WATER STORAGE AND HYDROPOWER DEVELOPMENT FOR AFRICA
International Conference and Exhibition
14 to 16 March 2017
Palais des Congrès de la Palméraie
Marrakech, Morocco
Conference mission

Aqua-Media International, in partnership with the International Commission on Large Dams, and with the strong support of the Government of Morocco, will be hosting the next regional conference for Africa, AFRICA 2017, in Marrakech. The first conference in this series, AFRICA 2013, took place under the auspices of the African Union, in Addis Ababa, and was attended by more than 600 international participants.

The AU is again supporting the event, and H.E. Dr Elham Ibrahim, Commissioner for Infrastructure and Energy, and Vice-President of the World Energy Council, will give the keynote address in the AFRICA 2017 opening plenary session. A talk will also be given by the Executive Director of the African Energy Commission, A. Marzouk.

Senior officers will also participate from the World Water Council, the International Energy Agency, the European Renewable Energy Federation, the African Development Bank, the World Bank, and the EBRD.

Eminent experts from all the inter-related sectors of the hydropower and water infrastructure professions, including consultants, researchers, contractors and suppliers, will share their expertise throughout the three-day event, with the aim of advancing water and energy schemes in African nations.

Morocco welcomes AFRICA 2017

The location of the Kingdom of Morocco in North Africa, together with rapid urbanization and greater demands on water resources, present the country with a number of challenges, and place water issues high on the national agenda.

Under the strong leadership of the King and his Government, Morocco has progressively developed an integrated approach to water resources management.

Today the country has an impressive portfolio of 140 large multipurpose dams (providing 17 km³ of storage), large and small irrigation systems, and a National Water Plan serving as a framework for investment programmes up to 2020.

The country is also seeking to expand its renewable energy, with the goal of generating 40 per cent of national electricity from renewable sources by 2020. Hydropower already plays a significant role, with more than 1300 MW of pure hydro in operation, 464 MW of pumped-storage, and a new major pumped-storage scheme under construction. Morocco is thus an ideal meeting point for the world water and hydro community to discuss achievements, needs, challenges and plans.

Marrakech as host city

Located to the north of the snow-capped Atlas mountains, Marrakech is an ancient city founded in 1062 by Abu Bakr ibn Umar. The iconic red walls of the city were constructed a few decades later. With 130 000 ha of green vegetation including more than 180 000 palm trees, Marrakech is an oasis of rich plant varieties. The old fortified city, with its bustling medina, was declared a UNESCO World Heritage Site in 1985.

The First World Water Forum took place in Marrakech in 1997, and COP22 was hosted there in November last year, underlining the city’s capacity and enthusiasm to welcome large global congresses.

PRE-CONFERENCE SMALL HYDRO WORKSHOP

Design a small hydropower project in one day (Monday 13 March)

Many factors are considered in the design and construction of the optimum hydropower project. All parts of a scheme are interrelated and interdependent. If one component is changed, all others will be affected.

This workshop, following the successful ones held at ASIA 2016 and HYDRO 2016, is aimed at people who are, or will be, involved in hydro development as part of rural electrification programmes. It will cover run-of-river hydro projects in the ‘pico’ to ‘mini’ range: approximately 1 kW to 1 MW capacity.

As this is a diverse form of energy production, there are always areas which are unfamiliar to people, despite many individual professional specialities. This workshop aims to fill in the gaps, and help people to gain a good basic grounding in the topic.

All relevant aspects will be covered, from rainfall to energy evaluation, including:

- Analysis of scheme location and definition of potential catchments
- Turning rainfall into an available flow range from a catchment and development of a flow duration curve
- Power and energy generated calculation
- Intake structures, channel and/or pipeline routes and sizing
- Powerhouse design and equipment
- Turbine selection
- Generator, controls and switchgear options
- Grids, national and local

This will be a ‘hands-on’ workshop, which will involve the participants, working in groups, in developing an actual hydro project during the day. After presentations on the individual scheme aspects, the groups will put together the components of the project. This will follow through to the completed design.
### AFRICA 2017: TIMETABLE

<table>
<thead>
<tr>
<th>Monday 13 March</th>
<th>Tuesday 14 March</th>
<th>Wednesday 15 March</th>
<th>Thursday 16 March</th>
</tr>
</thead>
<tbody>
<tr>
<td>From 08.30 hrs: Conference Registration opens</td>
<td>08.30 hrs: Opening Plenary Session: Welcome addresses</td>
<td>08.30 hrs: Parallel Sessions:</td>
<td>08.30 hrs: Parallel Sessions:</td>
</tr>
<tr>
<td>Exhibition set-up for custom stands only</td>
<td>Coffee</td>
<td>6 - Developments in West Africa</td>
<td>16 - Developments in Southern Africa</td>
</tr>
<tr>
<td>09.00 hrs: Small Hydro Workshop</td>
<td>Opening speeches from professional association officers and industry experts</td>
<td>7 - Civil works: Design and construction</td>
<td>17 - Sedimentation</td>
</tr>
<tr>
<td>10.45 hrs: Excursion departs for Bahia Palace, Majorelle Gardens Koutobia Mosque and lunch</td>
<td>Lunch</td>
<td>8 - Hydro machinery</td>
<td>18 - Small hydro technology</td>
</tr>
<tr>
<td>14.00 hrs: Access to stands for exhibitors</td>
<td>Parallel Sessions:</td>
<td>9 - Planning</td>
<td>Coffee</td>
</tr>
<tr>
<td>19.00 hrs: Chairmen’s Meeting</td>
<td>1 - WRD in Morocco</td>
<td>10 - Civil works: Materials</td>
<td>Parallel Sessions:</td>
</tr>
<tr>
<td>19.30 hrs: Speakers’ Briefing at the Palmeraie Congress Centre</td>
<td>2 - Hydrology and climate</td>
<td>11 - Machinery: O&amp;M and rehabilitation</td>
<td>17 - Sedimentation (contd)</td>
</tr>
<tr>
<td>20.00 hrs: Speakers’ and Chairmen’s Reception in the grounds of Palmeraie</td>
<td>3(a) - Legal, contractual, financial issues</td>
<td></td>
<td>19 - Developments in East Africa</td>
</tr>
<tr>
<td></td>
<td>Lunch</td>
<td></td>
<td>20 - Rural development (small schemes)</td>
</tr>
<tr>
<td></td>
<td>Parallel Sessions:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4 - WRM in North Africa</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>5 - Climate resilience</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>13 - Dam safety regulations (contd)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>14 - Pumped storage</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>15 - Environmental and social issues</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>17.30 hrs: Workshop on small dams</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>17.30 hrs Exhibition Networking Party</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Coffee</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Closing Plenary Session:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Summary and outcomes</td>
<td>Welcome to HYDRO 2017, Seville and ICOLD 2017, Prague</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>20.00 hrs: Conference Dinner</td>
<td>Beldi Country Club</td>
</tr>
</tbody>
</table>

