



PROGRAMME

Monday 9 October – Morning (Opening Plenary Session)

Opening Plenary Session

Auditorium Al-Andalus (08.30hrs – 10.30hrs)

- 08.30 *Music by Orqesta Bética de Cámara*
- 08.40 **Introduction to HYDRO 2017** – *A. Bartle, Aqua~Media International Ltd*
- 08.55 **Opening Address by Guest of Honour** – *S. Diaz Pacheco, President of Andalucia (invited)*
- 09.05 **Welcome message** – *F. Arteaga, CEO of ENDESA Andalucía and Extremadura*
- 09.15 **Welcome message** – *J. Polimón, President, SPANCOLD*
- 09.25 *Musical Interlude*
- 09.30 Dams and reservoirs as vital water infrastructure: still urgently needed this century – *Prof A. Schleiss, President, International Commission on Large Dams*
- 09.40 IEA's research on sustainable hydro – *N.M. Nielsen, Joint Secretary, IEA Hydro*
- 09.50 Overview of World Bank Guarantees – *L. Canale, the World Bank*
- 10.00 Outcomes of the Workshop on Operation and Maintenance – *Dr R.J. Correa da Silva, Deputy Superintendent of Operation, Itaipu Binacional*
- 10.10 *Musical Interlude*
- 10.15: Coffee in the Exhibition Hall

Monday 9 October – Morning (4 Parallel Sessions)

Session 1 Risk

Ronda (11.00hrs – 12.30hrs)

Chair: **Dr J. Plummer-Braeckman, University of Cambridge, UK**

- 11.05: Putting sound risk management into practice: A case study – *P.H. Perazzo, ENDE Servicios y Construcciones, Bolivia; K.I. Candee, Aqua Energie LLC, USA*
- 11.20: Have we got better at controlling time and cost overruns since 2000? – *J. Plummer-Braeckman, University of Cambridge, UK; J. Kirchherr, Utrecht University, The Netherlands; T. Disselhoff, Leuphana University, Germany*
- 11.35: Sustainability: Financial implications for the design and operation of dams – *R. Hotchkiss, Brigham Young University, USA*

- 11.50: Challenging aspects of design and construction of the Sendje hydro plant in the Republic of Equatorial Guinea – *R. Malizderskyi and A. Berner, Douglas Alliance Ltd, Ukraine*
- 12.05: World Bank support for FCV countries – *N.J.M. Sans, World Bank*
- 12.20: Discussion
- 12.30: Lunch

Session 2 **Cross border collaboration**
Albaicín **(11.00hrs – 12.30hrs)**

Chairman: J-M. Devernay, Consultant, France

- 11.05: *L. Fofana, OMVG, Senegal*
- 11.20: Power development in Southern Africa – *O. Ystgaard and P.M. Heggli, Norconsult AS, Norway*
- 11.35: Regional collaboration in hydropower projects on the Mekong river – *Xaypaseuth Phomsoupha, Department of Energy, MEM, Lao PDR*
- 11.50: Improvement of the Kembs environmental project through cross-border discussions – *A. Barillier and A. Garnier, EDF, France*
- 12.05: Discussion
- 12.30: Lunch

Sessions 3 **Hydro machinery research**
Itálica **(11.00hrs – 12.30hrs)**

Chairman: Prof F. Avellan, EPFL-LMH, Switzerland

- 11.05: Experimental investigation and analysis of the spear valve design on the performance of Pelton impulse turbines – *A. Židonis, S. Petley and G.A. Aggidis, Lancaster University, UK; D.S. Benzon, Mott MacDonald Ltd, UK; A. Panagiotopoulos, J.S. Anagnostopoulos and D.E. Papantonis, National Technical University of Athens, Greece*
- 11.15: A CFD approach for assessing sediment erosion in Francis runners – *J.H. Masoodi, G.A. Harmain, F.A. Najar, M. Zehab-Din and I. Maekai, National Institute of Technology Srinagar, India; A. Jameel, Shri Mata Vashno Davi University, India*
- 11.25: Towards extending Francis turbine operation to very deep part load: Insights gained from the European HYPERBOLE project – *P. Conrad, Dr W. Weber, M. Maiwald and Dr A. Jung, Voith Hydro Holding GmbH & Co. KG, Germany; J. Loefflad, Voith Digital Solutions GmbH, Germany*
- 11.35: State of the art in Francis turbine design – *H. Brekke, Professor Emeritus Consult, NTNU, Norway*
- 11.45: Relationship between wave propagation velocity and singular pressure variation at load rejection – *S. Yamato, K. Shimokawa, S. Nakamura and M. Nakai, Voith Fuji Hydro, Japan*
- 11.55: High part-load fluctuations in Francis turbines and the applicability of model test data – *T. Neidhardt and M. Magnoli, Voith Hydro Holding GmbH & Co. KG, Germany; J. Gummer, Hydro-Consult Pty Ltd, Australia*
- 12.05: Optimal blade design and model test validation for the developments of a diagonal turbine – *R. Lestriez, Num Iberica, Spain; C. Cottin, Mhylab, Switzerland*
- 12.15: Detection of vortex frequency in the draft tube of a model test pump turbine by ultrasound – *P. Gruber, R. Agner, S. Deniz and P. Odermatt, Lucerne University of Applied Sciences and Arts (HSLU), Switzerland*
- 12.25: Discussion
- 12.30: Lunch

