

ALPIQ

The Lucendro hydroelectric power station
Valuable stored energy from the heart
of Switzerland



Hydro power – Switzerland’s energy source

Hydro power is Switzerland’s most important renewable energy source. It has a long tradition here – and a lot of future. Because hydro power

is CO₂-free, renewable and economical. The Lucendro storage power station also utilises these advantages.

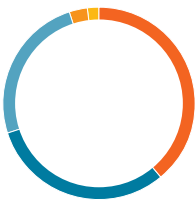
Alpiq Hydro Ticino

Alpiq Hydro Ticino SA is a fully-owned subsidiary of Alpiq Holding Ltd. and was founded in December 2000. The company is responsible for the operation, the maintenance and the extension of the Lucendro storage power station.

Switzerland is Europe’s surge chamber. From the Gotthard a great deal of water flows northwards into the North Sea and southwards into the Mediterranean Sea. This provides ideal conditions for the generation of energy from hydro power. With nearly 60 percent, it provides the largest contribution to Switzerland’s energy supply.

Water is a unique resource. The hydraulic energy gained from it has many advantages: It protects the environment, is CO₂-free and natural. Switzerland and Alpiq with their many hydroelectric power stations have relied on this ecological form of energy generation for more than one hundred years.

Electricity mix Switzerland



■ Nuclear energy	39%
■ Storage power stations	31.2%
■ Run-of-river power stations	24.9%
■ Conventional thermal and other power stations	3%
■ Waste, biomass, biogas, sun, wind	1.9%

Renewable energy from the Gotthard

Alpiq Hydro Ticino SA operates the Lucendro hydroelectric power station on the Gotthard pass with two reservoirs and two power stations. The power station, with the TÜV certificate “Electricity from 100 percent renewable energies”, can provide electricity for 20,000 households. The advantage of this storage power station is its speed: Its output is available within minutes. Thanks to this advantage, storage power stations are playing an ever growing role in the supply of electricity.

Technical data – dams and reservoirs

	Lucendro	Sella
Type	Composite gravity dam (Nötzli design)	Gravity dam
Construction years	1942 – 1945	1945 – 1948
Height	68.5 m	32 m
Municipality	Airolo	Airolo
Crown length	270 m	330 m
Volume	155 000 m ³	75 000 m ³
Proprietor / operator	Alpiq Hydro Ticino SA	Alpiq Hydro Ticino SA
Shareholders	Alpiq Holding AG	Alpiq Holding AG
Name of reservoir	Lago Lucendro	Lago Sella
Drainage area	16.67 km ²	6.7 km ²
Reservoir surface	53.7 ha	45 ha

Impressive reservoirs on the Gotthard

The Lucendro storage power station utilises the water from two drainage areas on the Gotthard. It accumulates in the Lucendro and Sella reser-

voirs with their spectacular dams. From here the water thunders into the valley where its power is transformed into electrical energy.

A world war plant

In 1942 the former Atel (today Alpiq) received the concession for the construction of the Airolo power station from the Swiss cantons of Ticino and Uri. The storage power station was constructed between 1942 and 1948 and was partially put into service already in 1945. Hence it made a contribution to Switzerland's energy supply even before the end of the Second World War. Because concrete and reinforcement rods were rationed, it was decided during planning to construct a seldom chosen pillar plate wall or a composite gravity dam. This so-called "Nötzli design" was cost-effective, rapidly constructed and safe.

The Lucendro storage power station has been generating energy from renewable hydro power for more than 65 years. The energy is especially valuable in winter. Then the power station transforms the water that has been collected in the reservoirs in spring and summer into energy.

Lucendro reservoir

This huge reservoir lies to the north of the watershed on the Gotthard. It was constructed at the location of the natural lake. Amongst other things, the reservoir stores the water for the Gotthard Reuss River in the Ticino region and contains 25 million cubic metres of water. The maximum height of the dam is 69 metres and its width is 270 metres. Inside it consists of 17 huge chambers that are tapered towards the middle. This design saved concrete, shortened the construction period but still met all the static specifications.

