WATER AND HOW TO CONTROL IT

The Hydrotechnical Construction on The River Olt

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- A hydroelectric power plant has the following main usages:

- producing electricity;

- protection against floods;

- irrigation and drainage of the surrounding terrain.

- Other usages include the following domains: sanitary, tourism and fishing.

Producing electricity in hydroelectric plants

- The first hydroelectric power plants in the world were:

-Cradside, England (1870);

-Appleton, Wisconsin USA (1882), which was used to power up light bulbs recently invented by Thomas Edison.

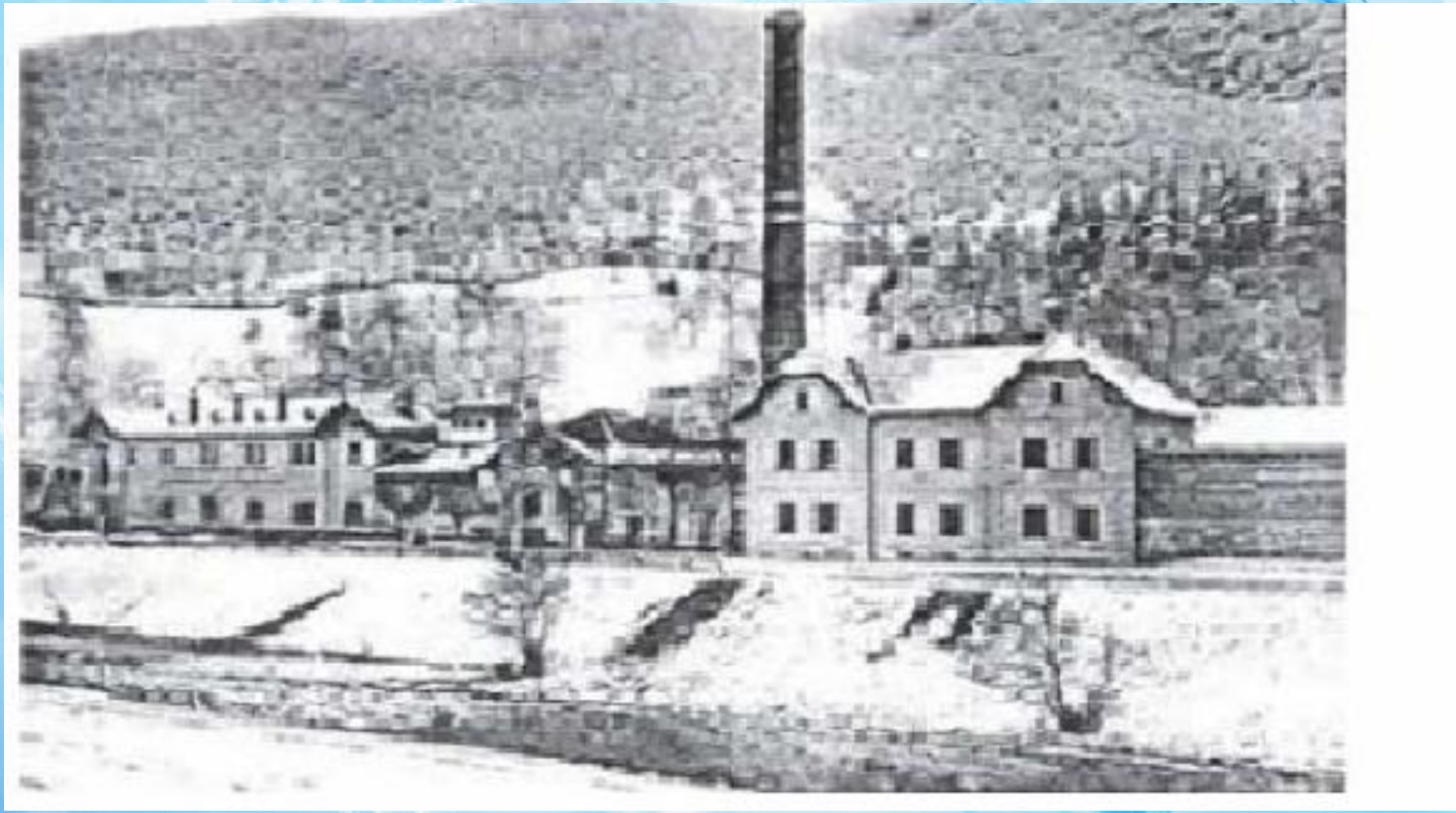
Quick facts on a global scale

- Some of the largest hydroelectric power plants in the world are, as following:

Quick Facts About Romania

- The first hydroelectric power plant in Romania was the Grozăveşti power plant, located on the Ciurel lake near Bucharest, in 1889, which was able to produce 2x 180 horse power.
- Another honorable mention is the first Romanian mixed power plant built on the valley of the river Sadu, power plant which was both hydroelectric and thermoelectric.

Sadu power plant 1



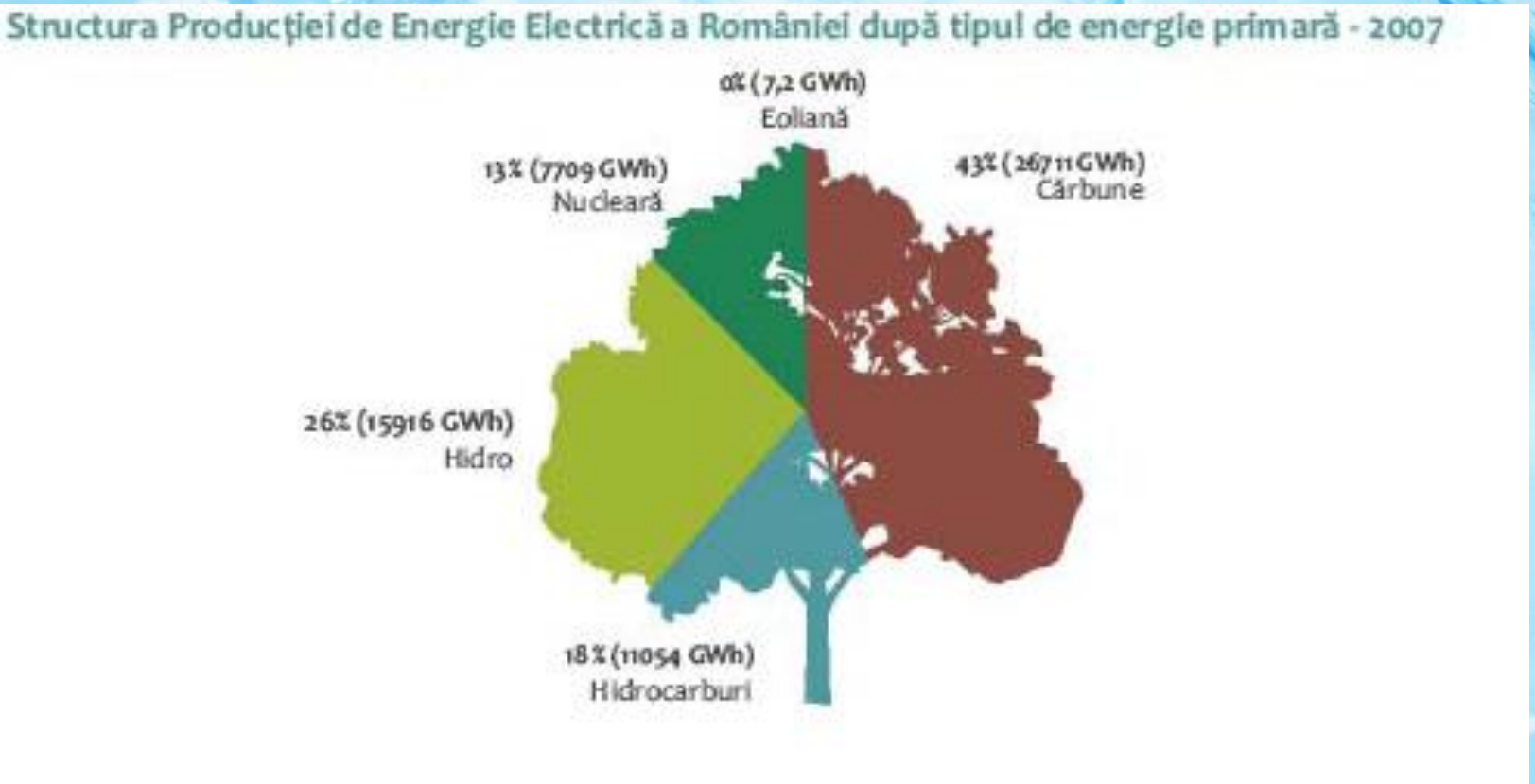
- In 1933, the first general structural plan of hydroelectric potential was elaborated. It consisted of 567 power plants. It was only put into action after 1951, after being delayed by WW1.