Session 4 **Civil engineering: Design**
Bahía **(11.00hrs – 12.30hrs)**

Chairman: **M. Rogers, MWH, USA**

- 11.05: Ribeiradio and Ermida dam foundation treatment: Design, execution and effectiveness control – *A. Morgado, R. Oliveira and C. Costa, COBA, Portugal; G. Monteiro, C. Lima and M. Queralt, EDP Produção, Portugal*
- 11.20: The Upper Tâmega hydroelectric scheme: Hydraulic design and optimization of the Alto Tâmega spillway – *F. Hernando Matellano, A. Arnáez Barrio and M.A. Ramirez, Iberdrola Generación S.A.U., Spain*
- 11.35: Vibration studies of hydraulic powerhouses: Fully coupled model and calibration using experimental measurements – *N. Bagneux and S. Domitile, EDF-CIH, France*
- 11.50: Innovative solutions for the development of the 1410 MW 5th Hydropower Extension Project at Tarbela dam, Pakistan – *B.B. Darling, Mott MacDonald, UK*
- 12.05: Hydraulic design of the Alto Maipo hydropower project – *S. Weissenbach, ILF Consulting Engineers Austria GmbH, Austria*
- 12.20: Discussion
- 12.30: Lunch

Monday 9 October – Afternoon (4 Parallel Sessions)

Session 5 **Unlocking investments in private hydropower – Panel Discussion**
Ronda **(14.00hrs – 15.30hrs)**

Co-Chairs: **L. Canale, Senior Hydropower Specialist, The World Bank;**
 C.R. Head, Consultant, UK

- Introduction to the key challenges in developing private hydropower (*by Chairmen L. Canale*)
- The Private Sector Window (PSW): a new World Bank facility to support PPPs – *N.J. Sans, World Bank*
- The FELT (Finance, Engineer, Lease and Transfer) concept: A new business model to unlock private investment – *M. McWilliams, Mott McDonald, UK*

A Q&A session and panel discussion will follow. The panel of experts will offer their views on the best ways of attracting the private sector in the implementation of hydro projects, based on some specific examples of their international experience. Panellists will include: *O. Tricca* (Energy Department, European Investment Bank), *P. Kunert* (Joule Africa, UK), *J. Dumas* (EDF, France), *B. Quigley*, (Stucky, Switzerland); and, *M. McWilliams* (Mott McDonald, UK).

Key issues for discussion will include risk-sharing and mitigation; achieving a balance between commercial needs and long-term sovereign interests; equitable sharing of benefits; sustainability of long concession arrangements in changing conditions; reducing the lead time for the private investor; and alternative procurement models for the private partner.

Session 6 **GHG emissions (IEA session)**
Albaicín **(14.00hrs – 15.30hrs)**

Chairman: **N.M. Nielsen, IEA Hydro, Australia**

- 14.05: IEA Hydro Annex XII: Managing the carbon balance in freshwater reservoirs – *Dr J.M. Damazio, CEPEL, Brazil*
- 14.20: Approaches to manage, mitigate and allocate GHG emissions from hydropower reservoirs – *N.M. Nielsen, IEA Hydro, Australia*
- 14.35: GHG emission from Icelandic reservoirs – *O.G.B. Sveinsson, EVP of R&D Landsvirkjun, Iceland*

- 14.50: Gross GHG emissions from the newly created Romaine 2 reservoir in Boreal Québec, Canada – *A. Tremblay, Hydro-Québec, Canada; P. del Giorgio, Québec University, Canada*
- 15.05: A leading practice example: Greenhouse gas monitoring at the Theun Hinboun Hydropower Company, Nam Gnouang reservoir, Laos – *Vongchanh Indavong and J. Millgate, THPC, Laos*
- 15.20: Discussion
- 15.30: Coffee

Session 7 **Hydraulic machinery: Design and operation**
Itálica **(14.00hrs – 17.30hrs)**

Chairman: J. Gummer, Hydro-Consult Pty Ltd, Australia

- 14.05: Measures to improve fish survival in axial turbines – *J. Michelcic and S. Weissenberger, Andritz Hydro GmbH, Austria; M. Richmond, Pacific Northwest National Laboratory, USA*
- 14.15: Design and implementation experience with oil-free Kaplan runners – *S. Krotec, B. Hudobivnik, D. Udovič and D. Dolenc, Litostrój Power, d.o.o., Slovenia*
- 14.25: Advantages of SAM turbines over other low or medium head small hydro turbines – *A. Monteyremard, P. Pepin and O. Teller, GE Renewable Energy, France*
- 14.35: Investigation of regulated Darrieus turbines for tidal powerplants – *Y. Kuznetsov, G. Semenov, M. Romanova and I. Kuznetsov, Power Machines LMZ, Russia*
- 14.45: Francis technology to operate reliably from 0 to 100 per cent power – *J. Brammer, P-Y Lowys, F. Duparchy, M. Thibaud, K. Wheeler, J. Bremond and R. Guillaume, GE Renewable Energy, France*
- 14.55: Effects of passage modelling in high-head Francis turbines – *E. Tengs and M. Holst, EDR & Medeso, Norway; P. Storli, NTNU, Norway*
- 15.05: Numerical investigation of effects of the guidevane tip clearance on the high-head Francis turbine performance quantities – *G. Semenov, A. Smirnova and A. Zakharov, Power Machines LMZ, Russia*
- 15.15: Discussion
- 15.30: Coffee
- 16.00: Composite bearing design with improved tribology and machinability for aggressive applications – *M. Kim and E. Wapner, GGB Bearing Technologies, USA*
- 16.10: Reducing maintenance with water-lubricated turbine guide bearings: Design principles and case studies – *G. Auger and G. Ren, Thordon Bearings Inc., Canada*
- 16.20: A study on methods for proper bearing adjustment – *T. Ishii and N. Kashima, Chubu Electric Power Co., Inc, Japan; M. Kawabata, N. Yoshida and Y. Abeta, Tribotex Co., Ltd, Japan*
- 16.30: Independent model testing in the Andritz Hydro laboratory by Norconsult: A new way of witness testing – *H. Bjørndal and L. Parr, Norconsult AS, Norway; P. Grafenberger and J. Steinmassl, Andritz Hydro GmbH, Austria*
- 16.40: An alternative approach to the Von Karman Vortex problem in modern hydraulic turbines – *T. Neidhardt, A. Jung and S. Hyneck, Voith Hydro Holding GmbH & Co. KG, Germany; J. Gummer, Hydro-Consult Pty Ltd, Australia*
- 16.50: Prototype measurements of the regulating forces in a water-filled Kaplan runner improve the understanding for fatigue life prediction – *T. Neidhardt and M. Kondo, Voith Hydro Holding GmbH & Co. KG, Germany; P. Jonsson and A. Skagerstrand, Vattenkraft AB, Sweden*
- 17.00: CFD computation of transients in pump-turbines – *E. Casartelli, A. Del Rio, A. Schmid and Prof. L. Mangani, Luzern University, Switzerland*
- 17.10: Discussion
- 17.30: Close

