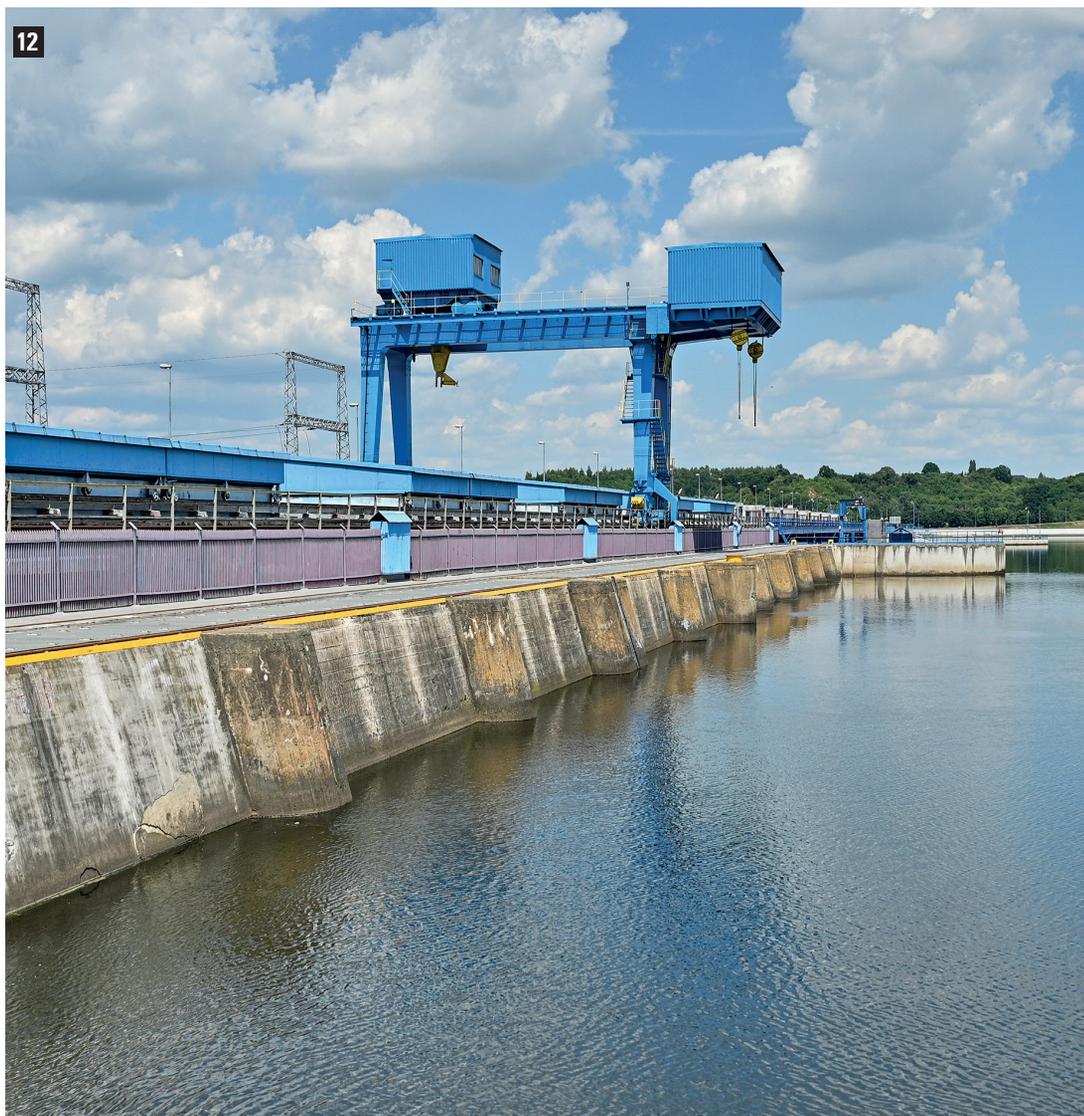
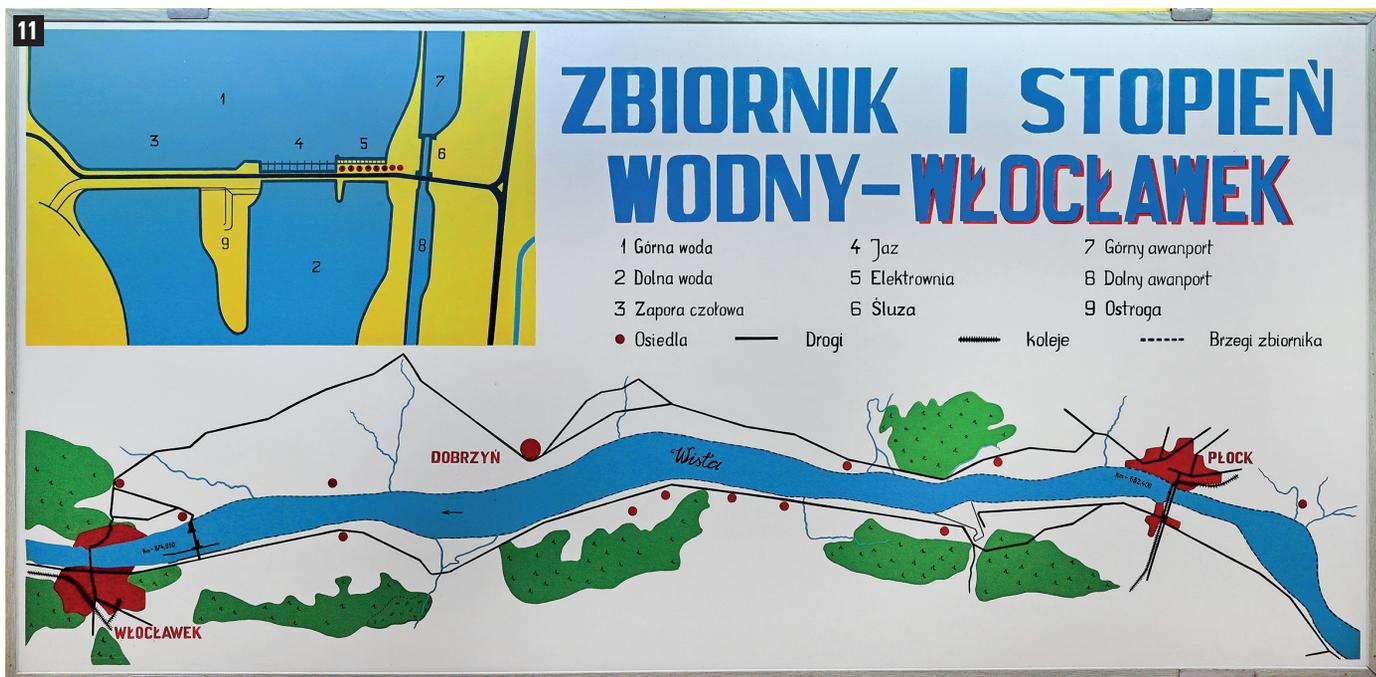


Photo 11  
Diagram of the reservoir and dam

Photo 12  
A view of the upstream portion of the plant – turbine inlets