### International Steering Committee

- D. Aelbrecht, France
- H.I. Aker, Turkey
- S. Alam, France
- J. Antunes Sobrinho, Brazil
- I. Araki, Japan
- A. Asmack, Ethiopia
- M. Aubliger, Austria
- F. Avellan, Switzerland
- E. Bellendir, Russian Federation
- L. Berga, Spain
- P. Boeri, UNESCO-IHE
- H. Brekke, Norway
- R. Bucher, Germany
- J.M. Buil Sanz, Spain
- A. Carrère, France
- R.C. Charlwood, USA
- A.F. Chraibi, Morocco
- V. Denis, Switzerland
- R. Derungs, Switzerland
- D. Develay, Belgium
- J-M. Deverney, France
- M. De Vivo, France
- O. Didry, France
- M.R.H. Dunstan, UK
- A. El Ghassassi, Morocco
- K. El Ghomari, Morocco
- I. Ekpo, Nigeria
- P. Erbisti, Brazil
- A. Fassi Fihri, Morocco
- P. de Félix, France
- J. Freitas, Portugal
- D. Fritsch, France
- B. Gondouin, France
- M. Gospodinički, Slovenia
- R. Grether, Germany
- E. Griffin, UK
- K. Grubb, UK
- P. Gruber, Switzerland
- J. Gunner, Australia
- C.R. Head, UK
- M. Heiland, Germany
- A. Hughes, UK
- F. Isambert, France
- R.E. Israelsen, USA
- Jia Jinsheng, China
- D. Johansen, Norway
- C. Kaytongkore, Burundi
- H. Kreuzer, Switzerland
- A. Kumar, India
- T. Kunz, Switzerland
- U. Myo Myint, Myanmar
- R. Lafitte, Switzerland
- F. Lemperière, France
- B. Leyland, New Zealand
- L. Lia, Norway
- Lin Chuxue, China
- Liu Heng, China
- P. Mason, UK
- L. Mouvet, Switzerland
- N. and L. Nielsen, Australia
- A. Nombre, Burkina Faso
- A. Noorzad, Iran
- H. Obermoser, Switzerland
- J. Palacios Saiz, Spain
- A. Palmieri, Italy
- D. Pasolini, China/Lao PDR
- B. Pelikan, Austria
- B. Petry, The Netherlands
- J. Plummer, UK
- P. Pradhan, Nepal
- J. Polimon, Spain
- Do Dor Quan, Vietnam
- V. Radchenko, Russian Federation
- P.J. Rae, Canada
- M. Rogers, USA
- J.R. Rojas Morales, Costa Rica
- G. Ruggeri, Italy
- F. Coelho da Rocha e Silva, Portugal
- D. Roul, France
- J. Rupič, Croatia
- A. Schleiss, Switzerland
- J-J. Simon, Switzerland
- S. Sparkes, Norway
- B. Tardieu, France
- J. Teysieux, France
- J. Thanopoulos, Greece
- B. Trouille, USA
- J.G. Warneck, UK
- J. Weiss, Switzerland
- O. Westberg, Norway
- D.A. Williams, UK
- G. Zenz, Austria
Monday 13 March – Afternoon
A half-day excursion is being arranged, providing an opportunity to visit three important sites in Marrakech: the Bahia Palace, the Majorelle Gardens and the Koutobia Mosque. A three-course lunch will be served in an elegant local restaurant.

Monday 13 March – Evening
Meetings and briefings for chairpersons and speakers will be followed by a reception within the gardens of the Palmeraie Palace complex. Over a buffet supper, chairmen will have the opportunity to meet the speakers.

Tuesday 14 March – Evening
The AFRICA 2017 Welcome Reception will take place in a ‘nomad camp’ setting, in the palm grove close to the Palmeraie Palace. There will be a buffet of local specialities, and musical entertainment.

Wednesday 15 March – Evening
The Exhibition Halls will remain open for an extended period following the afternoon conference sessions, and a networking party will take place around the stands. This will enable delegates to spend some extra time visiting exhibitors and making new business contacts, in a relaxed and informal atmosphere.

Thursday 16 March – Evening
The AFRICA 2017 Conference Farewell Dinner will take place at an elegant Country Club, surrounded by rose gardens and olive groves, just a few kilometres from the Palmeraie resort. Transport will be provided for the short drive to and from the Club. Apéritifs will be followed by a seated dinner, and there will be music and entertainment. A memorable and lively evening is guaranteed. Study tours will depart next morning.

ACCOMPANYING PERSONS’ TOURS

Tuesday 14 March
Photography Exploration
Departing from the Congress Centre, the group will begin with a guided tour through the hidden artisan quarters of the famous souks. Participants will witness the traditional methods used to create a variety of goods. A professional photographer will accompany the group to advise on how best to capture the unique sights on camera.

The group will then explore the narrow streets of the Medina. Lunch will be in a beautiful tiled courtyard of an old palace.

The final visit will be to the Maison de la Photographie, housing a collection of photos, glass negatives, and prints. The collection depicts the colourful history of Marrakech from 1870 to 1960. A rooftop terrace offers panoramic views across the city.

Wednesday 15 March
Atlas Mountains Discovery
Travelling into the heart of the Atlas Mountains, the group will enjoy spectacular scenery while learning about the traditional Berber way of life. Participants will be welcomed into the home of a local family to take part in a customary mint tea ceremony.

Higher in the mountains, lunch will be served at an olive grove, where a guide will explain the growth and production process of olives.

En route back to the city, a short stop will be made at a local Women’s Argan Oil Cooperative. The labour-intensive preparation process creates an oil rich in minerals, vitamins and antioxidants, with both culinary and cosmetic applications.

Thursday 16 March
Spices and Spa Experience
The final day will be dedicated to experiencing some of the most popular elements of Moroccan culture: national cuisine, and the conventional spa.

In the morning, the group will attend a state-of-the-art cookery school to learn how to blend spices and create authentic Moroccan dishes. Everyone will have the opportunity to sample the fruits of their labour in the pleasant surroundings of the school’s charming courtyard dining area.

There will then be an opportunity to relax at a local spa, and to choose between a traditional Hammam treatment or a rejuvenating facial, ahead of the Conference Farewell Dinner in the evening.
CONFERENCE SESSIONS

Tuesday 14 March - Morning

Opening Plenary Session
- Welcome and Introduction to AFRICA 2017 – A. Bartle, Aqua–Media International Ltd
- Welcome from ICOLD – Prof A. Schleiss, President, International Commission on Large Dams

Opening Keynote Address:
- H.E. Dr Elham Ibrahim, Commissioner for Energy and Infrastructure, African Union

Opening Speakers:
- A. Marzouk, Interim Executive Director, African Energy Commission
- M. De Vivo, Secretary-General, ICOLD
- K. El Ghomari, Ministry of Water and Energy, Morocco
- A. Fassi Fihri, Director of ON EE, Morocco
- Prof B. Braga, President, World Water Council
- N. Nielsen, Joint Secretary, IEA Hydro
- Dr J. Moulot, African Development Bank
- N. Sans, The World Bank
- C. Davies, European Bank for Reconstruction and Development

Tuesday 14 March - Afternoon

Session 1 – Water resources development in Morocco
Chairman: A.F. Chraibi, Damtech, Morocco
- Integrated development masterplans of water resources, planning and water management tools and an instrument to identify water mobilization project by dams – A. Ziyyad, Ministère Délégué Chargé de l’Eau/DRE, Morocco
- Experience of ON EE with water intakes – A. Ridati, ON EE Branche Eau, Morocco
- Presentation of the Global Rural Electrification Programme (PERG) – D. Norodine, ON EE - Branche Electricité, Morocco
- Water transfer project in Morocco from northern zones to the south – M. El Mentoumi, Novec, Morocco; K. El Ghomari and N. El Mohammedi, Ministry in Charge of Water, Morocco
- The role of hydropower in Morocco – T. Taki, ON EE - Branche Electricité, Morocco

Session 2 – Hydrology and climate issues
Chairman: Prof A. Schleiss, President, ICOLD and EPFL-LCH, Switzerland
- Water and flood trends under climate change – Prof L. Berga, Hon. President, ICOLD, Spain
- A free and state-of-the-art probabilistic flow forecasting tool designed for Africa – J.P. Matos and A.J. Schleiss, EPFL-LCH, Switzerland
- A look at new and existing hydropower projects on the Zambezi under climatic uncertainty – J.P. Matos and Prof A.J. Schleiss, EPFL-ENAC, Switzerland

Session 3 – Legal, contractual and financial issues
Chairman: Dr J. Moulot, African Development Bank
- Experiences and lessons learned in the implementation of multinational electricity generation projects on transboundary rivers: Case study of the Ruzizi III hydro project – C. Kayetinkore, Energie des Grands Lacs, Burundi
- Critical success factors of a hydropower plant: Dam construction and erection contract – B. Geisseler, Geisseler Law, Germany
- Turkish financing model: PPP experiences in Turkey and possible applications in Africa – H.I. Aker, Dolsar Engineering Inc Co, Turkey
- A panel discussion on project finance will follow after the coffee break (Panelists to be announced shortly.)

