From the Board Room: Anton Schleiss, ICOLD

In this interview, the new president of the International Commission on Large Dams discusses the commission’s efforts to disseminate information on dams and hydropower and bring young engineers into the fold, as well as how market conditions are affecting hydro.

By Elizabeth Ingram

The International Commission on Large Dams is an international organization, with almost 100 member countries, that focuses on providing a forum for the exchange of knowledge and experience in dam engineering. ICOLD seeks to ensure that dams are built safely, efficiently, economically and without detrimental effects on the environment. Its original aim was to encourage advances in the planning, design, construction, operation and maintenance of large dams and their associated civil works by collecting and disseminating relevant information and by studying related technical questions.

HRW-Hydro Review Worldwide sat down with Dr. Anton J. Schleiss, who was elected president of ICOLD in June 2015. Schleiss directs the Laboratory of Hydraulic Constructions in the Civil Engineering Institute of the School of Architecture, Civil and Environment Engineering at Ecole Polytechnique Federale de Lausanne (Swiss Federal Institute of Technology Lausanne), where 20 PhD projects are ongoing under his guidance. He has a degree in civil engineering and a doctorate of technical sciences on pressure tunnel design from the Swiss Federal Institute of Technology. The following is a transcript of that discussion.

Q: ICOLD seeks to provide a forum for the exchange of knowledge and experience in dam engineering. Tell me a little about how the commission fulfills this goal.

Schleiss: ICOLD from the beginning, 87 years ago, was established to lead the dams and civil structures industries in setting standards and guidelines designed to ensure that dams are built and operated safely, efficiently and economically. It is also important that they are environmentally sustainable and socially equitable. This is what we focus on as an organization. We try to assist our member countries so that they can meet the challenges of this century, which are development of the world’s water and hydropower resources. This is a goal motivation of ICOLD in setting the standards and guidelines, which are published in our 156 bulletins. The latest bulletin, for example, concerns integrated flood risk management. [Publication of these bulletins is the heart of ICOLD activity, according to the website. In addition to the bulletins already released, another dozen are being prepared.]

Q: You became the ICOLD president in 2015. What are specific areas you plan to focus on during your tenure?

Schleiss: What I have been focusing on as vice president since 2012 is the need to enhance worldwide dissemination of our publications, which includes the congress proceedings and the bulletins elaborated by our 26 technical committees. This information is not getting out as much as we would like to the global dams and hydropower industries because we publish this data ourselves and hence it is not in the worldwide DOI database system of professional and scientific publications.

We publish during our annual congress several questions that will be addressed, and all are a rich source of high-quality knowledge for the dams and hydropower industries. That is why in the future we would like to try to have a professional publisher to do this type of work.

Another area of focus for me, because of my university background (although I also worked a long time for an engineering company), would be to increase our relationships with university research institutes, as well as professional organizations in the dams industry. ICOLD is based on national committees and national members. Countries are our members. We are discussing a kind of cooperative membership for dam industry and related companies. In addition to attending the congresses and providing knowledge, they can help prepare publications for engineering and all key dam industries. That’s something we want to enhance.

Q: One of ICOLD’s key issues is encouraging young people to participate in the organization and its national committees. Why is this important for ICOLD?

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Schleiss: It is important for me that we promote young engineers, to motivate them, and giving them ways to participate in the congress is also very important. Young engineers receive a reduced registration rate to attend the congress, and we offer a Young Engineers Forum Formal Meeting and Young Engineers Social Gathering at the congress. Also, during the congress and symposium, we offer awards for the best presentations by young engineers.

There is always a question regarding the financial issues surrounding having young engineers participate in the congress. We would like to find sources that would allow us to give them a waiver for congress participation, especially for young engineers coming from developing and emerging countries.

Traditionally ICOLD was an organization in which already confirmed engineers participated. Nevertheless, young engineers will be the ones who will build the future large dams and hydropower plants, so it is very important that we involve them in ICOLD very soon.

Q: According to the ICOLD website, your focus has broadened a bit since the commission was founded in 1928. What are focuses for today that differ from those, say, 50 years ago?

