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The KWO's Power Plants, Kraftwerke Oberhasli AG

The KWO produces an average of 2350 gigawatt hours of energy per year in its nine power plants with 8 storage lakes – 7% of Switzerlands hydroelectricity production. Enough energy for one million people.

The 1125 megawatt capacity of the KWO's 26 turbines is equal to the power of 3000 articulated trucks – a 50km long langen row oft rucks. With one major difference – the KWO's turbines do not produce any exhaust!

Our Power Plants:

Kraftwerk	Bauzeit von – bis	Energie Millionen Kilowattstunden pro Jahr (GWh)	Leistung Installierte Turbinenleistung in Megawatt (MW)	Leistung Maximale Pumpenleistung in Megawatt (MW)
Grimsel 1				
- Maschine Oberaar	1950 – 1954	40	35	
- Maschine Grimsel	2004 – 2006	60	32	
Grimsel 2	1973 – 1980	600	348	363
Handeck 1	1925 – 1932	160	100	
Handeck 2	1947 – 1950	280	136	
Handeck 3	1972 – 1976	40	55	56
Innertkirchen 1	1940 – 1942 / 2007	700	255	
Fuhren	1958 – 1960	20	10	5
Hopflauenen	1962 – 1967	280	92	
Innertkirchen 2	1964 – 1968	170	62	
Total		2350	1125	424

Das Kraftwerk Grimsel 2 ist mit seinen kräftigen Pumpen als Umwälzwerk konzipiert: Energie wird von Zeiten schwachen Verbrauchs in Zeiten starken Verbrauchs verlagert.

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Power Plant Innertkirchen 1

One of the KWO's most important power plants. Built during the second world war (1939 till 1943) this power plant is at the end of the Aare Valley production chain. With its large capacity, Innertkirchen 1 is predestined for the production of peak and regulating electricity.

Apart of the KWO plus investment program, this power plant was upgraded between 2002 and 2007. To reduce friction and increase energy efficiency, a 10km long headrace tunnel between Handeck and Innertkirchen was built. This runs parallel to the old tunnel. At the same time, the five tubines in Innertkirchen 1 were outfitted with new shafts and wheel and new transformers were intalled. The modernised plant now produces 55 gigawatt hours more energy per year. Investment cost was 95 million Swiss Francs.

A further upgrade of this plant is currently being planned.

Power Plant Data:

Number and type of turbines	= 5 Pelton turbines
Construction	= 1940 – 1942 / 2002 – 2007
Installed turbine capacity in megawatt (MW)	= 255
Energy in millions of kilowatt hours	= 700
Inflow	= 39 m^3/s
Head	= 672 m

Difference in altitude between the Handeck reservoir and the Aare in Innertkirchen

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Power Plant Innertkirchen 2

Final power plant in the Susten / Gadmen Valley production chain. Built between 1964 and 1968. Typical run of the river plant. Hooked up to the Hopflauenen reservoir, this power plant does not have much room for free utilisation of capacity.

Power Plant Data:

Construction	= 1964 - 1968
Number and type of turbines	= 2 Francis turbines
Installed turbine capacity in megawatts (MW)	= 62
Energy in million kilowatt hours	= 170
Inflow	= 29 m^3/s
Head	= 242

Difference in altitude between the Hopflauenen reservoir and the Aare in Innertkirchen

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Power Plant Fuhren

Uppermost power plant in the Kraftwerk im Susten and Gadmen Valley catchment area. Built between 1958 and 1960. Important power plant for the water supply between the Susten and Grimsel / Aare Valley area. This power plant can pump excess water from the Susten / Gadmen Valley towards Trift and from there towards Handeck,in the Aare Valley and further into the Räterichsboden Lake.

Power Plant Data:

Construction	= 1958 - 1960
Number and type of turbines	= 1 Francis turbine
Installed turbine capacity in megawatts (MW)	= 10
Inflow	= 3 m^3/s
Head	= 400m

Difference in altitude between the Teuflaui reservoir and the Trift intake

Number and type of turbines	= 1 Pumpe (Francis wheel)
Installed turbine capacity in megawatts (MW)	= 5
Inflow	= 2 m^3/s
Head	= 184m

Difference in altitude between the pump intake in Fuhren and the Trift intake

Energy in million kilowatt hours (total)	= 20

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Power Plant Hopflauenen

Built between 1962 and 1967. Two machine groups - one that uses the water coming from Trift, the other water from the Leimboden reservoir (Gental).