Power plant	River	Installed power (MW)	First usage
PORTILE DE FIER I	Dunarea	1050,0	1971
LOTRU CIUNGET	Lotru	510,0	1972
RAUL MARE RETEZAT	Raul Mare	335,0	1987
MARISELU	Somes	220,5	1977
VIDRARU	Arges	220,0	1966
PORTILE DE FIER II	Dunarea	216,0	1985
STEJARU	Bistrita	210,0	1960

Portile de Fier 1 (Iron Gates 1)

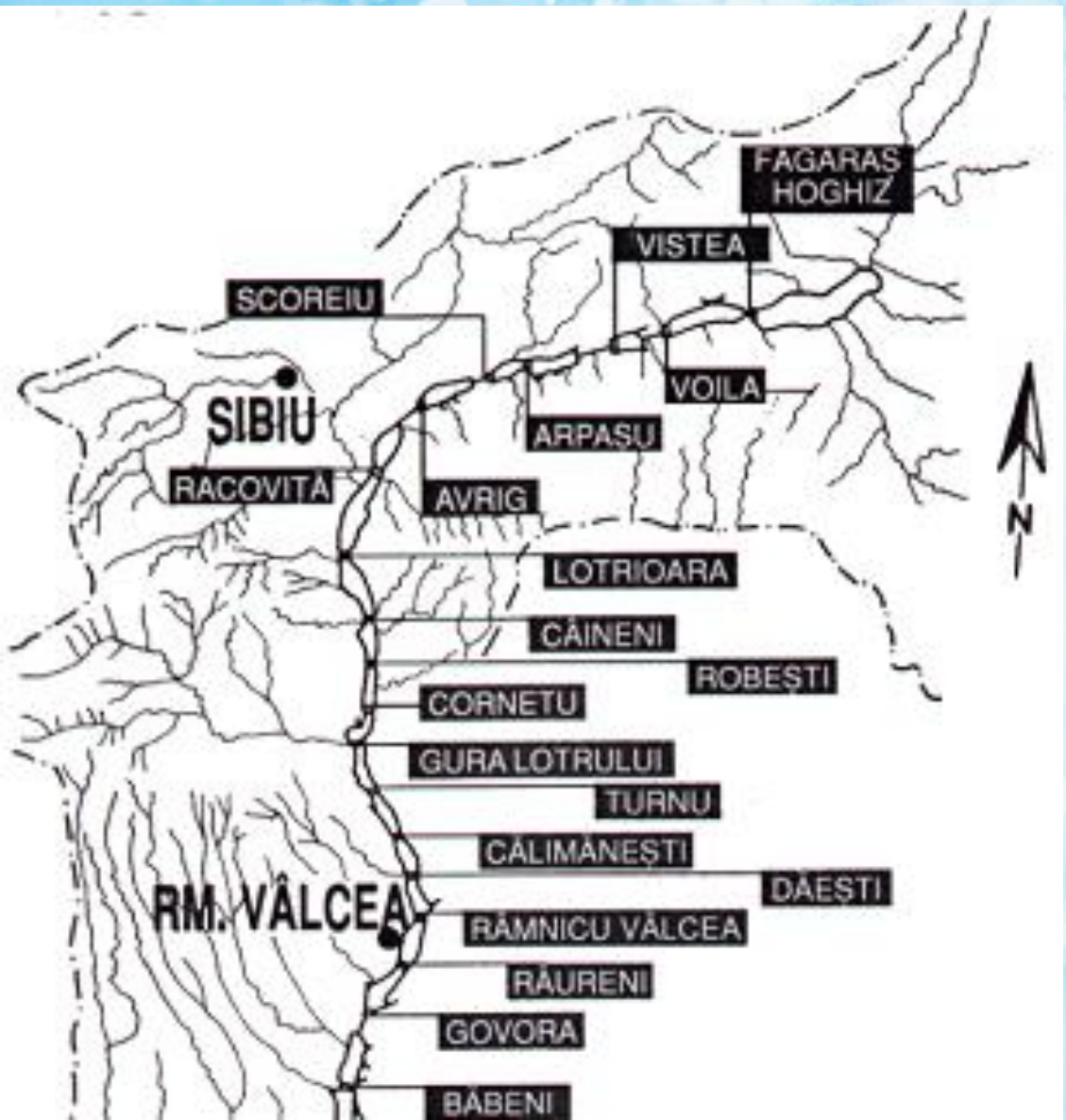
The hydroelectric plant that generates the most power in all of Europe

