

# Lucerne 2011: Dams and Reservoirs under Changing Challenges

*The International Commission on Large Dams' 79th Annual Meeting, to be held May 29-June 3 in Lucerne, Switzerland, brings together dam experts from throughout the world to exchange knowledge and experiences. Such information exchange is vital to ensure efficient use and development of dams and hydroelectric generating facilities.*

By Anton J. Schleiss

The International Commission on Large Dams' (ICOLD) 79th Annual Meeting provides dam engineering professionals with multiple opportunities to learn about the challenges facing the profession today and to gather the latest technical information. The annual meeting will be held May 29-June 3, in Lucerne, Switzerland. In addition, delegates can take part in technical and study tours featuring dams and hydro projects both under construction and those that have been operating for decades.

## Dams in Switzerland

Switzerland is a land of mountains, rivers, and lakes. With no source of mineral fuel, the country had to rely on hydroelectric reservoirs to produce a large part of the energy required for its development. Reservoirs were created as early as 100 years ago in the Alps, some of them impounded by very large dams. Of the 161 total large dams in Switzerland, there are 48 higher than 60 meters. Of these, 25 are higher than 100 meters. The country is home to Grande Dixence Dam, which was completed in 1961. At 285 meters high, this is still the highest concrete gravity dam in the world. It impounds water for three hydro projects with a total capacity of 1,998 MW: the 1,269 MW Bieudron, the 321 MW Fionnay, and the 408 MW Nendaz.

Nearly 60% of the electricity consumed in the country is produced by hydroelectric facilities. There are more than 100 hydroelectric schemes with 580 powerhouses operating in Switzerland, with a total capacity of nearly 14,300 MW. Of these, 26 are currently undergoing rehabilitation (total capacity of 3,875 MW). In addition, there are 18 projects under construction with a total capacity of 1,395.5 MW and eight more proposed for development, mainly pumped-storage plants, which would add 4,340 MW of capacity.

In addition, the 86 meter-high Les Toules arch dam was rehabilitated and strengthened in 2010 to fulfill increased earthquake requirements. And a new 35 meter-high gravity dam to impound the upper reservoir (Muttsee) of the 1 GW Linthal pumped-storage project is now under construction.

All dams in Switzerland are well-integrated into the environment and contribute to the economic prosperity of the country. This successful development earned Swiss engineers a worldwide reputation. Since 1960, more than 150 large dams have been built around the world with the participation of Swiss specialists. Today, Switzerland can be considered a center of excellence in the dams field, with engineering teams having extensive experience not only in the design and construction of dams but also in their operation, maintenance, rehabilitation, and upgrading.

## Exchanging information

Lucerne 2011 offers delegates four forums to exchange and disseminate technical information.

One opportunity for information sharing is during a one-day symposium on June 1. The theme is "Dams and Reservoirs under Changing Challenges."

As of the end of January 2011, about 170 papers from some 40 countries had been accepted for this symposium. The four areas of focus for the symposium are dams and climate change, dams and natural hazards, dams in a sound environment, and the long-term behavior of dams.

During Lucerne 2011, a three-day technical exhibition (May 30-June 1) showcases advanced technologies; the latest innovations; and recent achievements in dam construction and management, water resources development, hydropower, and more. The exhibition is an

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opportunity to network with engineers, professionals, organizations, and companies connected with the design, maintenance, and management of dams. Products and services to be showcased during the exhibition include water resources management, construction, fabrication and erection of electrical and mechanical equipment, maintenance, engineering, power plant design, project finance, and much more. As of the end of January 2011, 48 companies were scheduled to exhibit at the conference.

A less formal, but equally valuable, opportunity are the meetings of the ICOLD technical committees. At these meetings, which will take place Tuesday, May 31, committee members discuss various topics that could lead to the publication of future specialized technical bulletins. Topics to be discussed include the technical, environmental, financial, and educational aspects of dam design, construction, maintenance, and operation. Delegates are welcome to participate as "observers" at these meetings, which provide a valuable opportunity to learn the important issues facing leaders in the dam industry.