Session 8 **Civil works: Materials and construction**
Bahia **(14.00hrs – 15.30hrs)**

Chairman: Dr M. Dunstan, MD&A Associates, UK

- 14.05: Experiences and challenges in shaft construction at the Uma Oya project, Sri Lanka – *A. Rahbar Farshbar and B. Ahabi Manafi, Farab Co, Iran; P. Stkne, Marti Contractors Ltd, Austria; D. Dodangeh, Mahab Ghodss Consulting Engineering Co, Iran*
- 14.17: The application of BIM 5D during the construction of the powerhouse at the Golen Gol hydropower plant in Pakistan for monitoring purposes – *C. Siemer, Fichtner GmbH, Germany*
- 14.29: Assessment on the performance of the RCC properties in Myanmar – *Zaw Min San, Ministry of Electricity and Energy, Myanmar*
- 14.41: Review of quality control of roller compacted concrete dams during construction: A case study of the Dyraaba and Puhulpola RCC dams in Sri Lanka – *H.M. Torkamani, Farab Company, Iran*
- 14.53: Safe design of concrete for dams: Prevention, diagnosis and prognosis of alkali-silica reaction – *E. Menéndez, B. Aldea and R. García-Rovés, CSIC, Spain*
- 15.05: Asphaltic cores: Making embankment dams truly watertight – *D. Müller, Walo International AG, Switzerland; D. Wilson, Walo UK Ltd, UK*
- 15.17: Discussion
- 15.30: Coffee

Session 9 **Contractual issues**
Ronda **(16.00hrs – 17.30hrs)**

Chairman: P. Rae, P.J. Rae Consulting, Canada

- 16.05: Why do power purchase agreements sell energy? – *C. Grant, Multiconsult UK Ltd, UK*
- 16.20: Improving construction management of large hydropower projects: A consultant's perspective – *E. Aamot, O. Ystgaard, Ø. Engelstad and Ø. Lilleland, Norconsult AS, Norway*
- 16.35: Development of Pakistan's hydropower potential through independent power producers (IPPs) using the example of the 1124 MW Kohala hydro plant – *Dr R. Siebel, Lahmeyer International GmbH, Germany; Zhang Jun, Kohala Hydro Company Ltd, China; Yi Lu, Changjiang Survey, Planning, Design and Research Co Ltd, China*
- 16.50: Critical success factors in a contract regarding the maintenance and rehabilitation retrofit of an existing hydro plant: Contractual strategies to minimize project-related risks – *B. Geisseler, Geisseler Law, Germany*
- 17.05: Discussion
- 17.30: Close

Session 10 **Climate**
Albaicín **(16.00hrs – 17.30hrs)**

Chairman: Prof A. Schleiss, EPFL-LCH, Switzerland, and President, ICOLD

- 16.05: World Bank guidelines on climate change and natural disasters resilience for hydropower projects – *K. Macpherson and N. Kent, Mott MacDonald, UK; B. Trouille, Mott MacDonald, USA*
- 16.20: Integrated geohazard assessment as part of climate change resilience and disaster risk management in the hydropower sector in high mountain environments – *J.M. Reynolds, Reynolds International Ltd, UK*

- 16.35: Swedish perspective at hydropower production and outlook using climate scenarios – *K. Hallberg, WSP Sverige AB, Sweden; E. Sjökvist, Swedish meteorological and hydrological institute, Sweden*
- 16.50: Assessing the potential increase of seasonal energy storage to mitigate the impact of climate change in Switzerland: Case study of the Grande Dixence dam – *P. Manso, A.J. Schleiss and J. Dujardin, EPFL-ENAC-IIC-LCH, Switzerland; B. Monay, Stucky SA, Switzerland; M. Zappa, Swiss Federal Institute for Forest, Snow and Landscape Research, Switzerland*
- 17.05: Perpetual supply of water: Climate change and sustainable development – *Dr.G.W. Annandale, George W. Annandale, Inc., USA*
- 17.20: Discussion
- 17.30: Close

Session 11: Upgrading of civil structures
***Bahía* (16.00hrs – 17.30hrs)**

Chairman: Prof L. Berga, Hon. President, ICOLD, Spain

- 16.05: Civil engineering: Research, development and innovation for the maintenance of water channels – *A.B. Martin Vacas and A. Millán Mattern, Iberdrola Generación Hidráulica, Spain*
- 16.20: Underwater work at the Punt dal Gall dam: A challenging project – *E. Kaempfen, Hydro Exploitation SA, Switzerland; M. Roth, Engadiner Kraftwerke, Switzerland*
- 16.35: Sealing of leakage in the Prada pressure gallery, Spain – *J.A. Alonso Pérez, ENDESA, Spain; A. Vaquero Hernández, HCC, Spain*
- 16.50: Upgrading of sand traps at existing hydropower plants – *K. Vereide, L. Lia and O.H. Havrevoll, NTNU, Norway; W. Richter, Graz Technical University, Austria; T. Jacobsen, SediCon, Norway*
- 17.05: Safety assessment of concrete-embedded steel structures by non-linear finite element analysis – *E. Digerud, T.N. Nguyen, J. Østerbø and H. Føsker, Norconsult AS, Norway*
- 17.20: Discussion
- 17.30: Close
- 20.00: **Welcome Reception - Pabellón de la Navegación (Maritime Museum) Seville**

