The Key Stages of the Construction Works

Address delivered by Mr. Jean-François Nicod, Chief Executive of Cleuson-Dixence Construction SA
Press presentation on April 30, 2010

Only the spoken version shall be authentic

Ladies and gentlemen the press representatives,

Following the accident that struck the penstock in December 2000, the rehabilitation of the Cleuson-Dixence installations has taken place in three stages:

1. The first stage, from 2002 to 2005, concerned the feasibility and design surveys for rehabilitation of the penstock. It was during this phase that the companies which own the facility established Cleuson-Dixence Construction SA in order to carry out the rehabilitation works. At the same time they appointed an International Group of Experts to assist Cleuson-Dixence Construction with this process. This group of international experts was strengthened in 2003 with Swiss experts.

2. The second phase - execution of the works - lasted three years, from 2006 to 2009.

3. As for the last stage, it was devoted to channelling water through the penstock and to putting the installations into operation (2nd half of 2009).

During the first phase, **the principal options** that were decided on were as follows:

- Rehabilitation concerned the whole of the penstock. Consequently the existing shielding would not help to make the new penstock more resistant.
- The penstock was to be entirely lined outside the zone in which the accident occurred.
- Having been weakened, the accident zone was to be avoided by means of a deep bypass.

The preparatory works, which lasted two years (2005-2006), consisted:

- of passing a clearance gauge through the inside of the existing penstock so as to ensure that it was feasible to lower 12-metre-long pipes down the penstock;
- putting in place a cableway between Plan-Désert and Tracouet to allow access to the head of the penstock at all times;
- and of performing injections over the whole length of the penstock in order to securely join the existing penstock to the casing rock;
- qualification tests were performed on the welding techniques at the Stuttgart Materials Testing Institute (MPA) and under real-life conditions at Chandoline.

- We then proceeded to bore two galleries to gain access to the penstock upstream and downstream of the bypass and to adapt the existing windows to allow the transportation and lowering of pipes into the existing penstock;
- Finally, we conducted suitability tests on the annular concrete.

The sheet-metal works proper began in 2007 and were completed in 2009. The lining was executed in S500 ML steel on the upper portion from Tracouet à Péroua, and in S690 QL steel on the lower portion between Péroua and Bieudron. These steel s were chosen for their good "weldability" and their tried-and-tested use in similar applications. The thickness of the shielding varies from 20 to 70 mm.

All the welds were inspected twice 100%, the first time by the sheet-metal contractor and the second time by an independent company appointed directly by Cleuson-Dixence Construction.

The inside of the lining was painted with a two-component epoxy coating, SIKA SW500, which has high anti-corrosion and abrasion-resistance properties.

The penstock was gradually filled with water during the first fortnight of August 2009 and its behaviour has been continuously monitored since then.

Since 2008 **preventive maintenance and a point-by-point check** have been carried out on the installations of the Bieudron power station, which has been non-operational since 2000. The commissioning tests lasted eight months and confirmed that the installations satisfied all the necessary requirements for the facility to be put into operation.

Thus on January 27, 2010 Cleuson-Dixence Construction handed over the installations to their owners, Grande Dixence SA and Alpiq Suisse SA, in faultless and perfectly safe operating condition.

Thank you for your attention.