Types of primary electrical power sources in Romania in 2007

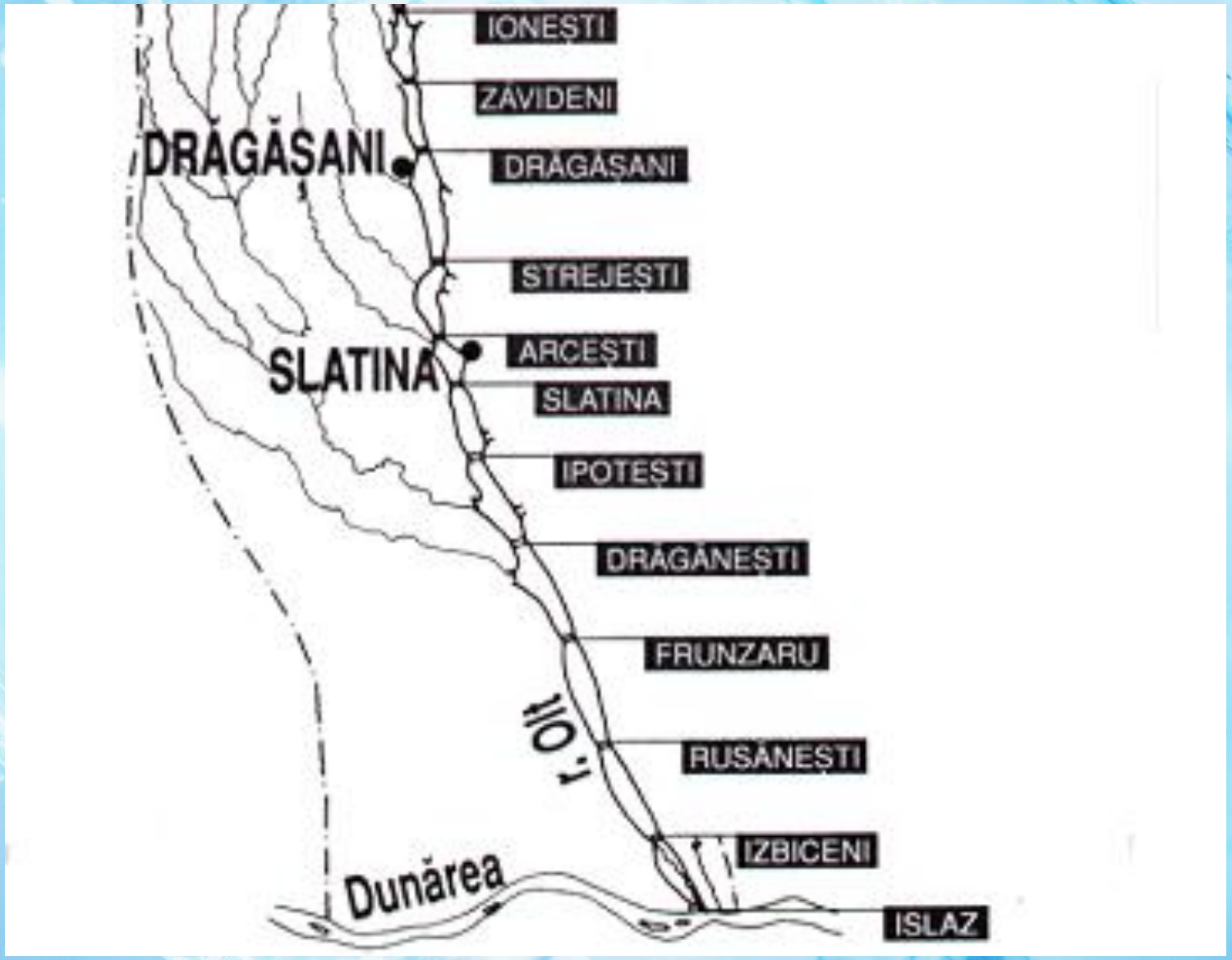


- From the above graphic, we can tell that 26% of the electrical power in our country came from hydroelectric plants.

The upper section of the Olt basin, containing hydroelectric power plants



The lower section



- The landscaping of Olt river was conceived as a cascade of 30 dam-type power plants.