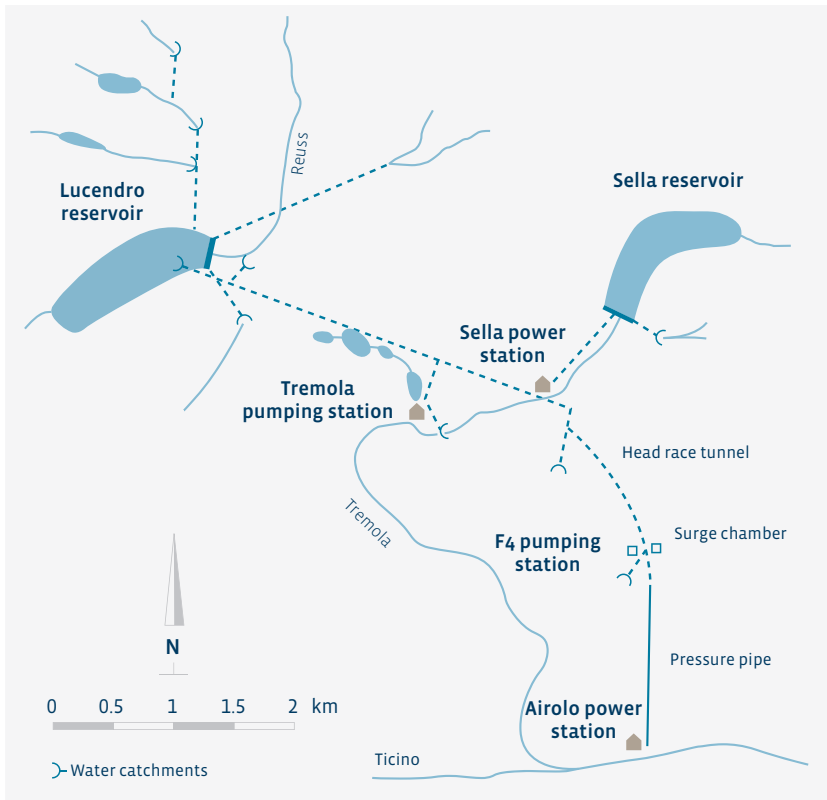
Sella reservoir

This reservoir is three times smaller than the Lucendro reservoir. It collects the southwardly draining water from the drainage area of the Ticino River. The lake has a capacity of nine million cubic litres of water. With a crown length of 330 metres the wall is a little wider than Lucendro but only half as high.

How the water thunders into the valley

A 4.8 kilometre long head race tunnel connects the Lucendro reservoir with the supply chute of the water from the Sella Lake and the retention basin of the Airolo power station. From the retention basin a 1.9 kilometre long pressure pipe channels the water 900 metres fur-

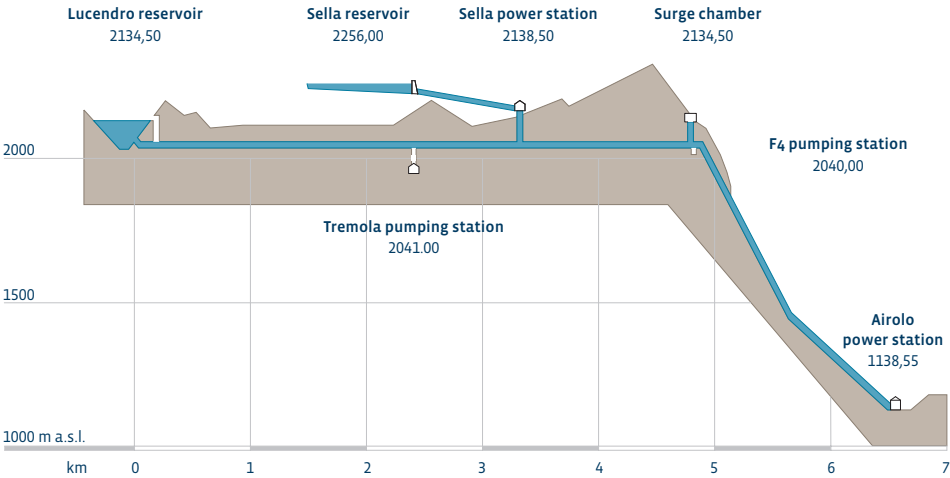
ther down onto the two turbines of the Airolo power station. On the remaining open section, about 1.5 kilometres long, the initially limited capacity was increased by the construction of a second pipeline in 1990.



The power station's longitudinal profile

The Tremola pumping station lies at over 2000 metres above sea level. From here the outlets of the lakes by the Gotthard hospice are fed into the pressure pipe with the aid of two pumping groups. The F4 pumping station was constructed near the surge chamber

and at the same height in 1964. From there the drainage water from the piped stretch of the head race tunnel is pumped directly into the pressure pipe. The average annual inflow of the Lucendro power station is 45 million cubic metres.



Hydro power becomes electricity

From the Lucendro and Sella reservoirs the water thunders down into the Sella and Airolo power stations. Here the power of the water

is transformed into electricity using the latest technology.

The pressure pipe from the reservoirs initially channels the water onto a turbine in the Sella power station. It lies only one hundred metres below the reservoirs. From there the water drops a further approximately 900 metres into the Airolo power station. It is the heart of the entire storage power plant.

Sella power station

The power station has been in service since October 1991 and utilises the water from the Sella reservoir, which lies approximately 100 metres above it. To comply with landscape conservation requirements, the small power station was faced with granite from the region and the 1000 metre long pressure pipe was laid underground.

Airolo power station

The Airolo power station was constructed in 1946 and is an example of rational industrial architecture of that time. The power station on the left bank of the Ticino River has two generator groups that are powered by two turbines. The generated electricity is fed into the 220 kilovolt grid via two transformers. From the computerised switchboard the power lines lead over the Gotthard, the Nufenen, the San Giacomo passes and to Lavorgo. The annual production corresponds to the power requirements of the city of Chiasso.