Session 4 – North Africa: Water resources management
Chairman: K. Tahri, ON EE - Branche Eau, Morocco
- Integrated planning for water supply in Morocco – A. Elissami, ON EE Branche Eau, Morocco
- Design and management of reservoirs in semi-arid zones – A. Nombre and M. Kabara, IFEC Consultancy, Burkina Faso; F. Millogo, Sonabel, Burkina Faso
- Design overview of the High Plains of Setif transfer project – C. Honnert, G. Diel, A. Si-Chaib and J-L. Cervetti, Tractebel Engie, France
- Dams and water resources management in Algeria in the context of climate change – R. Afi, S. Hadi Abderrahmane and S. Gabi, Maloud Mammeri University, Algeria
- Role of water storage in the watershed management of the Sanaga river – A. Towa, E. Bell and S. Ndam, Electricity Development Corporation, Cameroon
- Sequeli dam: Challenges and solutions – J-L. Cervetti and A. Si-Chaib, Tractebel Engie, France; M.L. Aliane, Cob El-Djazaïr, Algeria

Session 5 – Climate resilience
Chairman: P. Karki, The World Bank
- Impact of climate change on hydropower in Cameroon – A. Towa, Electricity Development Corporation, Cameroon; J. Grijsen, Consultant, USA
- Identification of the impacts of climate change on water and food security – A. Nemedli and M. Mahmoudi, University of Sciences and Technology-Mohamed Boudiaf of Oran, Algeria
- Effects of climate change on domestic water use in Southern Africa: A case study with proposed adaptation and mitigation measures – M. Fuamba and F. Houssa, Polytechnique Montréal, Canada; H. Jacobs and C. Makwiza, Stellenbosch University, South Africa
- Climate change impacts and resilience: challenges and opportunities for hydropower and water storage in Africa – G. Prudent-Richard, Artilia Eau & Environnement, France
- Resilience guidelines for climate change and natural disasters: the World Bank approach – B. Trouille, Mott MacDonald, USA

Wednesday 15 March - Morning

Session 6 – Potential and developments in West Africa
Chairman: J-L. Cervetti, Tractebel Engie, France
- Theoretical hydropower potential for different plant sizes for all rivers in West Africa – K. Kling, P. Stanzel and M. Fuchs, Pöyry Hydropower, Austria; H. Bauer, ECREEE, Cape Verde
Harvesting the hydropower potential of the Fouta Djallon: A catalyst for regional development – J. Teysseaux and N. Tomczak, Tractebel Engie, France; C. N’Tall Cissoko, National Energy Authority, Guinea

Challenges and progress at the Bumbuna phase II project in Sierra Leone – J. Mödinger, Lahmeyer International GmbH, Germany; R. Scott, Joule Africa, UK

The Samendeni dam project and hydropower plant, – A.C. Lahjomri and A. Boukaidi Laghzaoui, CID-Moroc, Morocco; T. Bonzi, A. Ouédraogo and A. Bastos, PDIS, Burkina Faso

### Session 7 – Civil engineering: Design and construction

**Chairman: Dr A. Hughes, Atkins Global, UK**

- Oued Martil dam: Adaptations made to the project during construction and implementation challenges – K. Tenouri, Novec Consulting Engineers, Morocco; M. Bahtat, Directorate General of Hydraulics (DGH), Morocco
- Moulay Bouchta dam: Design adjustments during construction – A.F. Chraibi, Damtech, Morocco; A. Zaki, Hydraulic Developments Directorate, Morocco
- Design and construction supervision challenges at the Bagatelle dam project in volcanic conditions in Mauritius – X. Ducos, F. Brousset and J. Jost, Artelia Eau & Environnement, France
- The design and construction of Neckartal dam – E. Lillie and G. Steyn, Knight Piésold Consulting, South Africa
- Dam foundation grouting at Gibe III dam: A case study – A. Cagnano, G. Pittalis, B. Tesfamariam and A. Pietrangeli, Studio Ing. G. Pietrangeli Srl, Italy
- Melah dam: Design changes during construction – T. Vincent, Artelia Eau & Environnement, France
- Tunnelling solutions for hydropower projects – P. Schmaeh and R. Sistermann, Herrenknecht AG, Germany

### Session 8 – Machinery: Research and new developments

**Chairman: D. Paschini, EDF-GEH, France**

- Inga 1 hydroelectric powerplant, Democratic Republic of Congo – S. Francin, Voith Hydro GmbH & Co KG, Germany; F. Kuljevan, Voith Hydro Inc, USA
- Large Francis machine developments in Africa and recent large Francis experience – J-M. Henry, E. Flores and J. Bremond, GE Renewable Energy, France
- Electro-mechanical equipment for the Kashimbila multipurpose dam, Nigeria – M. Motz and H. Wolfhard, Andritz Hydro GmbH, Germany Inc.
- A verification of draft tube modifications of a vertical axis Kaplan turbine using CFD – J. Schiffer, H. Benigni and H. Jaberg, Graz University of Technology, Austria; G. Penninger, Verbund Hydro Power GmbH, Austria
- New approach in machine shaft centering – A. Kapović, A. Elez, and J. Študir, Končar, Croatia
- Fatigue assessment in hydro generator poles – D. Ludwig and H. Henning, Voith Hydro Holding GmbH, Germany; M. Hagmeyer, Voith Hydro Inc, Canada; T. Hildinger, Voith Hydro Ltda, Brazil

### Session 9 – Planning

**Chairman: H.I. Aker, Dolsar Engineering, Turkey**

- Methodology for automated hydropower potential estimations: Dam siting for hydropower and water storage – T. Ivanov and V. Oleshko, JSC VNIG, Russia
- The importance of hydropower plants in Nigeria’s energy planning – O.A. Fasipe and V.O. Eniola, Energy Commission of Nigeria; J.G. Aikhuele, Humboldt State University, USA; I.P. Fasipe, National Centre for Energy and Environment, Nigeria
- Planning and design considerations for early impoundment of a concrete gravity dam – S.B. Shinde, Gbib (Pty) Ltd, South Africa

### Session 10 – Civil works: Materials

**Co-Chairmen: Dr Malcolm Dunstan, MD & A, UK; M. Lino, ISL, France**

- Tamalout: the first large RCC dam in Morocco with a low cement content – A. Zakaria and M.H. Zoubeidi, Novec, Morocco
- State of the art thermal analysis for large Neckartal dam – R.P. Greyling and C. Zhang, Knight Piésold, South Africa
- The faced symmetrical hardfill dam: Feedback from 20 years of experience – M. Lino, ISL Ingénierie, France; Dr Jia Jinsheng, China Institute of Water Resources and Hydropower Research, China
- Alkali-aggregate reaction at Nalubaale hydropower station, Uganda – R. Brueckner, Mott MacDonald, UK; N. Ndagga and T. Meri, Mott MacDonald, Uganda; M. Mahsen, Eskom, Uganda
- Effective geomembrane systems for hydraulic structures in Africa – A. Scuero and G. Vaschetti, CarpiTech, Switzerland

### Session 11 – Hydro machinery: O&M and rehabilitation

**Chairman: W. Hakin, Manitoba Hydro International, Canada**

- Securing long-term O&M in the SSA hydropower sector: The development bank’s perspective – L. Canale and N. Sans, World Bank
- Modernizing Africa’s hydropower fleet: Partnering solutions at Mount Coffee hydro, Liberia – H. Kathirvel and O. Baechle, Voith Hydro Heidenheim GmbH & Co KG, Germany
- All from one source: The rehabilitation of the Kpong plant in Ghana and Nkula A in Malawi – B. Mühlbacher, P. Angerer, V. Kienberger and A. Koenigsberger, Andritz Hydro GmbH, Austria
- Challenges and opportunities in rehabilitation of hydro power plants in Africa – S. Kaleb, J. Sudarević and M. Cukljek, Končar Plant and Electric Traction Engineering Inc, Croatia
- Addressing operation and maintenance challenges through service agreements – H. Maeder and T. Ochs, GE Renewable Energy, Switzerland; D. Tessier, GE Renewable Energy, Canada
- Abnormal vibrations in hydro generators resulting from quality issues of grouting – N. Shah, R. Gajbhiye and B.K. Singh, BHEL, India

### Wednesday 15 March - Afternoon

**Session 12 – Capacity building**

**Chairman: A. Nombre, Hon President, ICOLD, Burkina Faso**

- An introduction to the ICOLD Capacity Building Plan – A. Nombre, Hon. President, ICOLD, Burkina Faso
- Case studies in technology and training to increase electrical and knowledge capacity in Africa – C. Ferrari, Voith Hydro Inc, Canada; C. Pötsch, Voith Hydro Holding GmbH & Co KG, Germany
Preliminary copies of the proposed guidelines will be available on
based on number, size of dams and its consequences classifications,
water resource development and environmental policies, regulation
issues of the dams in the particular country, and be formulated
Guidelines or adapted to consider specific characteristics and
lines may be adopted ‘as is’ to become National Dam Safety
operation, refurbishment and upgrades to eventual decommission-
entire lifecycle of dams from planning, through design, construction,
unnecessary duplication of effort. The guidelines will address the
to offer up-to-date, internationally peer-reviewed guidelines that
development of their own dam safety regulations and guidelines.
The objective of this effort by ICOLD’s Committee on Dam Safety is
to offer up-to-date, internationally peer-reviewed guidelines that
can be shared worldwide to meet this pressing need and avoid
unnecessary duplication of effort. The guidelines will address the
entire lifecycle of dams from planning, through design, construction,
operation, refurbishment and upgrades to eventual decommission-
ing, and include dam safety review processes. The Generic Guide-
lines may be adopted ‘as is’ to become National Dam Safety
Guidelines or adapted to consider specific characteristics and
issues of the dams in the particular country, and be formulated
based on number, size of dams and its consequences classifications,
water resource development and environmental policies, regulation
and water acts, institutional setup and implementation capacity.