- The energetic potential of it is estimated as being 17% of the national interior river potential.

The hydroelectric power plant of Voila, Fagaras

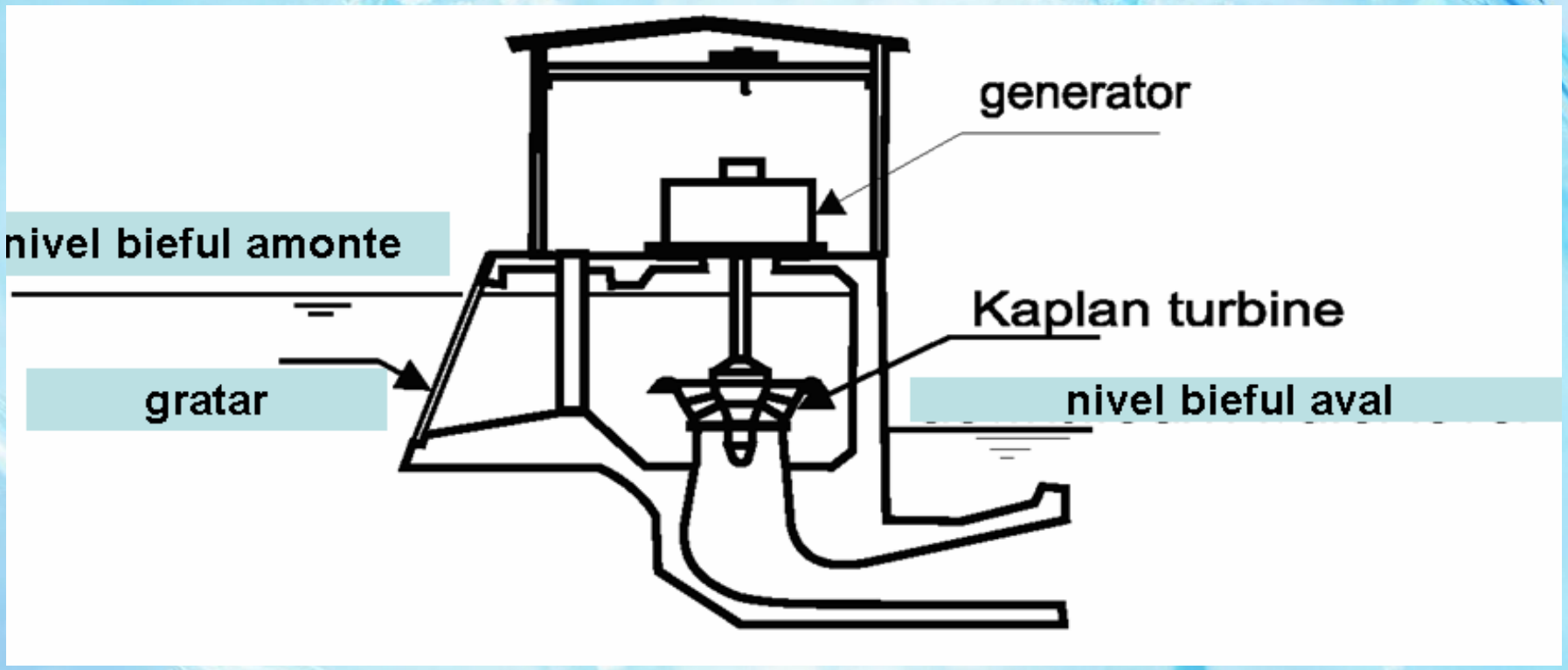
- It’s a dam-type power plant, with an average flow of 180 m^3/s.
- It has an installed power of aproximatelly 14.2 MW.
- It also has an annual production of 29 GWh.