Schleiss: In the beginning, ICOLD’s focus was more on technical aspects of dam engineering, so in principal the dams were considered an engineering structure and the main discussions surrounded the methods and tools to calculate or design this structure.

It is no longer the case today that the technical issue of dam engineering is the most important thing. In addition, today dams and reservoirs have to be considered part of a complex system, not as a simple structure. This system is in a built environment that is complex, taking into account everything around, including the environment, societies, and the economy. You have to identify all factors that can influence the project or the system. The end goal is to try to find a synergy between all factors influencing this complex system where you arrive at the best situation for the particular project, allowing also wide acceptance.

And this will always be a multipurpose project. I participated in such a multipurpose project, where hydropower was involved, as well as creation of a new ecosystem, services such as hydro peaking mitigation, flood protection, and recreational opportunities. Developers of dams and hydropower facilities have to find a kind of compromise among all these purposes. This type of project can quite easily defy expectations, as already mentioned.

Q: How does ICOLD's work affect or translate to the hydroelectric power sector?

Schleiss: In many countries, the large dams are mainly used for hydropower. ICOLD treats this topic in our technical committees. We discuss issues that are related to hydropower, for example in our committees that deal with water resources management and environment. We also have a committee that discusses the topic of integrated operation of hydropower plants and reservoirs, another committee preparing guidelines for multipurpose water storage and a third working on dams and river basin management. We discuss the aspect of climate change, which comes into play with regard to hydropower.

But we are not discussing which turbine you will use and what type of hydropower plant you will construct. Hydro is an integrated part of the system, and for every layer in the project there is an interaction that we will discuss.

Q: What does the term “modern hydropower” mean to you?

Schleiss: To me, modern hydropower refers to the new generation of hydro plants. As mentioned earlier though, we are talking about more than hydropower, and we should have a goal to build sustainable projects that can develop synergies between environment, social, and economic issues. For any future hydropower project or dam, we need to ask: “What will be the gain from an economical view, and how can we improve social aspects?” We also need to consider how this project can maybe create new ecosystem services. Any project has a certain influence on the environment, but there is also a chance to create new ecosystems if the project is done in a good way. That’s how we develop sustainable projects.

Also important is hydropower design under uncertainty. How can you design and build a project in a way that takes into account uncertainties that may arise in the future so you have projects that can work in a robust and flexible way? This is really very important. In formal engineering this is not looked at in a systematic way, instead it is treated in a simple way. There are methods available to assess this uncertainty and react with design of the project.

The modern hydropower project will also be successful in view of climate change and...
dealing with changing economic situations if it is handled this way. This for me is something quite important that I would consider as modern hydro: that it takes into account uncertainties in the future. The key words here are robust and flexible design, as well as resilience for this project.

We do not have any committees addressing this topic, but this past October, together with the World Bank, which is very interested in the question of resilience of hydropower and dam projects, we discussed this issue. We decided we will treat that problem in our committee that is working on environmental issues (includes climate change) and related to resilience. In principal, this committee will work out ways to address resilience of projects.

Q: What is the main challenge for hydropower development around the world?

Schleiss: One of the challenges I see is the need for large investments that can be quite long-term. Often today, also perhaps because of uncertainty, investors have a short-term mission and perhaps will choose other options that pay back sooner than hydropower. The payback period on hydro projects can range from 20 to 60 years, compared with fewer than 20 years for other investment options. That’s a bit of challenge, to show that these high investment costs can have a huge benefit in the future, even if the future is a bit delayed.

Again, the challenge is that the project has to be designed to fulfill multiple purposes, which results in high expectations. A project must deliver not only energy production or financial wealth but also deal with climate change and provide ecosystem services, flood protection, and flow restoration.

The challenge is to make this situation better and ensure more multipurpose projects are built. There will without a doubt be climate change. Major hazards, such as floods or instability of slopes, will be much more frequent and will be a challenge in the design and development of projects so they can withstand these increased natural hazards and even help mitigate the situation through flood protection, a retention basin and so on.