Finally, Lucerne 2011 offers delegates four opportunities for technical visits, during which they will visit both projects under construction and dams that have been operating for decades. The technical visits, held June 2, let delegates learn the features of dams in Switzerland. All of the tours are multi-day events. For details see: [www.icold2011.ch](http://www.icold2011.ch).

On the technical tours, delegates will visit a variety of hydro projects operating and under construction, including the 628 MW Nant de Drance, pumped-storage facility located near the French border. This project will utilize the height difference between the existing Emosson and Vieux Emosson reservoirs to produce about 1.5 TWh of peaking power each year. The entire project will be located underground to deal with environmental constraints. The powerhouse will contain four vertical Francis reversible turbines and vertical asynchronous motor-

generator units. A groundbreaking ceremony for this project was held in June 2009, and the project is expected to begin operating in 2015.

Delegates of one technical tour will visit the 155 meter-high Goscheneralp earthfill dam on the Goschenerreuss River, which was completed in 1960, as well as the 76 million m<sup>3</sup> reservoir. The reservoir provides water for three powerhouses with a total installed capacity of 460 MW. Work is scheduled to begin in the spring of 2011 to raise the dam height by 8 meters and so to increase the reservoir volume by some 15% for additional hydroelectric production in winter. This work is scheduled to be completed in 2013. Another dam on this tour is Lucendro buttress dam, the only dam of its type in Switzerland. This dam, on the Gotthardreuss River, is 69 meters high and was completed in 1947. The buttresses have been laterally reinforced using struts to increase stability of the structure. The 25 million m<sup>3</sup> reservoir provides water for a 58 MW powerhouse.

Another tour takes delegates to the Solis arch dam, a 61 meter-high structure completed in 1986 that impounds water for two hydro facilities with a total capacity of 65 MW. The dam accumulates coarse sediments, and an 850 meter-long bypass tunnel is being built to remove sediment and maintain sufficient storage capacity for energy production. Delegates also stop at the Marmorera (Castiletto) rockfill dam. At 91 meters high, this was the tallest dam in Europe when it was completed in 1954. The 60 million m<sup>3</sup> reservoir supplies four powerhouses with a total capacity of 165 MW.

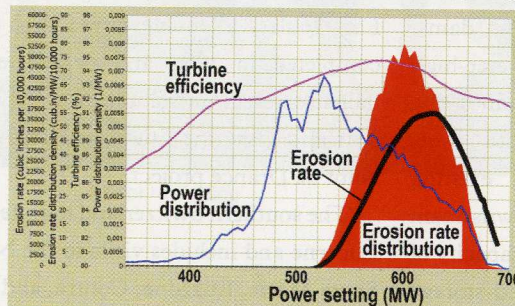
Two other dams on the technical tours are Spitalamm and Seeuferegg. Both dams are being considered for heightening. Each dam would be raised by 23 meters to increase reservoir capacity for winter peak production in the two downstream powerhouses, with a combined capacity of about 330 MW.

In addition to the technical tours, a range of study tours are offered, both before and after Lucerne 2011.

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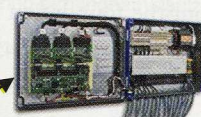
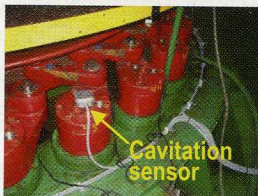
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Punt dal Gall, a 130 meter-high arch dam in Switzerland and its associated 393 MW hydro facility, feature in the pre-conference and post-meeting tours.



Nalps Dam is undergoing intensified monitoring as a result of construction of the Gotthard Base Tunnel. This railway tunnel beneath the Alps was completed in 2010.

Three different study tours are offered before the meeting, on May 26-29. The western Switzerland tour begins in Geneva. Delegates have a chance to visit the 86 meter high Les Toules arch dam, which impounds water for a hydro powerhouse. They also will visit the Emosson arch dam, part of the Nant de Drance project. The final dam on the tour is Grande Dixence.