The dam with the water gate lowered

The water gate works using a hydraulic system.

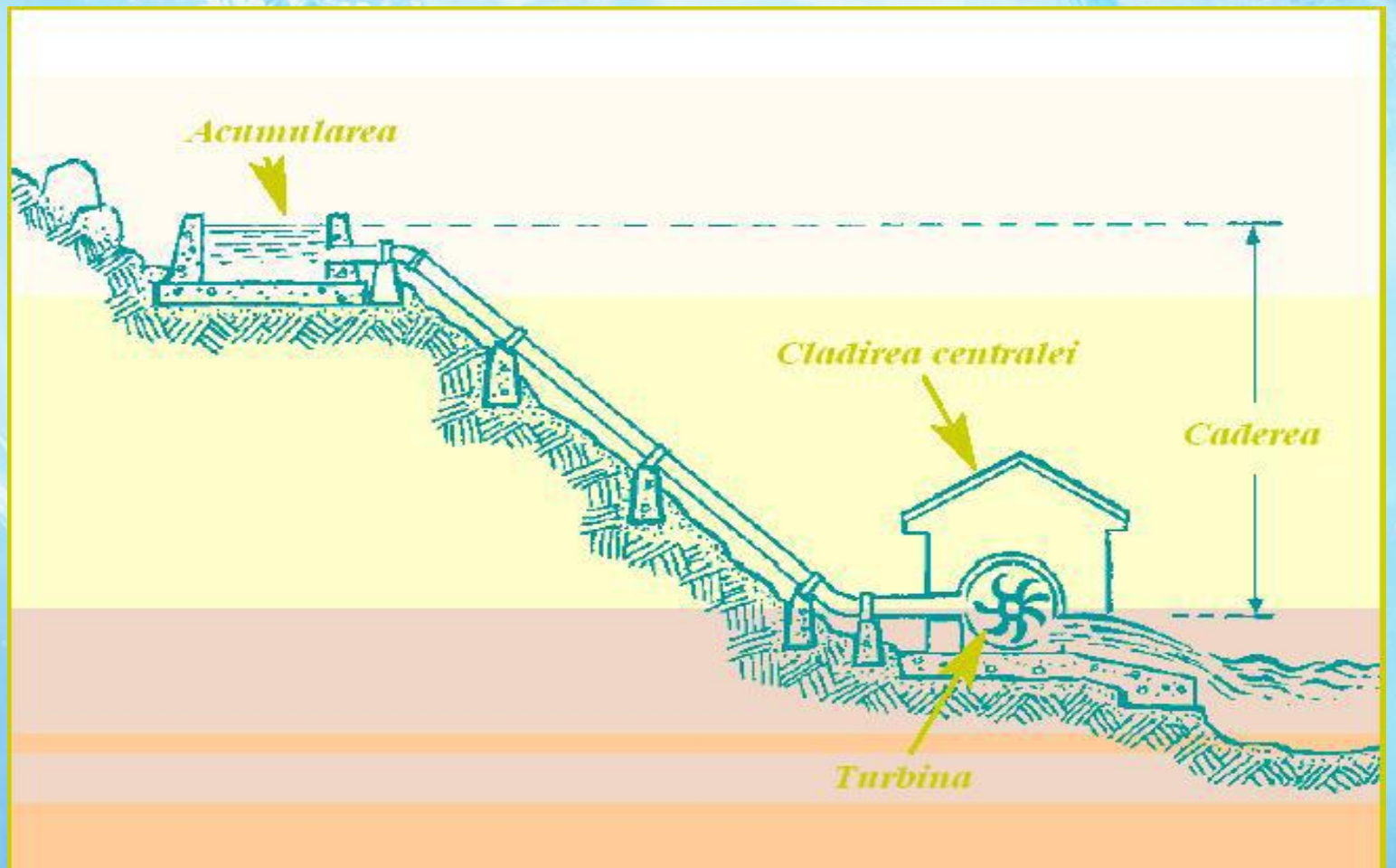
The dam with the water gate closed

- The plant is equipped with two groups made of generators powered by Kaplan turbines.



A different perspective

- At the power plant in Voila, the height difference between the upstream and the downstream is 10 metres.



The process of obtaining electricity from the water flow

- A part of the accumulated water flows through the forced pipeline and through the turbine, making it rotate. The rotating turbine puts the generator into action, which converts the mechanical energy to electrical energy.

EFFECT ON THE ENVIRONMENT

- When sediments collect, the ecosystem can be affected in two ways:
- First, downstream habitat conditions can decline because these sediments no longer provide important organic and inorganic nutrients.
- Second, where sediment builds up behind a dam, there is not enough supply of oxygen. This happens because more nutrients are now available, and more organisms populate the area to consume the nutrients.

Wildlife

- When habitat is lost, animals are forced to move to higher ground or other areas where habitat conditions may be less suitable, predators are more abundant, or the territory is already occupied. As an example, ground birds like pheasant require cover and cannot successfully move to higher, more open, ground.

- **Certain species will begin to decline**, **others will become more abundant**, and some will populate these areas for the first time (seagulls)
- Ducks and geese are examples of birds that are strongly attracted to the habitat conditions found in reservoirs.

Fish

The most common and serious fishery impacts that relate to hydroelectric projects:

- Slower moving waters in a reservoir can strongly affect fish. Thus, they can **become disoriented** in slower moving waters; With disorientation and lengthened travel time comes an increased **exposure to predators**.
- Fish passing through or around a dam can become **stressed, injured, disoriented, or die** because of contact with turbines, the walls of the dam, or deflection screens.

