CRUACHAN POWER STATION SITE INFORMATION

SCOTTISHPOWER
Energy Wholesale

OVERVIEW

Cruachan Power Station is one of only four pumped storage power stations in the United Kingdom.

It was constructed during the early 1960s and officially opened by Her Majesty the Queen in October 1965.

Situated near Oban, Argyll, the station's turbine hall has been constructed within the hollowed-out rock of the mountain, Ben Cruachan.

Only the impressive 316 metre-long dam at the top of the mountain, the offices and visitor facilities are visible from the road, preserving the scenic beauty of the landscape.

INTRODUCTION TO CRUACHAN POWER STATION

Cruachan Power Station plays an important strategic role in helping to secure the nation's electricity supply.

The pumped storage power station enables energy to be temporarily stored to meet peaks in demand.

Cruachan achieves this by clever management of water resources between a reservoir high in the Argyll hills and Loch Awe, 396 metres below.

Using its reversible turbines, the station pumps water from Loch Awe to fill the upper reservoir when electricity prices are low. When prices rise again, often at times of peak demand, the stored water can then be released through the plant's turbines.

The plant can also operate like a conventional hydro-electric station using rainwater from its catchment area – around 10% of its annual generated output is produced in this way.

The station is also very responsive. When its four turbines are on "spinning reserve" – turning in air, awaiting the rush of water – each unit can generate at full load within 30 seconds.

Normally, the plant runs for short periods to meet daytime peaks, but it is capable of operating continuously for around 20 hours if necessary.

CONTACT US

Cruachan Power Station
Lochawe, Dalmally,
Argyll
telephone: 01866 822618
web: **www.spenergywholesale.com**

The station's machine hall, containing the four turbines, is the same size as a football pitch

THE "HOLLOW MOUNTAIN"

Cruachan's machine hall, built inside the hollowed-out rock of Ben Cruachan, is the size of a football pitch and reached by a tunnel about seven metres wide and four metres high.

The main cavern houses four generator/motor sets that are capable of generating 440 megawatts (MW) of electricity – enough to supply more than 225,000 homes.

The cavern also contains the transformer halls, a viewing gallery for visitors and a computerised control room from which the plant is monitored and controlled.

Construction of the "Hollow Mountain" involved the excavation of 220,000 cubic metres of rock and soil. Around 1,500 workers were employed at the peak of this major civil engineering project.

Access to the turbine hall is through a 1km tunnel

Cruachan is a green provider of electricity. Because it is powered by water, its operation does not directly result in emissions to air of gases such as carbon dioxide (CO_2) or sulphur dioxide (SO_2).

The only CO_2 produced directly is from the use of transport and process energy, such as start-up and pumping.

The station is, however, a net consumer of electricity. It uses up more power for pumping water and spinning its turbines than it actually generates.

The station is tackling its use of resources. Energy usage is monitored to help the plant identify possible savings.

New, more energy-efficient motors and pumps have been fitted as part of a recent investment across the station's four generating units.

Another key consideration is ensuring water quality.

Cruachan has an excellent record on environmental protection but nevertheless has invested heavily in improving its readiness in the unlikely event of an oil spill or leak.

New oil skimmers have been installed in the low level gallery of the machine hall. These work continuously to skim any oil leaks or spills.

As an extra safety net, four oil interceptors work like septic tanks to trap any leak or spill before it enters the water system and ultimately the loch.

REDUCING OUR ENVIRONMENTAL IMPACT

Monitoring an oil skimmer

Alarms are fitted to the interceptors to alert station staff in the event of a spill, allowing early intervention.

Meanwhile, improved bunding has been put in place around the transformers and oil tanks at the station, at the dam and at the tailrace at Loch Awe.

Cruachan Power Station operates to conditions set out in a Controlled Activities Licence that is issued and enforced by the Scottish Environment Protection Agency (SEPA)

The station operates an Environmental Management System that is certified to the standard ISO 14001 and also has published a site biodiversity action plan (BAP).

