A lack of dedicated resources, proper training and institutional capacity can result in hydropower generating stations being poorly maintained and operated, particularly in developing countries.

Poor operations and maintenance (O&M) of hydropower facilities can result in significant consequences, such as: high outage rates; performance losses; and rehabilitation/replacement costs.

Ultimately, poor O&M may lead to lost energy production and revenue. More indirect and longer-term impacts of poor O&M can also include dam safety concerns, and environmental or safety issues. These have the potential to lead to loss of lives and property.

This workshop explored different models for the O&M of dams and hydropower generating assets, with a particular emphasis on best practices that can be that could be developed in low-capacity countries.

It is in developing countries where the consequences of inadequate O&M are often amplified, due to lack of capacity.

The workshop explored a roadmap for tools that could be further developed in order to foster and support sustainable O&M practices in the hydropower sector.

Speakers

- **Guy Bonvin**, head of infrastructure financing division, Swiss Sec. of Economic Affairs (SECO)
- **Jean-Michel Devernay**, consultant, World Bank
- **Bill Girling**, hydropower development director, International Hydropower Association
- **Dominik Godde**, managing director, H2GO Consult GmbH
- **Robin Goodman**, hydro services leader, GE Renewable Energy
- **Pierre Lorillou**, senior hydropower specialist, energy and extractives practice, World Bank
- **Laurent Mouvett**, CEO, Hydro Operations
- **Norbert Riedel**, CTO, Voith Hydro
Key discussion points

Moderating the workshop, Dominik Godde opened the session by explaining the structure and format of the workshop, which focused on three themes: O&M awareness, O&M strategy, and O&M in hydropower.

Guy Bonvin provided a summary of the O&M workshop in Martigny (Switzerland) in October 2016. The main conclusions were instrumental in moving this theme forward and sharing experience from developing countries.

The key messages from the Martigny workshop were:

• Include O&M in the design phase of hydropower projects, including planning for spare parts, developing O&M manuals, giving staff training and ensuring good understanding of machinery and equipment.

• Establish a cost-effective tariff, and secure sufficient financial resource to perform O&M activities and investment, i.e. buy the long life of hydropower assets.

• Promote O&M through marketing, dissemination of knowledge, and through template contracts.

Pierre Lorillou from the World Bank outlined the bank’s commitment to enhancing sustainable hydropower as a key driver of renewable energy, which ultimately requires adequate O&M of assets.
Lorillou pointed out that the World Bank, with the support of SECO, and in collaboration with IHA, is supporting the initiative for Sustainable O&M for Hydropower (SOMH). This initiative aims to promote best O&M practices and models and foster an integrated approach for adequate services and asset-life management.

Jean-Michel Devernay outlined the consequences of poor O&M, such as:

- loss of revenues caused by high outage rates and loss of performance
- emergency situations that can be dangerous and expensive to fix
- high rehabilitation costs, even for relatively recent projects
- safety issues

He then described the three models for O&M currently supported through the World Bank:

1. O&M in the hands of the owner of the scheme (standard model worldwide).
2. O&M responsibility totally or partially transferred to a private or semi-private independent operator under an O&M (or management) contract with the owner.
3. O&M responsibility entrusted to the EPC contractor, as part of the EPC contract.

While there isn’t one single best model which would best fit all situations and projects, over the long term the first model would likely be the cheapest and most sustainable.

Each of the three models was discussed as a topic for the breakout sessions.

Norbert Riedel of Voith Hydro gave an overview of the company’s HydroSchool training programmes. These programmes are designed to build capacity and O&M skills in some of Voith’s client countries. He provided examples of the programmes in use in Mount Coffee (Liberia), Cambambe II (Angola), and the Ingula project (South Africa).

Voith’s programmes incorporate some of the company’s latest digital technologies, such as OnCare AM, an asset management app designed to optimise operating costs, and HyGuardTM, an integral monitoring system for hydropower equipment.
Robin Goodman closed the first session with insights from GE Renewable Energy on the transformation towards the ‘digital hydropower plant’, where digital innovation is enabling better condition-based maintenance and a 10 per cent O&M cost reduction, through:

- maintenance, personnel and lifecycle management tools to drive visibility and performance in real time
- operations and system optimisation in multi-constraint environments and water systems
- 3D, virtual reality, tools and training to support optimised staffing and mobilisation, improve local capabilities and knowledge management

Key outcomes
The workshop provided valuable insight into the key challenges facing hydropower operators, around the world.

The main takeaways of the workshop can be summarised as follows:

- The three O&M models presented by World Bank provided valuable structure to the discussion; the World Bank will follow up on the need for guidelines on strategic planning of hydropower O&M;
- In developing countries, in particular in Africa and Asia, there remains a significant challenge for developers to institute training and build capacity to ensure that industry good practices in O&M are implemented prior to commissioning of a project;
- Adequate financing and proper budget governance must be built into projects to ensure proper O&M over the lifecycle of a project;
- Economic decision-making tools remain a priority across the hydropower sector, to guide strategic decisions for life extension and modernisation of existing assets;
- The digitalisation of hydropower systems is increasingly being implemented to enhance controls, and improve the performance of hydropower turbines, plants and related equipment. This results in reduced O&M costs, as well as optimised asset management. In addition, digitalisation is playing a role in controlling hydropower operations to work together with other renewable resources, such as wind power and solar photovoltaics, to provide increased flexibility and enhanced control for ancillary services;

The workshop gave participants an opportunity to discuss needs and priorities to respond to the above challenges. Options discussed included:

- Guidelines for planning adequate O&M model and strategy;
- Training modules and capacity-building on O&M good practices;
- Technical guidelines for different equipment including conditions assessment.

What next?
IHA will continue to work closely with its key members and World Bank to advance knowledge in O&M good practices for the hydropower sector. Some activities planned in the coming period:

1. Case studies will be developed by IHA featuring examples of modernisation of existing hydropower assets.
2. World Bank and IHA will be collaborating on development of toolkit to support strategic planning of O&M including support for selecting adequate model, planning necessary human & financial resources and promoting effective budget governance.
3. A joint paper on digitalisation of hydropower systems is currently being finalised; future work in this space will be planned with other members of the association.