Preliminary copies of the proposed guidelines will be available on
request, for discussion and comment. They will continue to be
reviewed by the Committee on Dam Safety and will be discussed at
ICOLD’s Annual Meeting in Prague in July.

**Introductory session: Objectives and current practice**

**Introduction and objectives** — R. Charlwood, USA and M. Abebe, Ethiopia

Challenges and lessons learnt during the construction of the Karuma hydro plant: Implications on dam safety — H.E. Mutikanga, UEGCL, Uganda; S. Baluch, Independent Consultant, UK; M. Conrad, O. Voborny and J. Brommundt, AF-Consult, Switzerland

Operational safety at US Army Corps of Engineers dams and hydropower facilities — R.C. Patev, US Army Corps of Engineers, USA; A. Komey and G. Baecher, University of Maryland, USA

Reconstruction of the Matala spillway: Dam safety issues — A. Bouyad, SNC Lavalin, Canada

**Status of regulation**

Regulation of dam safety: An ICOLD overview of current practice worldwide — J. Polácek, Vodní Dila, Czech Republic; M. Bartsch, Svenska Kraftnät, Sweden; M. Balissat, Consultant, Switzerland

The history of dam safety implementation in South Africa — L. Hattingh, Hattingh Anderson Associates, South Africa; C. Oosthuizen, Consultant, South Africa

Progress towards a regulatory framework in the Eastern Nile sub-basin and consideration of transboundary dimensions — M. Abebe, ENTRO, Ethiopia

What does a dam safety management system need to involve? Roles and responsibilities: Government, regulator, owner consultants, industry, and so on — R. Charlwood, USA

**Dam safety management systems**

Key elements of a dam safety regulatory framework: Legislation and regulations, transboundary issues — R. Charlwood Consultant, USA

Dam safety guidelines: Required scope and role — L. Hattingh, Consultant, South Africa

Hazard classification systems — L. Hattingh, Consultant, South Africa

Potential failure modes analysis, Risk-informed decisions: Objectives and methods — R. Charlwood, Consultant, USA

**Implementation**

Regional and national dam safety units, capacity building and training — M. Abebe, ENTRO, Ethiopia

Owners’ dam safety programmes: Scope and responsibilities — R. Charlwood, Consultant, USA

Surveillance, monitoring, instrumentation plans and reviews — L. Hattingh, Consultant, South Africa

Safety reviews: Owners, regulators, panels of experts, independent consultants — L. Hattingh, Consultant, South Africa

Operation and maintenance manuals — R. Charlwood, Consultant, USA

Emergency action plans — R. Charlwood, Consultant, USA

Discussion and feedback — Moderated by R. Charlwood, USA, M. Abebe, Ethiopia and A. Nombere, Burkina Faso

**Session 13 – Workshop on dam safety guidelines and regulatory frameworks**

Led by: Dr R. Charlwood, USA; L. Hattingh, South Africa, and M. Abebe, Ethiopia

This will provide a preview of proposed Generic Dam Safety Guidelines being developed by ICOLD as a reference document for use by countries wishing to establish a comprehensive dam safety management framework. These Guidelines should be read in conjunction with ICOLD Bulletin ‘Development of a Dam Safety Regulatory Framework’, which will also be discussed.

In the last few years, various countries have independently initiated development of their own dam safety regulations and guidelines. The objective of this effort by ICOLD’s Committee on Dam Safety is to offer up-to-date, internationally peer-reviewed guidelines that can be shared worldwide to meet this pressing need and avoid unnecessary duplication of effort. The guidelines will address the entire lifecycle of dams from planning, through design, construction, operation, refurbishment and upgrades to eventual decommissioning, and include dam safety review processes. The Generic Guidelines may be adopted ‘as is’ to become National Dam Safety Guidelines or adapted to consider specific characteristics and issues of the dams in the particular country, and be formulated based on number, size of dams and its consequences classifications, water resource development and environmental policies, regulation and water acts, institutional setup and implementation capacity.

Preliminary copies of the proposed guidelines will be available on request, for discussion and comment. They will continue to be reviewed by the Committee on Dam Safety and will be discussed at ICOLD’s Annual Meeting in Prague in July.

**Introductory session: Objectives and current practice**

**Introduction and objectives** — R. Charlwood, USA and M. Abebe, Ethiopia

Challenges and lessons learnt during the construction of the Karuma hydro plant: Implications on dam safety — H.E. Mutikanga, UEGCL, Uganda; S. Baluch, Independent Consultant, UK; M. Conrad, O. Voborny and J. Brommundt, AF-Consult, Switzerland

Operational safety at US Army Corps of Engineers dams and hydropower facilities — R.C. Patev, US Army Corps of Engineers, USA; A. Komey and G. Baecher, University of Maryland, USA

Reconstruction of the Matala spillway: Dam safety issues — A. Bouyad, SNC Lavalin, Canada

**Status of regulation**

Regulation of dam safety: An ICOLD overview of current practice worldwide — J. Polácek, Vodní Dila, Czech Republic; M. Bartsch, Svenska Kraftnät, Sweden; M. Balissat, Consultant, Switzerland

The history of dam safety implementation in South Africa — L. Hattingh, Hattingh Anderson Associates, South Africa; C. Oosthuizen, Consultant, South Africa

Progress towards a regulatory framework in the Eastern Nile sub-basin and consideration of transboundary dimensions — M. Abebe, ENTRO, Ethiopia

What does a dam safety management system need to involve? Roles and responsibilities: Government, regulator, owner consultants, industry, and so on — R. Charlwood, USA

**Dam safety management systems**

Key elements of a dam safety regulatory framework: Legislation and regulations, transboundary issues — R. Charlwood Consultant, USA

Dam safety guidelines: Required scope and role — L. Hattingh, Consultant, South Africa

Hazard classification systems — L. Hattingh, Consultant, South Africa

Potential failure modes analysis, Risk-informed decisions: Objectives and methods — R. Charlwood, Consultant, USA

**Implementation**

Regional and national dam safety units, capacity building and training — M. Abebe, ENTRO, Ethiopia

Owners’ dam safety programmes: Scope and responsibilities — R. Charlwood, Consultant, USA

Surveillance, monitoring, instrumentation plans and reviews — L. Hattingh, Consultant, South Africa

Safety reviews: Owners, regulators, panels of experts, independent consultants — L. Hattingh, Consultant, South Africa

Operation and maintenance manuals — R. Charlwood, Consultant, USA

Emergency action plans — R. Charlwood, Consultant, USA

Discussion and feedback — Moderated by R. Charlwood, USA, M. Abebe, Ethiopia and A. Nombere, Burkina Faso

**Session 14 – Pumped storage potential and development**

**Chairman: B. Trouille, Mott MacDonald, USA**

Pumped-storage plants in synergy with other renewable energies — A. Saphar, ONEE, Morocco

Pumped-storage powerplants: How traditional and recent solutions integrate in large and small grids — K. Krueger, L. Lorenzini, T. Foitzik and T. Aschenbrenner, Voith Hydro Holding GmbH & Co KG, Germany

Evolution of the design of Abdelmoumen pumped-storage project from 2003 to 2013 — B. Chanzy and C. Bouquet, Tractebel Engie, France


