

“CLEAN, CLEVER, AND COMPETITIVE”

Interview with Richard Taylor

Executive Director of the International Hydropower Association (IHA)

The International Hydropower Association (IHA) has members in more than 80 countries and is a non-profit organization advancing hydropower's role in meeting the world's water and energy needs. Richard Taylor has over 20 years experience in water resource management and has been Executive Director of the Association since 2001. He shares with us his views about hydropower as a source of renewable energy.

Personal background

My professional career started in 1985. I specialized in hydropower project assessment, focusing on design and environmental performance. Between 1986 and 2001, I edited international journals on hydropower and dam construction. Since 2001, I have been the Executive Director of IHA. I am also a Fellow of the Energy Institute in the UK and have been engaged in various United Nations initiatives. I am IHA's observer to the UN Framework Convention on Climate Change.

Supply and demand

Global energy use has risen by 70% since 1971 and continues to increase at the rate of about 2% per year. There are many scenarios for future demand and the energy mix that will be needed to meet this.

In 2005, renewable energy represented one-fifth of total power generation. Hydropower is the most advanced and flexible of the renewables and represents 87% of this production. During 2005 alone, 18 GW of new hydro capacity was commissioned. IHA estimates that only one-third of the realistic potential has been developed.

Five countries make up more than half of the world's hydropower production: China, Canada, Brazil, USA, and Russia. Taking Europe as a benchmark (proportion of production in relation to realistic feasibility), we expect to see a ten-fold increase of hydro in Africa, a three-fold increase in Asia, a doubling in South America, and an increase of about 10% in North America. Future development in countries such as Chile, Colombia, Ethiopia, Nepal, Romania, Turkey, and Zambia will rely on finding appropriate long-term funding mechanisms and partnerships.

There are many recent cases of incremental hydropower, both adding to existing capacity and retrofitting large dams to increase hydropower production. There are 45,000 large dams in the world and the majority does not have hydro facilities. While this is not always an economic option, there is a significant market niche in this area.

An even bigger market is plant modernization. Equipment with improved performance can be installed, often to accommodate market demands for more flexible, peaking modes of operation. Most of the 807 GW of hydro equipment in operation today will need to be modernized by 2030.

Drivers

Beyond basic energy demand, there is a long-term economic advantage of hydro development. With annual operating costs in the order of 1% of capital costs, hydro's autonomy from fuel price is a distinct advantage. The flexibility of storage hydro (hydro with reservoirs) also makes it a compelling partner to ensure security in mixed power systems. Another driver is the increasing need for water management. Multi-purpose hydro reservoirs bring security of water supply as well as power.

Technologies

Most of the early hydropower projects were built to provide a primary “baseload” to the power system. As other technologies were introduced, hydro has tended to evolve into a supporting role – responding to gaps between supply and peak demand.

Consumers today subscribe to the need for a transition from “dirty, insecure, and expensive” to an energy future which is “clean, clever, and competitive.” However, there is certainly no technology panacea on the horizon.

With hydropower technology, the challenge is to improve by continuously pushing the envelope in terms of environmental performance, materials, efficiency, operating range, and costs. The least-cost alternative for producers desiring additional capacity is almost always to modernize existing plants, when this is an option.

“Water and energy are the world's key challenges – and hydropower has a vital role to play in both.”

Richard Taylor



Also, looking at new technologies, I think the hydro industry could take more of a lead in the marine energy sector. More broadly, I think all renewable technologies could benefit from closer collaboration.

Small versus large

This is an old debate. From the smallest to the largest, all developments have a footprint, especially when you look at the cumulative effect of a lot of small schemes. Smaller-scale hydro plays an important role in remote areas and in maximizing the value of multi-purpose sites. Large schemes will continue to be the most environmentally benign to the power industry and urban centers.

Pumped storage

Storing hydro at times of low demand and releasing it when demands are high can be a very good business. Pumped storage can solve a plethora of system challenges. It can follow load fluctuations so that fossil plants can continue to operate at their best efficiency. In many countries, pumped storage units ensure total system security and maintain the quality of supply.

Synergies

There are good synergies between renewable energies. For hydropower, the most developed relationships are with wind and geothermal power generation. Wind produces a variable and intermittent supply and hydro can provide the firming capacity to ensure both security and quality in the system. Geothermal plant characteristics lend the technology to baseload operation. Hydro's flexibility can support this by meeting peaks in demand. Similar synergies between hydro and solar, biomass and the marine technologies will develop as these technologies move into larger scale deployment.

Issues

With regard to climate change, hydropower tends to have a very low greenhouse gas (GHG) footprint. As water carries carbon in the natural cycle, scientists have investigated the extent to which a new reservoir might accelerate carbon emissions. In some very shallow tropical reservoirs, this may be the case, and account would need to be taken into consideration in the life cycle analysis of such schemes. In contrast, several hundred reservoirs around the world have been monitored to test their emissions, confirming that hydropower is one of the cleanest methods of power generation. Taking into account an international average for hydropower emissions, fossil fuel power plants tend to emit 10 to 35 times more greenhouse gas per unit of electricity.

Population growth in emerging markets is both a driver and a constraint. The demand for land and water resources increases with population growth. Water management is key to sustainable development. Many of the projects in the future will be multi-purpose: urban water supply, flood control, in addition to power generation.

Finding the right balance is fundamental. Sustainability criteria demand that economic decisions incorporate environmental stewardship and social justice. To give guidance, IHA has developed Sustainability Guidelines. Supplementing this is an Assessment Protocol which sets out a system by which sustainability can be measured. I believe that the Protocol will become the primary tool for certifying the sustainability of hydropower development.

Following this, certification could be a win-win for all parties. That is, the best performers will get the best returns, and customers can buy with confidence.

Regulatory matters

Europe and North America tend to have the most advanced regulatory frameworks. While comprehensive project assessment is a given, much unnecessary bureaucracy is created in the development of new projects and the periodic re-licensing of existing installations. The high administration costs are a significant burden, especially for smaller companies. In Europe, the Water Framework and Emissions Trading Directives are in need of clarification regarding hydropower. For the "transition" countries and developing world, regulations relating to the Kyoto mechanisms need to be better understood. In addition, financial institutions must standardize their policies to avoid unnecessary duplication and inefficiency.

Financing

Many economically feasible hydropower projects are financially challenged. High up-front costs are a deterrent for investment. Also, hydro tends to have lengthy lead times for planning, permitting, and construction. When you examine life cycle costs, however, hydro often has the best performance, with operating costs being a fraction of the capital investment.

The main challenges relate to creating investor confidence in hydropower. Green markets and trading in emissions reductions will undoubtedly give incentives in some areas. In developing markets, such as Africa, interconnection between countries and the formation of power pools will build investor confidence. Feasibility and impact assessments carried out by the public sector, prior to developer tendering, will ensure greater private sector interest in future projects.

However, I think most investment will only come when the need becomes urgent – when the lights go out. Unless policymakers are better informed, much of the investment will be targeted at quick-fix solutions. It is IHA's priority to increase awareness of the role that hydropower can play in the clean, clever, and competitive markets of tomorrow. ■