Shared water is an issue, this is absolutely clear, particularly in regions where there is stress on water. I think this goes in the direction of multipurpose projects. Hydro development has to be treated in such regions as a multinational effort, otherwise this work can create high tensions between countries. Modern projects should have to be negotiated with multilateral contracts so that benefits are distributed equally and everybody gets the best out of this project.

Indirectly, we have a committee on multipurpose projects and river basin management (covering several countries). The members are not directly focusing on water acts between different countries but on how you can distribute the benefits and how this can contractually be done. Many of our members are involved in just such kind of disputes, and I personally participated in some disputes between Pakistan and India to give technical advice to solve some issues.

Q: What is the most striking change you have witnessed for hydropower recently?

Schleiss: Here I will speak regarding the situation in Europe, and especially in Switzerland. Energy prices are so low that some hydropower plants can lose money during certain periods of the year. That was never experienced before. The problem is that we have a completely distorted electricity spot market in Europe, mainly because we have a high subsidy of wind and solar but also in some countries still of coal. This has changed the merit order in which power plants are dispatched so that the first that can meet the demand for energy on the market is wind, solar and coal, which have to run, and also nuclear. Only after that come run-of-river and storage hydropower plants. Because they come later, the electricity prices are quite low so that especially pumped storage or storage energy is not very well compensated.

It is very difficult to start large new hydropower projects, even if everybody knows those projects will be used, because electricity production becomes more volatile with wind and solar. We need grid integration services, which at the moment are not paid for.

We also in Europe have very low cost CO2 certificates that favor coal or gas turbines. This puts hydropower in a later rank in order of the market, as well.

Another influence is that we have too much installed electrical capacity throughout Europe, which pushes prices down. This may be the first time hydropower projects are not being developed because the economic situation is so bad, instead in the past where it was opposition from an environmental point of view that was hindering these projects.

At the same time, many countries in Europe want to phase out nuclear energy. By 2030 and 2050, we will need a much higher contribution of hydropower in order...
to guarantee that the highly volatile energy production from solar and wind facilities can be stabilized on the electricity grid.

In other regions of the world, such as Asia, this overcapacity is not an issue because there is still more electricity needed. In many countries, new hydropower plants substituting for coal and oil can reduce greenhouse gas emissions significantly, even by developing only a part of the remaining feasible potential.

Q: What single change would you like to see that could enhance the role of modern hydropower?
Schleiss: Stop the subsidies of new renewable and other energies. We should have a free market with no subsidies. It is clear hydropower probably is the most economic energy source compared with all others. There would be a very bright future for hydro if you had a true free market without any subsidies or favoring of certain energy in certain countries. The type of generation that is the cheapest would then be built, and the energy would be sold on the market, and that would almost always be hydro if the potential is available. Run-of-river plants produce energy at half the price all others can produce. Even for peak/storage energy, other generation types cannot compete in terms of cost. Oil and gas prices are very low, but new storage power plants would produce energy at about 15 cents per kilowatt-hour and I do not know anything else that can give energy with such high flexibility at any time for that price.

Another interesting area to watch will be the future for pumped storage. We continue to build these facilities in Europe, but new projects are a little bit on the waiting list because people are afraid of the prices we have at the moment on the European electricity market.

Q: Do you have any final comments or thoughts on the future of hydropower and dams globally?
Schleiss: I always say to my students that if you look at history, water and energy infrastructures have always been related to the development and welfare of any society in the world. These infrastructures will still be urgently needed because they are important to satisfy the vital human needs of water, energy and food. That means support of infrastructure in a general way is of fundamental importance for the economic health of any society. This infrastructure will be always needed and there will be even more needed with all the change we will experience with global warming.

There is a lot of work to be done. For dams and reservoirs, one important aspect is the question of reservoir sedimentation. This is something that has to be solved for future projects. We cannot build huge infrastructure that will be filled up by sediment in 20 to 30 years. This is closely related to climate change, which will increase the yield of sediments that will be imported to the reservoir. For new projects, we need a sustainable solution so that we can deal with sediment, for example we can flush the reservoir efficiently and regularly. We must build new dams and hydro projects in a way that they can either be protected from sediment or we can manage the sediment in the reservoir.