Development of new pumped-storage projects in the Middle east — A. Al Mubarak, Saudi Electricity Company (SEC), Kingdom of Saudi Arabia; F. Klomp and H. Salem, AF Consult Switzerland Ltd, Switzerland

Monont’s pumped storage scheme: A potential and sustainable hydroelectric development to serve Africa — C. Logan, Gibb (Pty) Ltd, South Africa

Overview and feasibility study for the 300 MW Ifahs pumped-storage project in Morocco — P. Baztan Moreno, F.J. Baztan Moreno and G. Rodriguez, Gas Natural Fenosa Ingeniería, Spain

**Panel discussion**

**Session 15 – Environment and social aspects**

**Co-Chairs: L. Nielsen, Joint Secretary, IEA Hydro; S.D. Usher, Aqua-Media International Ltd, UK**

Approaches to manage, mitigate and allocate GHG emissions from hydropower reservoirs — N. Nielsen, IEA Hydro

System-scale planning for hydropower development: a path to sustainability — J. Opperman, C. Apse and E. Martin The Nature Conservancy, USA; M. McGrath and M-C. Paiz, The Nature Conservancy, Gabon

Review of experience and lessons learned from the construction of four storage schemes between 1969 and 2016 in Cameroon: Environmental and social management and assessment of the socio-economic results — S. Ndum, A.S. Towa and T. Nsongu, Electricity Development Corporation, Cameroon

**Conference sessions**

- Strategic education and communication plans for environmental and social challenges to promote hydropower development for Africa — R. Stearnes, Foundation for Water and Energy Education, USA
- Capacity building for operators of water and energy facilities in Africa — K. Lagtari and A. Mardi, ONEE Branche Eau, Morocco
- Engineers in the field of the hydroelectric plants: Which role should they have in the current context? — L. Mivelaz and Ph. Jungo, Sarine Engineering SA, Switzerland
Co-chairmen: Dr G. Annandale, Consultant, USA; and M. Ho Ta Khanh, France; A. Chraibi, Morocco

Objectives and content
Small dams, according to ICOLD's definition, are numerous in many countries, and have been constructed for various purposes. They present many advantages, but also some drawbacks, with specific issues depending on the countries and the sites; some problems may relate to economic, environmental, safety or sustainability aspects. On the other hand, the conception and operation of small dams can be different compared with large dams. As these topics can sometimes be controversial, a discussion, during this workshop, between specialists from various developed and developing countries, sharing their experience and opinion, will be interesting. The workshop will focus on these topics and on possible innovations to lower costs and increase the safety of small dams. Interactive discussion between participants on other related topics will be welcomed.

AFRICA 2017 Exhibition networking
In accordance with usual tradition, the AFRICA 2017 exhibition halls will remain open after the sessions and workshops, to give participants an extra opportunity to visit exhibitors in a relaxed and informal atmosphere. Drinks and light refreshments will be available.

Thursday 16 March - Morning

Session 16 – Potential and developments in Southern Africa
Co-Chairmen: E. Baptista, Mozambican Commission on Dams, Mozambique; and F. Coelho da Rocha e Silva, Senior Advisor for REN (Portugal), Mozambique

Design, excavation and performance of the Lúaca power house cavern in Angola – J.M.G. Duarte and P. de Carvalho Thá, Intechnical Consultores S.A. Brazil

The Tseate hydro plant: Starting signal to overcome the energy scarcity in Central Mozambique – R. Siebel, Lahmeyer International GmbH, Germany; A. Rafaela and N. Gulab, Electricidade de Moçambique, Mozambique

Kariba dam: More than 50 years of safe operation and surveillance – C. Noret and O. Clave, Tractebel, France; K. Gurukumba and C. Chibvura, Zambezi River Authority, Zimbabwe

(Additional presentations to be announced)

Session 17 – Managing sedimentation
Co-chairmen: Dr G. Annandale, Consultant, USA; and S. Alam, Consultant, France

RESCON2: Rapid identification of optimal strategies to mitigate reservoir sedimentation and climate change impacts on water supply reliability – G.W. Annandale, G.W. Annandale Inc, USA; N. Efthymiou and S. Palt, Fichtner, Germany; P. Karki, The World Bank

Mitigation of reservoir sedimentation: A new life for the Timi N’Outine dam – K. El Ghomari, Hydraulic Development Department, Kingdom of Morocco; F. Del Rey, Hydropolis, France

Upstream storage method and RUSLE model to assess and rationalize erosion and siltation for efficient watershed planning and management – M.D. Hasnaoui, Ministry of Energy and Mines, Morocco; D. Ouazar and A. Bouziane, Mohamadia School of Engineers, Morocco; and K.B. Moumouni, National Directorate of Meteorology, Niger

SESSIONS

Key environmental aspects of the Lom Pangar hydroelectric project – J.P. Grandjean, Orçade-Breche Est, France; M. Lino, ISL Ingénierie, France; G. Gwet, EDC, Cameroon

SIDE EVENT: Workshop on small dams

Workshop leaders: A. Nombre, Burkina Faso; M. Ho Ta Khanh, France; A. Chraibi, Morocco

Session 18 – Small hydro technology
Chairman: Prof D. Williams, DAW Hydro, UK

Automation system for a small hydro plant connected to the isolated grid of Ibungdji, Gabon – I. Labiano Garcia, Ingeteam Power Technology SA, Spain

Numerical and experimental development of a cross-flow-turbine – C. Bodner, H. Benigni and H. Jaberg, Graz University of Technology, Austria

Techno-economic feasibility analysis for energy production by variable speed Francis turbines in water distribution networks – A. Santolin, Tamanini Hydro Srl, Italy; G. Pavesi, G. Cavazzini and G. Ardizzon, University of Padua, Italy; J.I. Pérez-Oñate, University of Madrid, Spain; M. Van Dijk, University of Pretoria, South Africa

A small propeller turbine to supply drinkable water to the small town of Kahembia (DRC) – N. Frosio and G. Frosio, Studio Frosio s.r.l, Italy; F. Pozzi, Techydro Srl, Italy

An alternative concept for low and medium head hydro plants – G. Holzman and C. Gentner, GE Renewable Energy, Switzerland; J. Bougerara, GE Renewable Energy, France

smart: An economic concept for mini hydropower plants – M. Graml, Global Hydro Energy GmbH, Austria

Session 19 – Potential and development in East Africa
Chair: A. Asnake, EEP, Ethiopia

Design optimizations for the 80 MW Rusumo Falls project – T. Vincent and A. Mikroutsikas, Arelia Eau & Environment, France; J.P. Hurait, Consultant, France


Kamuzu Barrage Operation Model (KABOM) – M. Sehatzadeh and J.A. Roti, Multiconsult ASA, Norway; N.R. Sælthun, Oslo University, Norway

Refurbishment and repair programme for Tanzania’s hydro plants – G. Pétursson, Landsvirkjun Power, Iceland

(Additional papers to be announced)

Session 20 – Small water and energy schemes for rural development
Chairman: Prof B. Pelikian, University of Natural Resources and Applied Life Sciences, Austria

The need for low dams in Africa and specific solutions – A. Nombre, Burkina Faso National Committee on Large Dams; F. Lempérière, Hydrocoop, France

Challenges for small hydro development in Sub-Saharan Africa – J. Kenfack, Solarhydrowatt Sarl, Cameroon; N. Crettenand, BG Ingénieurs Conseils, Switzerland

How to implement small scale hydropower installations for rural electrification in South Africa: Unique challenges – G.J. Bonthuys, M. van Dijk, I. Loots and B.G. Scharfetter,
CONFERENCE SESSIONS

University of Pretoria, South Africa; J.M. Bhagwan, Water Research Commission, South Africa
- Improving access to clean drinking water in rural areas and the development of long-term management solutions — M. El Khdar, ONEE- Branche Eau, Morocco
- The economic case for small hydropower (SHP < 10 MW) in Africa — H. Preuss, Amore Hydro, South Africa
- The role of mini hydropower projects in Uganda’s energy development — R.K.B. Nyakabwa-Atwoki, Susteneros Uganda Limited, Uganda