Tuesday 10 October – Morning (4 Parallel Sessions)

Session 12a: Pumped storage: Lessons learned I
***Itálica* (08.30hrs – 10.30hrs)**

Co-Chairs: B. Trouille, Mott MacDonald, USA; J. Freitas, EDP, Portugal

- 08.35: Double earth fault in a pumped-storage plant during back-to-back launching sequence – *J-L. Drommi, EDF, France*
- 08.50: Water and air waves in very long underground pumped-storage reservoirs – *E. Pummer, Aachen University, Germany*

- 09.05: Challenges during the pump-turbine rehabilitation of Bolarque II – *C. Widmer, Andritz Hydro AG, Switzerland; A. Gehrler, Andritz Hydro AG, Austria; J-J. Alonso, Andritz Hydro SL, Spain*
- 09.20: The 240 MVA motor generators for the Reißbeck II pumped-storage plant: An electrical rotating machine beyond the threshold – *W. Ladstätter and M. Gerhold, Andritz Hydro GmbH, Austria; K. Zikulnig and F. Senn, Verbund Hydro Power GmbH, Austria*
- 09.35: The Salamonde II hydroelectric project – *P. Santos, L. Gusmão and H. Fangueiro, COBA Engineering and Environmental Consultants, Portugal; J. Sousa Costa, EDP, Gestão da Produção de Energia, SA, Portugal*
- 09.50: Role and benefits of the Avče pumped-storage plant – *G. Hvala, T. Kocina and B. Kastelan, Soške Elektrarne Nova Gorica, Slovenia*
- 10.05: Transit-time flow measurements at pumped-storage plants – *D. Bozic, Markoja Ltd, Croatia; D. Bojic, N. Vrkcic, S. Sapunar and S. Simurina, HEP Proizvodnja Ltd, Croatia*
- 10.20: Discussion
- 10.30: Coffee

Session 12b **Pumped storage: Lessons learned II**
Itálica **(11.00hrs – 12.30hrs)**

Co-Chairs: **B. Trouille, Mott MacDonald, USA; M. Ordoñez Fernández, ENDESA, Spain**

- 11.05: Ingula pumped-storage scheme: Project lessons learned during design, procurement, and construction - *C. Logan and N. Nkiwano, Gibb Pty Ltd, South Africa*
- 11.20: Increasing the safety of the hydraulic structures at the Dniester pumped-storage plant using an automated monitoring system – *V. Hryshko, Hydrotechproject Ltd, Ukraine*
- 11.35: Investigation of the special behaviour of delayed load rejections at a 3 x 150 MW pumped-storage plant – *J. Junginger, Dr A. Ruprecht and Prof S. Riedelbauch, University of Stuttgart, Germany; S. Kolb, AF-Consult Switzerland Ltd, Switzerland; S. Vogel, Nant de Drance SA, Switzerland*
- 11.50: Integration of the Reißbeck II pumped-storage plant into the operation of the Malta power system, Austria – *J. Mayrhuber, Verbund Hydro Power GmbH, Germany*
- 12.05: Discussion
- 12.30: Lunch

Session 13 **Natural hazard and risk**
Ronda **(09.00hrs – 10.30hrs)**

Chairman: **Prof J. Reynolds, Reynolds International Ltd, UK**

- 09.05: Risk assessment for dams of different types and purposes in OECD and non-OECD countries with a focus on time trend analysis – *A. Kalinina, T. Sacco, M. Spada and P. Burgherr, Paul Scherrer Institut, Switzerland*
- 09.20: Lake Sarez could unravel southern Tajikistan's hydro potential – *A. Palmieri, Consultant, Italy; P. Droz, Stucky SA, Switzerland*
- 09.35: Discovery of a hidden and completely clay-filled syn-glacial valley with severe impact on a hydropower project in the foothills of the Central Swiss Alps – *T.N. Dietler, Pöyry Switzerland Ltd, Switzerland*
- 09.50: Modelling inflow to hydropower reservoirs in sub-arctic, glaciated watersheds with complex terrain and volcanic surface geology – *S.O. Palmarsson, H. Sigurjonsson, A. Gudmundsson and E.M. Myer, Vatnaskil Consulting Engineers, Iceland*
- 10.05: Perception analysis of public awareness and preparedness in preparing early warning systems for dam safety: A case study in the Bertam Valley, Cameroon Highlands – *S.M. Rahsidi, TNB Research Sdn. Bhd, Malaysia; T. Izawati, M.H. Mohd Ramzi and Z. Ismwi, International Islamic University, Malaysia*

10.20: Discussion
10.30: Coffee

Session 14 **Project planning and implementation**
Albaicín **(08.30hrs – 10.30hrs)**

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

08.35: The complex management of the waters of the Ñuble river in Chile – *R. Basso and F. Cevallos, Lombardi Eng. Ltd, Switzerland; S. Bonanni and P. Buonanno, Astaldi SpA, Italy*

08.50: Serial hydropower development plan on Myitnge river basin: The Namlang hydropower project – *Wunna Htun, Ministry of Electricity and Energy, Myanmar*

09.05: Harnessing hydropower for SCORE: A success story of the Murum hydroelectric plant – *J.A. Janggu, M. Hussain and P. Wong, Sarawak Energy Berhad, Malaysia*

09.20: Nachtigal: A 420 MW hydro project dedicated to Cameroon’s national grid – *O. Flambar, Nachtigal Hydro Power Company, Cameroon; R. Baudet, D. Magnan and P. Grillot, EDF-CIH, France*

09.35: Management of the early impounding of Gibe III dam in Ethiopia – *P. de Barmon and M. L’Hostis, Tractebel Engie, France; S. Amodeo, ELC Electroconsult, Italy; Azeb Asnake, EEP, Ethiopia*

09.50: Laúca hydropower project, Angola: Impounding and commissioning – *J. Horn, Lahmeyer International GmbH, Germany; E.D. Estêvão, GAMEK - Gabinete de Aproveitamento do Médio Kwanza, Angola*

