

hydropower

advantages/disadvantages



Foto: Verbund

hydropower plant in Gralla near Leibnitz, Austria

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Context

The demand for electricity varies at different times of a year and we have the problem that we can't use energy from wind, tides or sun at all time and hence there isn't a guarantee for steady production of electricity. Hydroelectric power stations can solve this problem. However hydropower plants haven't only advantages but there are disadvantages too.

This movie has been created by a group of students:



ADVANTAGES

1. If electricity is not needed, the sluice gates can be shut, stopping electricity generation. The water can be saved for use another time when electricity demand is high.
2. Dams are designed to last many decades and so can contribute to the generation of electricity for many years.
3. In some cases the lake that forms behind the dam can be used for water sports and pleasure activities.
4. The lake's water can be used for irrigation purposes.
5. The build up of water in the lake means that energy can be stored until needed, when the water is released to produce electricity. This type is called **pumped storage power plant**.
6. When in use, electricity produced by dam systems do not produce green house gases. They do not pollute the atmosphere.



pumped storage power plant in Kaprun, Salzburg (Austria)

Foto: Verbund

DISADVANTAGES

1. Dams are extremely expensive to build and must be built to a very high standard.
2. The high cost of dam construction means that they must operate for many decades to become profitable.
3. The flooding of large areas of land means that the natural environment is destroyed.
4. People living in villages and towns that are in the valley to be flooded, must move out. This means that they lose their farms and businesses. In some countries, people are forcibly removed so that hydro-power schemes can go ahead.
5. The building of large dams can cause serious geological damage. For example, the building of the Hoover Dam in the USA triggered a number of earth quakes and has depressed the earth's surface at its location.
6. Although modern planning and design of dams is good, in the past old dams have been breached. This has led to deaths and flooding.
7. Dams built blocking the progress of a river in one country usually means that the water supply from the same river in the following country is out of their control. This can lead to serious problems between neighbouring countries.
8. Building a large dam alters the natural water table level. For example, the building of the Aswan Dam in Egypt has altered the level of the water table. This is slowly leading to damage of many of its ancient monuments as salts and destructive minerals are deposited in the stone work from 'rising damp' caused by the changing water table level.

Reference: <http://www.technologystudent.com/energy1/hydr2.htm>

Example: Ataturk Dam

The **Ataturk Dam** is on the Euphrates River in Southeastern Anatolia Region in Turkey. It was built to generate electricity and to irrigate the plains in the region. The construction began in 1983 and was completed in 1990. The reservoir created behind the dam is the third largest in Turkey.

There are 22 dams on the Euphrates and the Tigris. The dam embankment is 169 m high and 1,820 m long. The hydroelectric power plant has a total installed power capacity of 2,400 MW generating 8 900 GWh electricity annually. The total cost of the dam project amounted about US\$ 1.25 billion.



The Aturk Dam was constructed 1983-1990



Landsat4 image of pre-Atatürk Dam
Harran (August 20, 1983)



Landsat7 image of post-Atatürk Dam
Harran (August 24, 2002)

Additional important information about the dam

1. Reservoir lake

The reservoir Lake Atatürk Dam, extending over an area of 817 km². The reservoir water level touched 535 m in 1994. The full reservoir level is 542 m.

10 towns and 156 villages of three provinces are located around the Lake Atatürk Dam. The lake provides a fisheries and recreation site. For transportation purposes, several ferries are operated in the reservoir.

2. Irrigation

Originating in the mountains of eastern Anatolia and flowing southwards to Syria and Iraq, the Euphrates and the Tigris are very irregular rivers, used to cause great problems each year with droughts in summer and flooding in winter. The water of the Euphrates River is regulated by means of large reservoirs of the Keban and Atatürk Dams. However, the waters released from those dams also need to be regulated.

Nearly 4,760 km² of arable land in the Şanlıurfa-Harran and Mardin-Ceylanpınar plains in upper Mesopotamia is being irrigated via gravity-flow with water diverted from the Atatürk Dam through the Şanlıurfa Tunnels system, which consists of two parallel tunnels, each 26.4 km long and 7.62 m in diameter. The flow rate of water through the tunnels is about 328 m³/s, which makes one-third of the total flow of the Euphrates. The tunnels are the largest in the world, in terms of length and flow rate, built for irrigation purposes.

The Atatürk Dam and the Şanlıurfa Tunnel system are two major components of the GAP project. Irrigation started in the Harran Plain in the spring of 1995. The impact of the irrigation on the economy of the region is significant. In ninety percent of the irrigated area, cotton is planted. Irrigation expansion within the Harran plains also increased Southeastern Anatolia's cotton production from 164,000 to 400,000 metric tons in 2001, or nearly sixty percent. With almost 50% share of the country's cotton production, the region developed to the leader in Turkey.

3. Political controversy

About 90% of Euphrates' total annual flow originates in Turkey, while the remaining part is added in Syria, but nothing is contributed further downstream in Iraq. In general, the stream varies greatly in its flow from season to season and year to year. As an example, the annual flow at the border with Syria ranged from 15.3 km³ in 1961 to 42.7 km³ in 1963.

One of the most important legal texts on the waters of the Euphrates-Tigris river system is the protocol annexed to the 1946 Treaty of Friendship and Good Neighborly Relations between Iraq and Turkey. The protocol provided the control and management of the Euphrates and the Tigris depending to a large extent on the regulations of flow in Turkish source areas. Turkey agreed to begin monitoring the two border-crossing rivers and to share related data with Iraq. In 1980, Turkey and Iraq further specified the nature of the earlier protocol by forming a joint committee on technical issues, which Syria joined later in 1982 as well. Turkey unilaterally guaranteed to allow 15.75 km³/year (500 m³/s) of water across the border to Syria without any formal agreement on the sharing of the Euphrates water.

Mid January 1990, when the first phase of the dam was completed, Turkey held back the flow of the Euphrates entirely for a month to begin filling up the reservoir. Turkey had notified Syria and Iraq by November 1989 of her decision to fill the reservoir over a period of one month explaining the technical reasons and providing a detailed program for making up for the losses. The downstream neighbors protested vehemently. At this point, the Atatürk Dam has cut the flow from the Euphrates by about a third.

Syria and Iraq claim to be suffering severe water shortages due to the GAP development. Both countries allege that Turkey is intentionally withholding supplies from its downstream neighbors, turning water into a weapon. Turkey denies these claims, and insists it has always supplied its southern neighbors with the promised minimum of 500 m³/s (18,000 cu ft/s). It argues that Iraq and Syria in fact benefit from the regulated water by the dams as they protect all three riparian countries from seasonal droughts and floods.

Reference: http://en.wikipedia.org/wiki/Atatürk_Dam

Tasks



1. Watch the movie about hydropowerstation

and then improve your knowledge with a short quiz: ?

! Pay particular attention to the following facts/terms:

- **gas which is produced in dammed water**
- **problems with hydroelectric powerstations**
- **waterquality**
- **efficiency**
- **advantages of hydropowerplants**

2. Test your knowledge on the **Atatürk Dam**: ?