Thursday 16 March - Afternoon

Session 21 – Potential and developments in Central Africa
Chairman: L. Mouvet, Hydro Operation International, Switzerland
- Potential for hydropower production and interconnections in the Central African region — P. Mavoula, PEAC, Rep of Congo
- Potential and developments in the Great Lakes Region — C. Kayitenkure, Energie des Grands Lacs, Burundi
- Lom Pangar in Cameroon: From design to commissioning — T. Guillemot and M. Lino, ISL Ingénierie, France; C. Daux and B. Coq, Tractebel Engie, France
- The Inga developments in DR Congo — J.S. Gonzalez, AEE Power Holdings, Spain
- Development of hydropower potential of the watershed of the Sanaga river in Cameroon — T. Nsapngou, A.S. Towa and C.E. Bell, Electricity Development Corporation, Cameroon

Session 22 – Civil works: Safety monitoring and rehabilitation
Chairman: Dr H. Kreuzer, Consultant, Switzerland
- Drilling of a 150 m-long new pendulum line to improve dam safety at the Kariba dam — K. Gurukumba and C. Chibvura, Zambezi River Authority, Zimbabwe; D. Fioret and F. Clauss, Sondages, Auscultation & Maintenance, France
- Multiple seismic hazards at the Kesem rockfill dam, located in the Ethiopian rift system — A. Aman and T. Mammo, Addis Ababa University, Ethiopia; Dr M. Wieland, ICOLD Committee on Seismic Aspects of Dam Design and Póyry, Switzerland
- Rehabilitation of Belfort dam: Walking the tightrope of challenges — C. Oosthuizen, Independent Dam Safety Surveillance Consultant, South Africa
- The impact of freeboard on embankment dam overtopping — N. Nigatu Tessema and A. Kemal Jabir, Addis Ababa Institute of Technology, Ethiopia; L. Liao, NTNU, Norway
- Influence of compaction on the safety of earth dams in Burkina Faso — E. Somda, A. Nombre and M. Kabore, IFEC Consulting Firm, Burkina Faso
- Some problems in installing and monitoring embankment dam instrumentation — A.R. Majidi, Mahab Ghodd Consulting Engineering Company, Iran

Session 23 – Gates and flood discharge works
Chairman: Dr P. Mason, MWH, UK
- The risk of gated spillways in a developing country: The South Africa experience — L.C. Hattingh, Hattingh Anderson Associates CC, South Africa; C. Oosthuizen, Independent Dam Safety Surveillance Consultant, South Africa
- Modern radial gate design in new dams and in refurbishment projects — H. Føsker, Norconsult AS, Norway
- Design and hydraulic model of the Gibe III dam mid-level outlets — A. Cagiano, F. Pianigiani and A. Pietrangeli, Studio Ing. G. Pietrangeli Srl, Italy
- Assessment of the curvature and slope for a 3-dimensional Ogee relationship: VC-Ogee relationship — G.L. Coetze, Knight Piésold Consulting Engineers, South Africa; F. van Vuuren, University of Pretoria, South Africa
- The discharge of free-flow spillways may be increased fivefold by combining innovative spillways — A. Ouamane, University of Biskra, Algeria; F. Lempérieré and J-P. Vigny, Hydrocoop, France

Closing Plenary Session
- Session summaries and key outcomes
- Welcome to HYDRO 2017, Seville
- Welcome to ICOLD 2017, Prague
- Close of the AFRICA 2017 sessions

Please check our website for regular updates to the AFRICA 2017 programme, for additional information and to register: www.hydropower-dams.com

Details of the conference presentations shown here reflect the confirmed speakers in early February. These papers were submitted in response to our call for papers. Additional speakers are now being invited, notably for some of the regional sessions and panel discussions, and updates will be announced regularly.

Also on our website, and in the on-line booking system (accessible via our website), information in French and English can be found about the social and cultural programme, the main conference hotels, accompanying persons’ tours, the exhibition (including a plan of stands), booking conditions, and fees for attendance.

Contact details:
Aqua~Media International Ltd
For enquiries about the conference programme:
Mrs Margaret Bourke
africa2017@hydropower-dams.com
Tel: +44 (0)20 8773 7244
For enquiries about the exhibition and sponsorship:
Mr Lukas Port/Mrs Maria Loredo/Ms Melanie Ganz
sales@hydropower-dams.com
Tel: +44 (0)20 8773 7250/1/2

ASK Event Management Ltd
For enquiries about registration, accommodation, tours:
africa2017@askeventmanagement.com
Tel: +44 (0)1725 519287
Three tours are being arranged, to give delegates an opportunity to view a wide variety of dams of different types, as well as pumped-storage schemes. Itineraries could be subject to minor changes, and any updates will be announced.

**Tour A – Marrakech Area (1 day)**

Haouz and Marrakech, in the central western part of Morocco, represent very important regions for agriculture, cultural heritage and tourism. Water resources management therefore plays a vital role in the area. About 20 per cent of the drinking water supplies for Marrakech are derived from groundwater, and the balance from surface water in the Oum Er Rbia basin.

After breakfast on 17 March, delegates will depart from the Palmeraie Congress Centre, in the direction of Agadir, with a first stop at the *Abdelmoumen dam* on the Sous river plain.

Located between the massif of the Haut Atlas and the plateaux of the Anti Atlas, the Sous plain is a very fertile area, important for agricultural development. The Abdelmoumen buttress gravity dam was therefore built, on the Essou river, to provide a reservoir with a capacity of 216 × 10^6 m^3, and it provides for an additional irrigated area of 6000 ha, as well as safeguarding irrigation water supplies to existing irrigation schemes. A 350 MW pumped-storage scheme is currently under construction at Abdelmoumen. There will be a guided tour, and refreshments will be served. The group will then travel on to Agadir, for lunch and to check in at the Beach Club hotel.

In the afternoon there will be a guided tour of the city, including the Marina, to view the modern part of the city, and a chance to see the production of Argan oil in a local cooperative. Dinner and the overnight stay will be in Agadir.

**Day Two (Saturday 18 March)**

The first technical visit will be to the *Youssef Ben Tachfine dam*.

This embankment dam, on the Massa river, was completed in 1972, and supported a substantial increase in agricultural development in the valley, including the cultivation of vegetables and citrus fruit over an area of about 18 000 ha. The dam also supplies drinking water.

The group will then continue to the city of Tiznit for lunch, followed by a chance to visit the famous silver souks.
The next stop will be the **Ahl Souss dam**, on the river Izg, a 49 m-high RCC structure which was completed in 2004. The Chtouka region, southeast of Agadir, had suffered from serious shortages of drinking water, as annual rainfall rarely exceeds 270 mm. Groundwater resources are inadequate. The Ait Baha region is an important economic centre for the province, so fulfilling water resources needs is closely linked to socio-economic development. The dam therefore plays an important role in providing irrigation and drinking water supplies, and also enabled the development of a mini hydro plant.

The group will then return to the hotel, for dinner and a second overnight stay at the Beach Club hotel in Agadir.

**Day Three (Sunday 19 March)**

The group will depart after breakfast for the **Moukhtar Soussi dam**, with a stop en route for refreshments.

On arrival there will be a technical briefing and tour of the site. Completed in 2002, this dam was built to provide water to the El Guerdane region, which had been affected by a declining aquifer, causing a decline in citrus fruit production. Water stored in the reservoir is released to the Aoulouz dam some 20 km downstream, and then conveyed through a 90 km-long pipeline to the project area to supply 45 × 10⁶ m³ of water to a gravity-pressurized system.

After the visit, the tour will continue to Taliouine for lunch in a Riad restaurant. In the afternoon, participants will travel on for the final technical visit, which will be to the 70 m-high **Aoulouz RCC gravity dam**, which was completed in 1990, for water supply. The dam presented design challenges, as a result of poor foundation conditions, which required special drainage works. The dam supplies drinking water to the city of Taroudant, as well as feeding public irrigation schemes in the Atlas foothills, and also contributes to recharging the aquifer.

After a tour of the site, the group will return to Agadir. The tour will end at Agadir airport, or in the centre of town for those who wish to extend their stay.

**Tour C – Afourer, Fez and Casablanca (3.5 days)**

**Day One (Friday 17 March)**

After breakfast on 17 March, the group will set off for the **Hassan 1st dam**. This 145 m-high earth- and rockfill dam, with a crest length of 380 m, is the highest dam in Africa, and impounds a reservoir with a capacity of 262 × 10⁶ m³. Hassan 1st, on the Lakhdar river, has a volume of 9 × 10⁶ m³. It is a multipurpose structure, built for irrigation, hydropower, and water supply. The dam provides irrigation water for an area of more than 40 000 ha, and the 67 MW hydro plant has average annual output of 132 GWh.