10.05: The role of BIM during the tender phase of a powerhouse structural design – *N. Andre, C. Ferreira, C. Lima, A. Alexandre, F. Marques and I. Gaspar, EDP, Gestão da Produção de Energia, SA, Portugal*

10.20: Discussion
10.30: Coffee

Session 15 **Capacity building**
Bahía **(09.00hrs – 10.30hrs)**

Co-Chairs: **M. de Vivo, Secretary-General, ICOLD; and**
 A. Nombre, Hon President, ICOLD, Burkina Faso

09.05: Training on dam safety, operation and maintenance: Some practical thoughts – *M.G. de Membrillera Ortuño and O. Pérez Arroyo, Ofiteco, Spain*

09.20: Working against capacity building and training: We are getting it wrong – *Dr A. Hughes, Atkins, UK*

09.35: Capacity building for hydro plants: Perspective for Sarawak Energy’s operational excellence – *Polycarp Wong H.F, Hilda Perhi and Mubasher Hussain, Sarawak Energy Berhad, Malaysia*

09.50: Dam engineers in Indonesia – *T. Hartanto and A.P. Wahyudi, Ministry of Public Works and Housing, Republic of Indonesia*

10.05: Discussion
10.30: Coffee

Session 16 **Hydro plant safety**
Albaicín **(11.00hrs – 12.30hrs)**

Chairman: **O. Westberg, Sivilingeniør Ole A. Westberg AS, Norway**

11.00: Presentation of Session: Challenges in order to improve powerplant safety – *O. Westberg, Sivilingeniør Ole A. Westberg, Norway.*

- 11.05: Cyber-security in hydro plants: Implementation at a 1 GW pumped-storage scheme – *W. Voigt and R. Bucher, Lahmeyer International GmbH, Germany; J. Menting, Engie Laborelec, Belgium*
- 11.17: New hydroelectric control centre (CCI): Integrating the past, preparing for the future – *L. Pertierra Fernández and R.A. Suárez de la Puente, Gas Natural Fenosa Generación, Spain*
- 11.29: Surge tank design in Austria: Dimensioning philosophy for flexible hydropower – *W. Richter, H. Knoblauch and G. Zenz, Graz University of Technology, Austria*
- 11.41: Safety and reliability of hydraulic structures during the construction of the Kakhovka 2 hydro plant – *A. Zhakun, Ukrhydroproject PJSC, Ukraine*
- 11.53: Hydro plant security: Transient flow simulation associated with records of transient sensors – *Prof. J-L. Kueny, Optydro Concept, France*
- 12.05: A risk-based programme to improve public safety downstream of hydropower dams – *C. Todde, Groupe E, Switzerland; B. Géhant, Oxand, Switzerland; R. Leclercq, Oxand, France*
- 12.17: Discussion
- 12.30: Lunch

Session 17 Challenging sites
Ronda (11.00hrs – 12.30hrs)

Chairman: L. Mouvet, Hydro Operation International, Switzerland

- 11.05: Challenges faced during the construction of a 38 m-diameter surge shaft and multijunction in Himalayan geology at Rampur – *R.N. Misra, M. Sharma and B. Sharma, SJVN, India*
- 11.20: Underwater heightening of the intake at the Gries dam – *A. Kaufmann and Y. Décaillet, Hydro Exploitation SA, Switzerland*
- 11.35: Implementation of the dam complex at Upper Atbara, Sudan, in challenging site conditions – *F. Zoellner and Y. Scheid, Lahmeyer International GmbH, Germany; M. Mukthar, Ministry of Electricity and Dams, Sudan*
- 11.50: The renaissance of the Banja hydro project – *X. Lorrain, F. Ferranti and Y. Felix, Tractebel Engie, France*
- 12.05: Special guest presentation
- 12.20: Discussion
- 12.30: Lunch

Session 18 Planning for the next generation of hydro experts –
Bahía Panel Discussion
(11.00hrs – 12.30hrs)

Co-Chairs: Dr A. Hughes, Atkins, UK; and J. Polimón, SPANCOLD, Spain

Part One – International hydro experiences of students and young engineers

In addition to supporting and supervising Bachelor and Master Theses, the initiative ‘Multiconsult for Students’ (Must) aims to recruit talented and committed students to bring new knowledge to the company. Every summer, Multiconsult’s Department of Renewable Energy engage three to four students for the Must Renewable Energy International Hydropower summer program. The students form a multidisciplinary team set to working on a project for an actual client.

The Must team is formed by four highly qualified students with backgrounds ranging from civil engineering to industrial economics and technology management, all with a keen interest in renewable energy.

The project is a pre-feasibility study for the potential of a cascade of small-scale hydropower plants downstream of the existing Kikuletwa hydropower station on the Kikuletwa river, northeast Tanzania. The clients are the Danish investors Frontier Energy and Arusha Technical College. Northeast Tanzania suffers from a major energy deficit, with large distances to the areas with power production. As a result of the large distances, technical power losses are significant. The power produced by a cascade of small hydropower plants will constitute a small, but valuable contribution towards reducing the critical energy deficit in this region of Tanzania. The students will present their analysis of economic, financial, social, environmental and technical aspects of the cascade scheme.

Part two – Panel discussion from mentors and employers

A panel discussion with contributions by senior representatives from organizations including Atkins Global, SPANCOLD, and Multiconsult will explore the approaches and challenges of attracting, training and retaining young engineers in the workforce.