Advantages of using the waterpower

Flexibility

- Hydro is a flexible source of electricity since plants can be ramped up and down very quickly to adapt to changing energy demands.

Low power costs

- The major advantage of hydroelectricity is elimination of the cost of fuel.

Reduced CO2 emissions

- Since hydroelectric dams do not burn fossil fuels, they do not directly produce carbon dioxide.

Other uses of the reservoir

- Reservoirs created by hydroelectric schemes often provide facilities for water sports, and become tourist attractions themselves. In some countries, aquaculture in reservoirs is common. Multi-use dams installed for irrigation support agriculture with a relatively constant water supply. Large hydro dams can control floods, which would otherwise affect people living downstream of the project.

Disadvantages of using the waterpower

Ecosystem damage and loss of land

- Hydroelectric projects can be disruptive to surrounding aquatic ecosystems both upstream and downstream of the plant site.

F**low shortage**

- The result of diminished river flow can be power shortages in areas that depend heavily on hydroelectric power. The risk of flow shortage may increase as a result of climate change.

Relocation

- Another disadvantage of hydroelectric dams is the need to relocate the people living where the reservoirs are planned.

Failure risks

- Dam failures have been some of the largest man-made disasters in history. Dams are tempting industrial targets for wartime attack, sabotage and terrorism.

Comparison with other methods of power generation

- Hydroelectricity **eliminates the flue gas emissions** from fossil fuel combustion.
- Hydroelectricity also **avoids the hazards of coal mining** and the indirect health effects of coal emissions.
- Compared to nuclear power, hydroelectricity **generates no nuclear waste**, has none of the dangers associated with uranium mining, nor nuclear leaks.

Bibliography

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