The tour will then continue to the **Afourer pumped-storage scheme**. The 465 MW plant, completed in 2004, was developed to ensure adequate installed capacity, in view of uneven rainfall volumes. Key features of the scheme include: an upper reservoir with a surface area of 17 ha and useful minimum capacity of 1.25 × 10⁶ m³, created in a natural depression, requiring a 14 m-high dyke on the north side; a lower reservoir with a surface area of 20 ha and minimum useful capacity of 1.25 × 10⁶ m³; powerhouse UR1 equipped with two 175.6 MW reversible units; powerhouse UR2, equipped with two 60.15 MW reversible units; external penstock 1261 m long and 3.7 m in diameter; two surge shafts; and extensive systems of conduits and shafts.

There will be a chance to view the **Bin Widane lake and dam**. Dinner and the overnight stay will be at Afourer.

**Day Two (Saturday 18 March)**

The group will leave Afourer after breakfast for a three-hour drive to Kenitra, with a stop en route for refreshments. After lunch in a local restaurant, the journey will continue to the site of the **Ouljet Essoltane RCC dam**, currently under construction. The dam will have a final height of 99 m, and a volume of 1 × 10⁶ m³. The dam is being built to protect the Gharb region from flooding, to increase the water supply to the town of Meknès and surrounding areas, to supply irrigation water, and to produce hydropower. The reservoir storage capacity will be 510 × 10⁶ m³.

The group will then continue to Meknès, and there will be a chance to see the Royal Palace, Bab Mansour Gate, and the Medina, before dinner and an overnight stay.

**Day Three (Sunday 19 March)**

On the final day, the tour will continue to Fez, and there will be a sightseeing tour during the morning in the Medina, which is classified as a UNESCO World Heritage Site. Lunch will be in a Riad restaurant in the Medina.

After lunch, the group will proceed to the **Mohamed Ben Abdella dam**, for the last technical visit. This rockfill dam, with a clay core, was originally built to a height of 97.5 km (completed in 1974), but was subsequently heightened, in 2006, to 105 m. This increased the dam’s storage capacity from 480 to 1025 × 10⁶ m³. The principal purpose of the dam, on the Bou Regreg river, is water supply to the Rabat region. Its associated water treatment plant is one of the largest on the African continent. After the site visit, the group will continue to Casablanca, for dinner and an overnight stay.

**Day Four (Monday 20 March)**

After breakfast there will be a visit to the famous Hassan II Mosque, the 13th largest in the world, with its 210 m-high minaret, before transferring to Casablanca airport where the tour will end.
The modern and well equipped Palmeraie Exhibition and Congress Centre will provide a magnificent setting for the Exhibition, which will take place in parallel with the AFRICA 2017 Conference.

Exhibition space is generally sold in units of 6 m² (with some areas reserved for larger pavilions). Each space reserved includes white panelling, a table, two chairs, spotlights and, a company name sign. The price for each stand space (6 m²) is US$ 3340, which includes one complimentary delegate registration and two more places at discounted rates. Lunch and refreshments will be served each day in the Exhibition halls, to ensure that international participants have plenty of time to visit the exhibitors. Various opportunities are also available to sponsor or co-sponsor social activities, such as apéritifs, lunches, receptions and coffee breaks. This is a memorable way of bringing your organization to the attention of the international participants.

If your organization is actively involved in water resources or hydropower development in the African region, you should not miss this opportunity to be represented at AFRICA 2017, which will bring together high level delegations in a region of the world with the greatest potential for future development.

For more details of the Exhibition or sponsorship opportunities, contact: sales@hydropower-dams.com
EXHIBITION STANDS BOOKED

Stands reserved as at February 2017

AF in Hydropower, Switzerland
AF Consult, France
AIC Metallurgie, Morocco
Andritz Hydro, Austria
Artelia Eau & Environnement, France
ATB Riva Calzoni, Italy
BGT Consulting Engineers, Switzerland
CarpTech, Switzerland
CID- Conseil Ingénierie et Développement, Morocco
CMC Suria SL, Spain
CMD Gears, France
COBA, Portugal
Deltaholding, Morocco
Dolsar Engineering Inc Co, Turkey
Dyhoff Ltd, UK
Ecofirma International, Portugal
Eureqek SAS, France
Flame Spray Spa, Italy
Flovel Energy, India
Geokon Inc, USA
GE Renewable Energy
Gilbert Gilkes and Gordon Ltd, UK
Global Hydro Energy, Austria
Herrenknecht AG, Germany
Hydro Operation International Ltd, Switzerland
Hydrostar, France
Hydroplus, France
Idreco BV, Netherlands
Indar Electric, Spain
International Commission on Large Dams (ICOLD)
Intertechnie, Brazil
ISL Ingenieria, France
Jacobs Engineering, Morocco
Kagal Ltd, UK
Kolektor Turbolnstitut d.o.o., Slovenia
Koncar, Croatia
Laboratoire Public d’Essais et d’Etudes- LPEE, Morocco
Leister Technologies AG, Switzerland
Litostrau Power, Slovenia
Macobate, Morocco
Mahab Ghodss Consulting Engineering, Iran
Mapel, Italy
Moroccan Committee on Large Dams
Multiconsult, Norway
Norconsult, Norway
Norwegian Renewable Energy Partners, Norway
Novac, Morocco
Omxom, France
ONEE, Morocco
On Site Support Services, Australia
Platinum Power, Morocco
Poyry
Rainpower, Norway
Royal IHC, Netherlands
Sarine Engineering, Switzerland
Secon, France
Sgtm, Morocco
Studio Ing. G. Pietrangieli, Italy
Sygeo / Soil Instruments Ltd, Morocco
Telemac, France
Tef Svetin, Czech Republic
The International Journal on Hydropower & Dams
Tis Service Spa, Italy
Tractebel Engie
University of Technology Graz, Austria
Vaptech, Bulgaria
Vinci, France
Voith, Germany
Vortex Hydra, Italy
WaterGenPower, Italy
Wheesoo Sdn Bhd, Malaysia
Willowstick Technologies, USA
Wollistra (Pty) Ltd, Sri Lanka
Worthington Products, USA
Yooli Rubberdam Engineering, Rep. of Korea

(Bold blue type denotes a Conference Sponsor)

INDUSTRY SPONSORS

(as at February 2017)
The Conference AFRICA 2017, is being organized by The International Journal on Hydropower & Dams with the International Commission on Large Dams, and with ASK Event Management Ltd.

On-line Registration
You can register on-line via the Hydropower & Dams website at: www.hydropower-dams.com. This is a secure site. Registrations will be handled by ASK Event Management on behalf of Aqua-Media. You will receive an acknowledgement of registration on completion of this process; however, this is not a confirmation. Confirmation will be sent separately.

We encourage all delegates to register on-line, using the newly upgraded system which provides more information during the registration process. In the unlikely event of any difficulties using this system, please contact ASK Event Management (see contact details below).

Picking up conference documents and badges
The desk will be open from 08.30 hrs on Monday 13 March 2017, at the Palmeira Congress Centre. Pre-registration is generally required.

Payment
Payment for all services (fees, hotels, tours) must be made in Euros (€) and received in advance of the Conference. Payment is possible by the following methods:

• On-line by Visa or Mastercard
• Banker’s draft to ASK Event Management (see details on the registration form);

All fees paid by credit card will be charged in Euros (€).

Accommodation
The Conference organizers have negotiated rates at hotels in three price categories in Marrakech. Accommodation bookings are being handled by ASK Event Management. Please include your hotel booking at the time of registering on-line.

Beware of scam accommodation bureaux who are operating this year, falsely claiming to represent AFRICA 2017! We recommend that you do not pass credit card details to them.

We anticipate a high demand for AFRICA 2017 accommodation, and strongly recommend that bookings are made as soon as possible, and at the latest before the end of January. Payment must be made in full at the time of booking.

Disclaimer
All best endeavours will be made to present the programme as printed. The AFRICA 2017 organizers and their agents reserve the right to alter or cancel, without prior notice, any arrangements, timetable, plans or other items relating directly or indirectly to AFRICA 2017 for any cause beyond its reasonable control. The organizers and agents are not liable for any loss or inconvenience resulting from such alteration.