Tuesday 10 October – Afternoon (4 Parallel Sessions)

Session 12c Pumped storage: New storage concepts *Itálica* (13.45hrs – 15.30hrs)

Co-Chairs: B. Trouille, Mott MacDonald, USA; E. Sola Álvarez, Iberdrola, Spain

- 13.50: The role of pumped storage in improving the integration of generation from renewable sources: The case of Germany – *F.K. Tedla and I. Gillies, AECOM, UK; Prof. S. Wieprecht, Institute for Modelling Hydraulic and Environmental Systems, Germany*
- 14.02: Investigation of unsteady phenomena in high-head double-stage pump-turbines for heads of up to 800 m – *R.S. Akulaev, A.V. Abushik, A.D. Zubov, I.L. Kuznetsov and V.N. Seleznev, Power Machines LMZ, Russia*
- 14.14: An innovative pumped-storage project in an underground mine – *K. Öhlböck, G. Lang and T. Weissensteiner, Pöyry Energy GmbH, Austria*
- 14.26: Hybrid and symbiotic solutions for a combination of intermittent RES with storage and pumped-storage plants – *Dr K. Krueger and Dr C. Mende, Voith Hydro Holding GmbH & Co. KG, Germany; Prof. A. Slocum, MIT Cambridge, USA*
- 14.38: (a) Calculation of head loss in a shared tunnel for a pumped-storage plant with variable speed pumps – *Jiehong Kong and H.I. Skjelbred, Sintef Energy Research, Norway; H. Abgottspon, Axpo Trading AG, Switzerland*
- 14.44: (b) Calculation of power compensation for a pumped-storage plant with hydraulic short-circuit operation – *H.I. Skjelbred and Jiehong Kong, Sintef Energy Research, Norway; H. Abgottspon, Axpo Trading AG, Switzerland*
- 14.50: Hydropower market trends: Forecast for pumped storage – *Y. Abdelilah and H. Bahar, IEA, France*
- 15.02: Discussion
- 15.30: Coffee

Session 12d Pumped storage: Potential, plans and case studies
***Itálica* (16.00hrs – 17.30hrs)**

Co-Chairs: B. Trouille, Mott MacDonald, USA; J. Baztan Moreno
Gas Natural Fenosa, Spain

- 16.05: Is there a case for new pumped storage in the UK? – *T.D.J. Pendrey, Mott MacDonald, UK; B. Trouille, Mott MacDonald, USA*
- 16.15: Successful energy transition in Germany: The contribution of increased pumped storage – *K. Krueger, Voith Hydro Holding GmbH & Co KG, Germany; A. Moser, RWTH Aachen University, Germany*
- 16.25: Site selection and feasibility study for a pumped-storage plant in Uruguay – *P. Baztán Moreno and F.J. Baztán Moreno, Gas Natural Fenosa, Spain*
- 16.35: Underground pumped storage in Wallonia, Belgium, using old mines: Potential and challenges – *S. Erpicum, P. Archambeau, B. Dewals, M. Piroton, E. Puades, P. Orban, A. Dassargues, B. Cerfontaine and R. Charlier, Liège University, Belgium; A. Poulain and P. Goderniaux, Mons University, Belgium; B. Ronchi, C. Fripiat and M. Veschkens, Institut Scientifique de Service Public, Belgium*
- 16.45: Atdorf pumped-storage plant: Three weeks of public discussion and a milestone in the permit application procedure – *R. Fritzer and E. Manninger, ILF Consulting Engineers Austria GmbH, Austria; M. Fink, Schluchseewerk AG, Germany; U. Gommel, EnBW AG, Germany*
- 16.55: On the pooling of hydro assets and grid-scale battery energy storage systems – *R. Bucher and A. Schreider, Lahmeyer International GmbH, Germany*
- 17.05: Study of cavitation erosion in the pumping mode operation of a prototype pumped-storage plant – *T. Cencič, Soške Eletrarne Nova Gorica, Slovenia; M. Hočevar and B. Širok, Faculty of Mechanical Engineering Ljubljana, Slovenia*
- 17.15: Augmentation of hydropower capacity by developing pumped storage for existing hydro plants: A concept note – *K. Singh, L.M. Verma, P. Verma and K.K. Garg, SJVN, India*
- 17.25: Discussion
- 17.30: Close

Session 19 Gates and valves
***Ronda* (14.00hrs – 15.30hrs)**

Chairman: P. Erbisti, Consultant, Brazil

- 14.05: Options for improving the safety of spillway gates – *B. Leyland, Consultant, New Zealand*
- 14.20: Head gate commissioning: A stressless method to confirm head gate flow cut-off capability – *P. Grillot and S. Jomni, EDF-CIH, France*
- 14.35: Installation of new intake gates in the Torán reservoir – *F.J. Conesa, F.J. Río, F. Grau, I. Ocaña and J. Asensio, Endesa Generación SA, Spain*
- 14.50: Enhancement of the operating system for the spillway gate at Victoria dam, Sri Lanka – *W.M.M.S. Wanigasekara, Mahaweli Authority, Sri Lanka*
- 15.05: Innovative approach for the main inlet valve design at the Reisseck II pumped-storage plant – *A. Antczak, TB Hydro Sp Z.o.o., Poland*
- 15.20: Discussion
- 15.30: Coffee

Session 20 **Dam safety**
Albaicín **(14.00hrs – 17.30hrs)**

Chairman: **Dr H. Kreuzer, Consultant, Switzerland**

- 14.05: Assessing the security of the Allt-na-Lairige pre-stressed concrete dam using quantitative risk assessment techniques – *P. Mason, MWH UK Ltd, UK; S.J. King, SSE plc, Engineering Centre, UK; A.C. Morrison, CH2M Hill, UK*
- 14.25: Two main risks that are often overlooked – *F. Lempérière, Hydrocoop, France; M. Ho Ta Khanh, CFBR, France*
- 14.45: The use of InSAR data to monitor slope stability: The case of Canelles hydropower dam, Spain – *J. Raventós, A. Conde and B. Salvà, TRE-Altamira, Spain; M. Chacón, F.J. Conesa and J. Segarra, Endesa Generación, SA, Spain; J.M. Garcia, IIC Ingeniería e Instrumentación, S.L, Spain*
- 15.05: Discussion
- 15.30: Coffee
- 16.00: Emergency action plans for EDP dams: Critical flow rate definition for high discharge warnings: Two case studies – *A. Oliveira, J.M. Oliveira, J. Dias da Silva, I. Ferreira and R. Costa, EDP - Gestão da Produção de Energia, SA, Portugal*
- 16.20: Evaluation of dam performance under seismic loads with linear time history analysis: Case study of Grand Ethiopian Renaissance RCC main dam – *A. Masciotta, C. Fontana and A. Fiorani, Studio Masciotta, Italy; A. Bezzi, Studio Pietrangeli, Italy*
- 16.40: Seismic optimization of concrete gravity dams using isolation layers – *M.P. Khiavi and A. Ghaedrahmati, University of Mohaghegh Ardabili, Iran*
- 17.00: Discussion
- 17.30: Close