The Airolo and Sella power stations in figures

	Airolo	Sella
Commissioning	1945	1991
Construction period	1942 – 1948	1990 – 1991
Gross incline with full reservoir	996 m	117 m
Max. electricity capacity	2 x 29 MW	2 MW
Machines	2 Pelton turbines	1 Francis turbine
Diameter turbine rotor	3 m	0.5 m
Generators	2 x 30 MVA	2.5 MVA
Transformers	2 x 30 MVA 11/220 kV	2.5 MVA 0.88/8 – 16 kV
Average annual generation	100 million kilowatt hours	3 million kilowatt hours
Winter (67%)	68 million kilowatt hours	2 million kilowatt hours
Summer (33%)	32 million kilowatt hours	1 million kilowatt hours



Experience hydro power for yourself!

You would like to experience live how electricity is generated from the power of water?
You are curious about what the inside of a

power station or dam looks like? Then register for one of our exciting power station tours!

Contact for tours

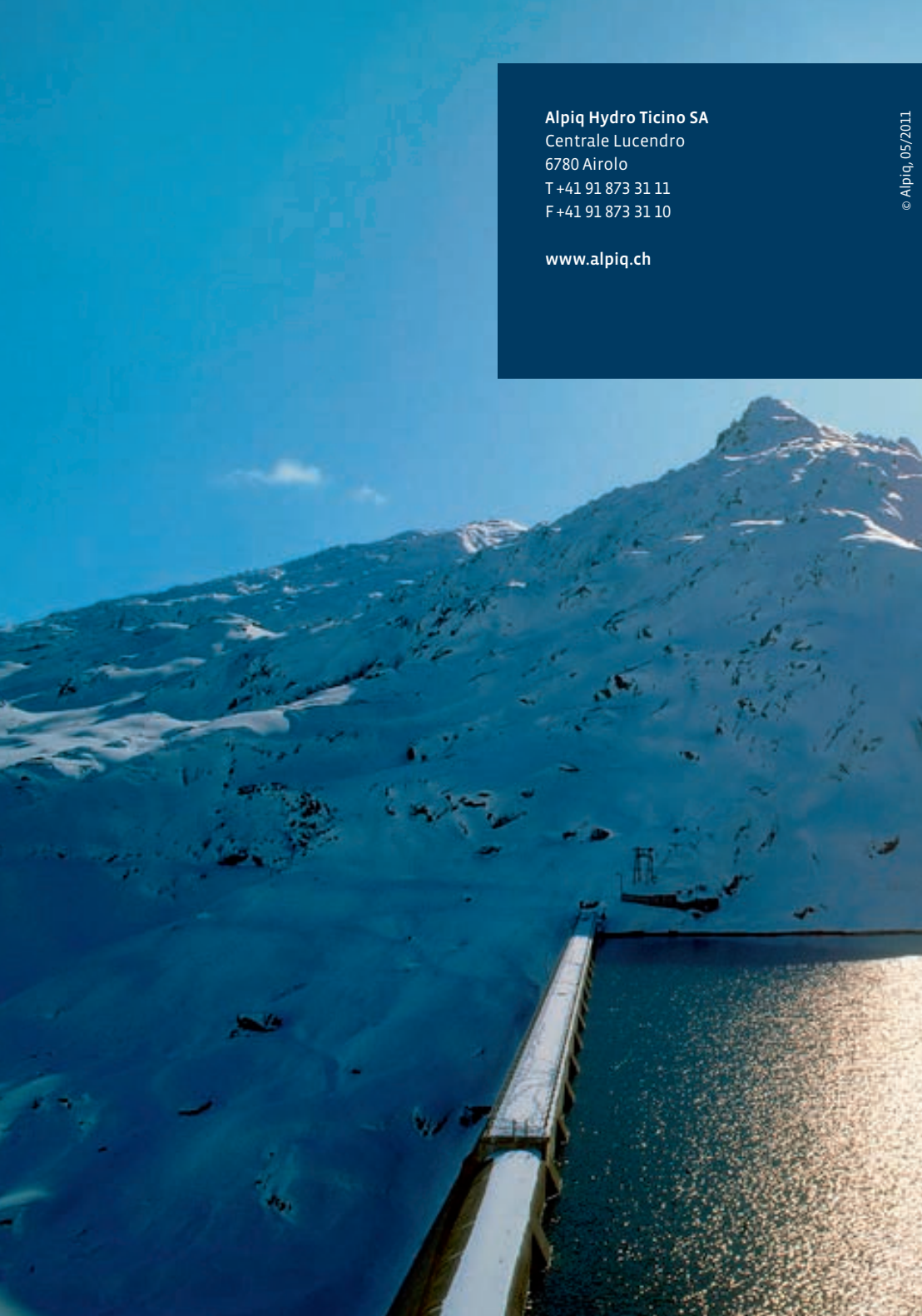
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Free tours

Visitors are most welcome to visit the Airolo and Sella power stations as well as the Lucendro and Sella dams after prior appointment by phone. Groups of a minimum of six persons and school classes can participate in a guided tour with a great deal of background information.

Insights and outlooks

Whether in Airolo or Sella – A visit to a power station is really worthwhile. In both power stations there are fascinating insights to be made into the world of hydro power. But also outside of the power station walls there are exciting things to be discovered: The hiking trails in the Gotthard area are rewarding excursion destinations.



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