As soon as a registration is confirmed, a number of expenses are incurred by the organizers; therefore the following cancellation conditions apply:

<table>
<thead>
<tr>
<th>Date cancellation received</th>
<th>On or before 20 January 2017</th>
<th>From 21 January to 19 February 2017</th>
<th>On or after 20 February 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Registration for the Conference</td>
<td>10% of fee will be forfeited</td>
<td>50% of fee will be forfeited</td>
<td>No refund</td>
</tr>
<tr>
<td>Technical Excursions (Study Tours)</td>
<td>10% of fee will be forfeited</td>
<td>No refund unless place can be resold</td>
<td>No refund</td>
</tr>
<tr>
<td>Accommodation</td>
<td>10% of fee will be forfeited</td>
<td>No refund unless place can be resold</td>
<td>No refund</td>
</tr>
</tbody>
</table>

NB: Separate booking conditions apply to Exhibition Stands, and these will be notified direct to Exhibitors by our Sales & Marketing Department.

A reduced registration fee is available for current subscribers to Hydropower & Dams. See registration form for details.

CONTACT DETAILS
For enquiries concerning registration and accommodation, contact:

ASK Event Management Ltd

Email: africa2017@askeventmanagement.com
Tel: +44 (0)1725 519287

On-line registration via: www.hydropower-dams.com

For further details of the programme, please contact:
Mrs Margaret Bourke at: Hydropower & Dams, PO Box 285, Wallington, Surrey SM6 6AN, UK.
Tel: + 44 (0)20 8773 7244  •  Fax: + 44 (0)20 8773 7255  •  Email: africa2017@hydropower-dams.com
• Website: www.hydropower-dams.com
The online AFRICA 2017 registration is now open and bookings can be made via: www.hydropower-dam.com. The online system features information in both English and French. The system is simple to use in either language, but in the event of any difficulties, please contact ASK Event Management. Email: africa2017@askeventmanagement.com – Tel: +44 (0)1725 519287

Prices for each delegate category and conference activity are given below.

**FULL DELEGATE FEE:** Includes attendance of the Conference and Exhibition; documentation; conference papers on a USB stick; morning and afternoon refreshments; lunches during the Conference; full social programme. €1155

**REDUCED DELEGATE FEE:** For existing subscribers to *Hydropower & Dams*. €1075

**FEE INCLUDING NEW SUBSCRIPTION TO H&D:** (6 issues from No. 2, 2017 + Atlas + Maps) (This represents a saving of around 40 per cent on the normal H&D subscription rate). €1275

**SPEAKER FEE:** Includes all facilities described above for Full Delegates, plus an additional reception on Monday 13 March. NB: This fee applies to one person per paper (main author or presenter). €580

**FIRST EXHIBITOR FEE:** (One full participant fee is included with exhibition booking). €0
(Covers attendance of Conference, Conference papers on a USB stick, refreshments, lunches and evening social programme).

**SECOND + THIRD EXHIBITOR FEE:** (Fee per person for up to two additional exhibitors). €780
(Covers attendance of Conference, Conference papers on a USB stick, refreshments, lunches and evening social programme).

**SMALL HYDRO TRAINING SEMINAR** (Full day on Monday 13 March ‘Design a small plant in one day’). €50

**ACCOMPANYING PERSON FEE:** (For family members, partners or friends, not colleagues of those attending the Conference or Exhibition). The fee includes the excursions each day, with lunch, and the evening social events.
The cost for registering as an accompanying person is €420.

**HALF DAY EXCURSION:** The details of this are presented on a previous page.
The cost for joining the tour including lunch is €95 per person.

**OPTIONAL DONATION TO THE AMI HYDROPOWER FOUNDATION:**
As in past years, there will be opportunity when registering online to make a donation to the AMI Hydropower Foundation. This is a charitable foundation, set up by Aqua-Media and governed by a board of international trustees. It exists to facilitate the participation of delegates from the less developed countries at the annual Hydro Conferences.

**TRANSFERS FROM MENARA INTERNATIONAL AIRPORT:**
Some coaches have been organized to transfer delegates from Menara International airport, at peak times (see on-line system for times) during the two days prior to the conference. Seats can be reserved using the online system at a cost of €20 each way.

**TECHNICAL TOURS:** Prices include all transportation, meals, guides, entrance fees during sightseeing trips, and accommodation.

**Tour A** - 1 day: Marrakech area. Yaacoub El Mansour and Lalla Takerkoust dams
€110 per person

**Tour B** - 3 days: Agadir area. Abdelmoumen, Youssef Ben Tachfine, Ahl Sous, Moukhtar Soussi, Aoulouz dams.
€340 per person, in a single room; €375 per person sharing a double room

**Tour C** - 3.5 days (ends on the morning of the fourth day): Afouer, Fez, Meknès and Casablanca. Hassan 1st dam, Afouer pumped-storage scheme, Bin Widane dam and lake, Ouljet Essoltane and Mohd. Ben Abdellah dams
€670 per person, in a single room; €590 per person sharing a double room

**DIETARY REQUIREMENTS:** These may be specified on the online registration system (including, for example, vegetarian, vegan, kosher, halal, gluten free).

**VISA REQUIREMENTS:** You will be able to apply for an invitation letter to support your visa application during the registration process.
**Palmeraie Palace, 5***

*Location*: Circuit de la Palmeraie, Marrakech, 0.25 km from the Congress Centre (less than 5 minutes walk).

This is an elegant hotel with traditional Moroccan architecture. Rooms are of a good size, with views of the swimming pool, golf course or the Atlas mountains. A business centre is available with computers and basic printing facilities.

All rooms include the following: air conditioning, television, safe deposit box, refrigerator, en suite bathroom and complimentary WiFi. All rooms also have a balcony or a terrace.

The hotel features a Mediterranean brasserie serving food until 22:30 hrs, and open 7 days a week.

A buffet breakfast with a selection of hot and cold items is included in our booking price. 24h Reception services are available. Check in: from 15:00 hrs / Check out: 12:00 hrs.

---

**Hôtel du Golf, 5***

*Location*: Circuit de la Palmeraie, Marrakech, 0.12 km from the Congress Centre (less than 5 minutes walk).

This is a modern 5* property with stylish features. The hotel offers an outdoor and indoor swimming pool as well as a fitness centre. Basic printing facilities are available.

All rooms include: air conditioning, television, safe deposit box, refrigerator, tea and coffee making facilities, en suite bathroom and complimentary WiFi. All rooms also have a balcony or a terrace.

The hotel’s international buffet restaurant is open 7 days a week, serving food until 22:00 hrs.

A buffet breakfast with a selection of hot and cold items is included in our booking price. 24h Reception services are available. Check in: from 15:00 hrs / Check out time: 12:00 hrs.

---

**Wazo Hôtel, 4***

*Location*: Avenue Abdelkrim Khattabi, Marrakech, 5.2 km from the Palmeraie Congress Centre. A coach transfer service will operate each morning and evening between the hotel and congress centre. The transfer time will be about 10 minutes.

Wazo is a new modern hotel, located between the city centre and the Palmeraie Congress Centre. It has an outdoor swimming pool, gym, spa and business centre.

All rooms include: air conditioning, television, refrigerator, safe deposit box, en suite bathroom with a shower (not a bath), and complimentary WiFi. All rooms have a small balcony or terrace.

The hotel has à la carte and buffet restaurants and a café, all open 7 days a week, until 22:00 hrs. Breakfast is included in the booking price. 24h Reception services are available. Check in: from 15:00 hrs / Check out: 12:00 hrs.

---

Room rooms have been reserved for AFRICA 2017 participants in three main hotels, in different price categories. Two are located within the complex of the Palmira Congress Centre, where the conference and exhibition will take place, and are therefore within easy walking distance; the other is a short distance away and will have a shuttle bus service.

It has come to our attention that some ‘scam’ booking agencies are claiming to represent this conference for accommodation bookings, and are telephoning participants. We strongly recommend that you do not pass on credit card details. Our event management team will not be contacting people by telephone to try and sell accommodation.

---

**ASK Event Management**

Email: africa2017@askeventmanagement.com

Tel: +44 (0)1725 519287

Grimsdyke Granaries, Salisbury, Wiltshire SP5 5RL, UK