Session 21 **Environment**
Bahía **(14.00hrs – 15.30hrs)**

Chairman: **Prof M. Aufleger, University of Innsbruck, Austria**

- 14.05: Environmental monitoring of hydroelectric reservoirs to predict the evolution of water quality parameters – *D.J Soto Varela and D.J. Agis Iglesias, Gas Natural Fenosa, Spain; D.C.G. González, University of Vigo, Spain*
- 14.17: Flood risk management at Scottish Power Galloway Hydros – *S. Ferns, Scottish Power Galloway, UK*
- 14.29: Methods to assess environmental flow for sustainable power generation: Case study of the Yeywa hydro plant, Myanmar – *Min Khaing, Ministry of Electricity and Energy, Myanmar*
- 14.41: Synergizing hydropower development with wildlife management in Uganda: The case of the Karuma hydro project – *J. Asimwe, A.M. Byaruhanga and H.E. Mutikanga, Uganda Electricity Generation Co Ltd, Uganda*
- 14.53: Investment prioritization in hydraulic infrastructures to ensure sustainability – *F. Pardo-Bosch, ESADE Business School, Spain; A. Blanco, Smart Engineering SL, Spain; A. Aguado, Universitat Politècnica de Catalunya, Spain*
- 15.05: Importance of environmental and socio-economic aspects during the simultaneous construction of three dams – *S. Hoya and J. Dapena, Iberdrola, Portugal*
- 15.17: Discussion
- 15.30: Coffee

Session 22 **Spillways and plunge pools**
Ronda **(16.00hrs – 17.30hrs)**

Chairman: **Dr P. Mason, MWH, UK**

- 16.05: Design of the Rositas dam spillway, Bolivia – *M. Pereira, Ende Corporacion, Bolivia; J. Ortas, B. Arana and I. Bisús, Eptisa Consulting, Spain; C. Granell and A. Duque, Jesús Granell Ing Consultores, Spain; J.J. Rebollo and D. López, Cedex Hydraulic Laboratory, Spain*
- 16.20: Spillway problems on some elderly structures: Often on the bits that have been repaired – *Dr A. Hughes, Atkins, UK*
- 16.35: Corrective measures to guarantee the stability of the stilling basins and downstream rockfill in the Crestuma-Lever dam – *I. Fernandes, C. Lima, J. Dias da Silva and M. Queralt, EDP-Gestão da Produção de Energia, Portugal; L. Caldeira and J. Melo, LNEC-National Laboratory for Civil Engineering, Portugal*
- 16.50: Emergency spillway for the Mt Coffee hydropower plant in Liberia – *M. Stangl and A. Trifkovic, Fichtner GmbH & Co KG, Germany; W. Hakin, Manitoba Hydro International, Canada*
- 17.05: Plunge pool physical models: Challenges and case studies – *Y. Oukid, G. Barsse, J-C. Girard and F. Ferranti, Tractebel Engie, France*
- 17.20: Discussion
- 17.30: Close

Session 23 **Fish protection**
Albaicín **(16.00hrs – 17.30hrs)**

Chairman: **Dr M. Raeder, CK Power Public Company Ltd, Thailand**

- 16.05: Fish protection using electric flexible fish fences – *B. Brinkmeier, H. Böttcher, R. Tutzer and M. Aufleger, University of Innsbruck, Austria*
- 16.20: State-of-the-art fish pass facilities enhance sustainability at Xayaburi, Laos – *C. Andrade, G. Stevanella and N. Castillejo, AF-Consult Switzerland Ltd, Switzerland*
- 16.35: Using attraction flows in an upstream migration facility for additional energy generation at the Xayaburi hydro plant – *Dr M. Raeder, M. Auekitkarjorn and P. Mahamai, CK Power Public Company Ltd, Thailand*
- 16.50: Innovative facilities for fish migration restoration: Case study of the Schifffahrtskanal run-of-river plant on the Aare river, Switzerland – *M. Müller, M. Mende, Y. Keller and P. Billeter, IUB Engineering Ltd, Switzerland; W. Bärtschi, IBI Industrielle Betriebe Interlaken, Switzerland*
- 17.05: Discussion
- 17.30: Close
- 17.30: **Networking party – Refreshments in the Exhibition Halls**
Evening free for private parties

Wednesday 11 October – Morning (4 Parallel Sessions)

Session 24 **Intakes and penstocks**
Albaicín **(08.30hrs – 10.30hrs)**

Chairman: **B. Leyland, Consultant, New Zealand**

- 08.35: Design criteria and installation methods of the logboom and debris diverter for the Xayaburi run-of-river hydro plant – *R. Razdan, W. Nedsawang and P. Maseekaew, CK Power Public Company, Thailand*