Power Plant Data:

Construction	= 1962 - 1967
Machine Group Trift	= 2 Pelton turbines
Installed turbine capacity in megawatts (MW)	= 86 MW
Inflow	= 21 m^3/s
Head	= 459m
Difference in altitude between the Trift inflow and the Hopflauenen reservoir	
Machine Leimboden	= 1 Pelton turbine
Installed turbine capacity in megawatts (MW)	= 6 MW
Inflow	= 2 m^3/s
Head	= 336 m
Difference in altitude between the Leimboden reservoir and the Hopflauenen reservoir	
Energy in millions of kilowatt hours (total)	= 280

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Power Plant Handeck 1

Handeck 1 is the first power plant built by the KWO. Built from 1925 to 1932 - a real pioneering venture! The robust installations still function faultlessly today. The water for this power plant comes from the Gelmer Lake situated 550 metres above the power plant.

Power Plant Data:

Construction	= 1925 - 1932
Number and type of turbines	= 4 Pelton turbines
Installed turbine capacity in megawatts (MW)	= 100
Energy in millionen kilowatt hours	= 160
Inflow	= 20 m^3/s
Head	= 547m

Difference in altitude between Lake Gelmer and the Handeck reservoir

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Power Plant Handeck 2

This underground plant was built after the second world war between 1947 and 1950. A solid "work-horse" that is used today to produce peak energy and to regulate the grid:

Power Plant Data:

Construction	= 1947 - 1950
Number and type of turbines	= 4 Pelton turbines
Installed turbine capacity in megawatt hours	= 136
Energy in millions of kilowatt hours	= 280
Inflow	= 32 m^3/s
Head	= 463m

Difference in altitude between Lake Räterichsboden, Lake Mattenalp and the Handeck reservoir

Power Plant Handeck 3

The Handeck 3 power plant is very complicated as it fulfills a number of different functions. Built between 1972 and 1976. Water can be moved from Lake Räterichsboden to the Handeck reservoir or sent over to the Gadmen valley. Water can also come from the Gadmen valley and then pumped up to Lake Räterichsboden. The runner wheels here can be used as both pump and turbine. An engineering masterpiece!

Power Plant Data:

Construction	= 1972 - 1976
Pump-turbine group "Isogyre" (Francis wheels)	
Turbine operation	
Installed turbine capacity in megawatt (MW)	= 55 MW
Inflow	= 14 m^3/m
Head	= 450m
Difference in altitude between Lake Räterichsboden, Lake Mattenalp and the Handeck reservoir	
Pump operation	
Capacity in megawatts (MW)	= 46 MW
Inflow	= 8.5 m^3/m
Head	= 460 m
Difference in altitude between the Trift intake and Lake Räterichsboden	
Diagonal pump (Francis wheels)	
Capacity in megawatts	= 4.5 MW
Inflow	= 7.5 m^3/m
Head	=30 m
Difference in altitude between the Handeck reservoir and the Trift intake	
Energy in millions of kilowatt hours	= 40

Power Plant Grimsel 1

Original construction with the Oberaar machine group was between 1950 and 1954. The Grimsel machine group was installed between 1970 and 1974. The Oberaar machines use the gradient between the Oberaar and Räterichsboden Lakes (around 530 m) and the Grimsel machines use the gradient between the Grimsel and Räterichsboden Lakes (around 140 m).

Upgraded between 2004 and 2006. The Oberaar pump and Grimsel machine were removed and a 30m deep shaft was excavated and a new 32 MW turbine installed. This modernised power plant now produces 25 gigawatt hours more energy per year. Investment costs: 35 millionen Francs.

Power Plant Data:

Construction	= 1950 – 1954 / 2004 - 2006
Machingroup Oberaar: Double Pelton turbine	
Installed turbine capacity in megawatts (MW)	= 35
Energy in millions of kilowatt hours	= 40
Inflow	= 8 m^3/s
Head	= 533m
Difference of altitude between Lake Oberaar and Lake Räterichsboden	
Grimsel turbine **(new)**	
Installed turbine capacity in megawatts (MW)	= 32
Energy in millions of kilowatt hours	= 60
Inflow	=20 m^3/s
Difference in altitude	=max. 182 m / min. 83 m
Difference in altitude between Lake Grimsel and Lake Räterichsboden	

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Power Plant Grimsel 2

The most modern of the KWO's power plants. Built between 1973 and 1980. The four machine groups, each with a pump and turbine wheel on the same shaft, use the gradient between the Oberaar and Grimsel Lakes.

Water is pumped, using surplus grid electricity, from the Grimsel 2 pump storage plant to a higher lying lake and stored to produce electricity at a later point:

Power Plant Data:

Construction	= 1973 - 1980
Number and type of turbines	= 4 Francis turbines
Installed turbine capacity in megawatts (MW)	= 348
Energy in millions of kilowatt hours	= 600
Inflow	= 93 m^3/s
Head	= 400m
Difference in altitude between Lake Oberaar and Lake Grimsel	

Number and type of pumps	= 4 pumpen (Francis wheels)
Maximum pump capacity in megawatts (MW)	= 363
Inflow	= 80 m^3/s
Head	= 400
Difference in altitude between Lake Oberaar and Lake Grimsel	