CRUACHAN POWER STATION SITE INFORMATION

HOW IT WORKS

Cruachan's generators are powered by water from a reservoir on the slopes of Ben Cruachan, 396 metres above.

The reservoir has a storage capacity of 10 million cubic metres of water and has a catchment area of 23 km^2. A network of 19 kilometres of tunnels and pipes divert rainwater from streams into the reservoir.

The station can be used as a conventional hydro plant, using run-off water from its upper reservoir's catchment area. Around 10% of Cruachan's electricity is produced in this way.

More usually, however, Cruachan works like an enormous rechargeable battery. Its reversible turbines use cheap electricity during the night to pump water from Loch Awe at the foot of the mountain to its upper reservoir, in readiness for charging the turbines to meet peak demand the following day.

This water is, in effect, stored electricity, that can be released at any time.

1. Each of the station's four generator/motors receives water from the upper reservoir via concrete-lined shafts, known as penstocks.

The water passes into steel pipes that terminate at main inlet valves.

2. When generation is required, the valves are opened to allow a rush of water to drive the turbines.
3. After the water passes through the turbines, generating electricity, it flows into a surge chamber then into Loch Awe along a tailrace tunnel that is seven metres in diameter and 975 metres long.
4. When pumping is required to refill the upper reservoir, the station's turbines are switched into pumping mode and started using a pony motor, which spins the machine from rest to synchronous speed in the pumping direction.

Full pumping speed can be achieved in eight minutes, with each generating set absorbing between 110 MW and 120 MW from the grid to pump water from Loch Awe to the upper reservoir.

Outage work at Cruachan turbine hall

ENVIRONMENTAL PERFORMANCE HIGHLIGHTS 2009

Cruachan staff and contractors are committed to containing the station's impact on the environment to a practicable minimum.

The station has an Environmental Policy that is a public statement of the minimum standards expected.

Its Environmental Management System (EMS) details the actions taken by the station to meet its environmental responsibilities.

Cruachan staff work closely with our stakeholders, including the Scottish Environment Protection Agency and local communities, to achieve our environmental goals.

As a testament to this close co-operation, there were no complaints from local residents in 2009 and no notifiable incidents.

Cruachan Power Station control room

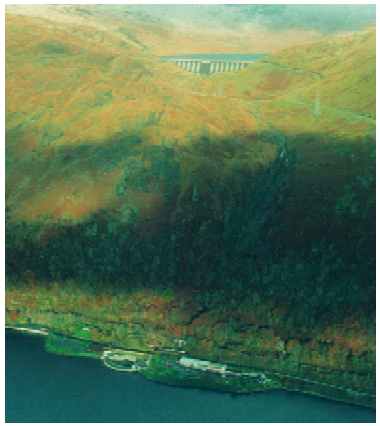
In 2009, the station generated 705 GWh of electricity – a 20% reduction compared with 2008 (885 GWh).

During the year, staff and contractors completed a major upgrade of Unit 4. Key tasks included replacement of the automatic voltage regulator and an upgrade of the unit's transformers.

Work was also carried out on the oil management skimmer system that removes oil arising from the station's basement, while the station's bearing oil mist equipment was upgraded.

Other highlights in 2009 were:

- Cruachan's EMS was recertified to the international standard ISO 14001
- Staff carried out an inventory of hazardous substances stored on site, such as transformer oil, leading to volumes being reduced
- A database was set up for recording environmental near-misses, allowing us to identify and target areas of risk for improvement
- A site induction DVD was produced with details about environmental responsibility
- The key waste streams from routine operations were identified – waste oil, paper and plastic drinking bottles – so that future minimisation targets can be set
- Cruachan Visitor Centre was awarded the Green Tourism Business Scheme's Gold Award for its efforts to promote sustainability
- The Visitor Centre was refurbished in 2009, with new exhibitions on energy production, renewable energy and energy efficiency
- A biodiversity consultant carried out a breeding bird and wildlife survey at Cruachan's landholdings **(see biodiversity information sheet)**.



Cruachan upper reservoir and the station offices far below at Loch Awe