The southern Switzerland tour begins in Zurich. Delegates will learn about the intensified monitoring of the 127 meter-high Nalps and 117 meter-high Santa Maria arch dams required by construction of the Gotthard Base Tunnel, a railway tunnel beneath the Alps that was completed in 2010. Other dams on the tour include the Luzzone and Contra (Verzasca) arch dams. Heightening of the 225 meter-high Luzzone Dam was completed in 1999, increasing reservoir volume to some 107 million m<sup>3</sup> from the existing 87 million m<sup>3</sup>. The two downstream powerhouses have an installed capacity of 376 MW. A new 300 MW pumped-storage powerhouse is proposed for the 220 meter-high Verzasca Dam. Delegates can learn about the foundation rehabilitation work under way at the 45 meter-high Isola Dam, which provides water to two powerhouses with a combined 107 MW.

The eastern Switzerland tour also begins in Zurich. Delegates will visit the 73 meter-high Ova Spin arch dam and the associated 47 MW pumped-storage powerhouse, as well as the 130 meter-

high Punt dal Gall arch dam and the associated 393 MW hydro facility. The tour includes a visit to the information center for the 42 MW Linthal pumped-storage project under construction, with expected inauguration in 2015.

In addition, six post-meeting study tours are available, held June 4-June 7 or 8. All tours depart from Lucerne. The western Switzerland tour begins in Lucerne and visits Grande Dixence Dam. Delegates will see the 250 meter-high Mauvoisin arch dam, which was heightened by 13.5 meters in 1991. There are three plants in the Mauvoisin complex: the 29 MW Chanrion, the 138 MW Fionnay, and the 225 MW Riddes.

Other features of the tour include Les Toules, a double curve arch dam completed in 1958 and heightened to increase reservoir volume in 1964. The tour also visits the Emosson Dam at the Nant de Drance project.

The southern Switzerland tour departs Lucerne and includes visits to the Nalps, Santa Maria, Luzzone, Contra, and Isola hydro dams.

The eastern Switzerland tour visits the Tierfehd compensation basin, which is part of the Linthal pumped-storage project. Delegates also will visit the Solis, Marmorera, Punt dal Gall, and Isola dams.

The southern Germany/Austria tour involves a visit to the 1,048 MW Hornberg pumped-storage project and a presentation on the 1,400 MW Atdorf

pumped-storage project. Delegates will visit the Latschau Reservoir, which impounds water for a 9 MW project, and Kuhtai Reservoir, which impounds water for a 289 MW pumped-storage project. The tour finishes with visits to the 7 MW Sylvenstein project, currently undergoing rehabilitation, and the 480 MW Limberg 2 pumped-storage project.

The northern Italy tour visits the 160 meter-tall Alpe Gera Dam, the first roller-compacted-concrete gravity dam, completed in 1964. This dam impounds water for a hydro project. Delegates also get to visit the 10 MW San Giacomo di Fraele project, impounded by a buttress dam, the 125 meter-high Cancano II arch gravity dam and the 84 meter-high Zoccolo rockfill dam.

The French Alps and Rhone Valley tour visits Genissiat Dam, the highest gravity dam on the Rhone River, which impounds water for the 420 MW Genissiat-Seyssel project. Also included are the 90 MW Chautagne project, the 150 meter-high combined arch-buttress Roseland Dam, the 180 meter-high Tignes arch dam, and the 1,820 MW Grand Maison scheme. This consists of a 628 MW conventional facility and a 1,192 MW pumped-storage project. Finally, delegates will visit the Allemont powerhouse and the 354 MW Donzere-Mondragon scheme on the Rhone River. ■

— To register for Lucerne 2011, visit: [www.icold2011.ch](http://www.icold2011.ch). Online registration is available, or a pdf form can be downloaded and returned by mail or fax.