- 08.48: Estimation of diversion headloss at hydropower surface intakes – *D. Sanchez, Hatch Ltd, Canada*
- 09.01: Innovative and environmentally friendly penstocks and intakes for Inchbonnie small hydro – *D. Mackay, Inchbonnie Hydro, New Zealand; R. Press, RP Consulting, New Zealand; B. Leyland, Leyland Consultants, New Zealand*
- 09.14: Installation of sensors inside a penstock for use of the pressure-time method – *P. Ševčík, OSC a.s., Czech Republic; G. Rolandez, EDF DTG, France; F. Necas, Necas – Works at Heights, s.r.o., Czech Republic*
- 09.27: PU foam in buried penstocks – *N. Johnsen, S.L. Aaker and L. Lia, NTNU, Norway; M. Kullberg, Multiconsult ASA, Norway; G. Harris, Penstock BV, The Netherlands; T.O. Svalesen, Statkraft Energi AS, Norway*
- 09.40: Realization of steel penstocks with banded pipe technology for high head hydropower and pumped-storage plants – *Dr C. Curnis, Consultant, Switzerland; D. Bronzetti and S. Calvo, Lombardi Engineering Ltd, Switzerland*
- 09.53: Design and construction of the penstock at Chancay adjusted to unfavourable geotechnical and morphological conditions – *B. Zdravkovic, Sinersa, Peru; B. Petrovic, Colpex Project SA, Peru*
- 10.06: Estimating technical conditions and residual life of metal shell penstocks – *Yu.V. Shevchenko, S.M. Levina and K.I. Vasilchenko, JSC Vedeneev VNIIG, Russia*
- 10.19: Discussion
- 10.30: Coffee

Session 25 Upgrading and refurbishment I
***Itálica* (09.00hrs – 10.30hrs)**

Co-Chairs: W. Hakin, Manitoba Hydro International, Canada;
H. Obermoser, AF Consult, Switzerland

- 09.05: Rehabilitation of the Peligré hydro plant in Haiti – *V. Brost and T. Turk, Fichtner GmbH & Co KG, Germany; L. Racine, Electricité d’Haïti, Republic of Haiti*
- 09.20: Turbine upgrade at Theun Hinboun: Increasing efficiency and capacity – *T. Bylund, THPC, Lao PDR; K-T. Fjaervold, Statkraft, Norway; F. Mercado, Consultant, Philippines*
- 09.35: The challenges of a rehabilitation project: Experience from the commissioning of the Mt Coffee generating units, Liberia – *K. Gjevik, Multiconsult UK Ltd, UK; B. Børresen, B. T. Brunen and O. Skuncke, Multiconsult, Norway*
- 09.50: Reconstruction of the Zakučac hydro plant with a capacity increase, and with continous powerplant operation – *I. Martinac, Projektni Biro Split, Croatia; M. Dujmovič and I. Marušič, HEP – Production, Croatia*
- 10.05: Discussion
- 10.30: Coffee

Sessions 26 Small hydro technology
***Ronda* (08.30hrs – 10.30hrs)**

Co-chairs: Prof D. Williams and G. Black, Learning Hydro, UK

- 08.35: A small hydro plant with highly variable flow in a drinking water supply system: A case study – *A. Santolin, A. Spagnolli and D. Pilotto, Tamanini Hydro S.r.l, Italy; G. Cavazzini, University of Padova, Italy*
- 08.50: Flapping foils as efficient hydrokinetic turbines: First steps of CFD modelling – *L. Duarte, ICube, INSA, France; N. Dellinger, ICube, France; G. Dellinger, ICube, Engees, France; A. Terfous and A. Ghenaim, INSA, France*
- 09.05: Understanding why hydropower plants in general and small hydropower plants in particular often fail to deliver the expected power – *G.H. Kiplesund, Multiconsult ASA, Norway; A. Diep-Lynne, Aquila Capital, Norway; A.A. Bjerke, Blåfall AS, Norway*

- 09.20: Experimental investigation of the factors affecting Archimedes screw generator power output – *S. Simmons, K. Songin and W.D. Lubitz, Guelph University, Canada*
- 09.35: Pressure relief and energy dissipation systems installed at the San Miguel small hydro plant – *C.F.R. González and F.J.A. Montoya, HVM Ingenieros, Colombia; R.A. Tellería, M.H. Kondo and C.A. Tellería, Voith Hydro S.L., Spain*
- 09.50: Refurbishment of a small bulb turbine – *J-L. Kueny, Optydro Concept, France*
- 10.05: Discussion
- 10.30: Coffee

**Session 27 Sedimentation management
Bahía (08.30hrs – 10.30hrs)**

Co-Chairs: Dr G.W. Annandale, Consultant, USA; S. Alam, Consultant, France

- 08.35: Successful sediment management at the Jirau run-of-river hydro project on the Rio Madeira, Brazil: Transporting 500 x 10⁶ tonnes of sediment per year – *S. Alam, Independent Consultant, France; O. Cazaillet and P-E. Loisel, Artelia Eau et Environnement, France; C. da Silva Souto and P. Trindade, Energia Sustentável do Brasil, Brazil; A.L.F. Abreu Jorge, EISA Consultants, Brazil*
- 08.48: Challenges of sediment in hydropower plants in Bhutan: Sediment study from 2011 to 2016 – *Ugyen Rinzin, Druk Green Power Corporation, Bhutan*
- 09.01: Fine sediment routing in a cascade of alpine reservoirs; Influence of the inlet angle on settling of fine sediments – *S. Guillén-Ludeña, P. Manso and Prof. A.J. Schleiss, EPFL, Switzerland*
- 09.14: Contribution to sediment management at the Drin river hydropower cascade, Albania – *N. Efthymiou, P. Schäfer, H. Hildebrand and S. Palt, Fichtner GmbH & Co. KG, Germany; F. Bundo, Albanian Power Corporation, Albania*
- 09.27: Mapping of sediment-related costs at eight hydro plants in operation – *S. Stokseth, Statkraft AS, Norway; H. Nøvik, Multiconsult, Norway; H. Støle, Sediment Systems, Norway*
- 09.40: Sediment challenges at the Cheves hydro plant, Peru – *A. Løvoll, Norconsult AS, Norway*
- 09.53: Sediment transport through the power waterway and hydro-abrasive erosion on turbines – *D. Felix, I. Albayrak and R.M. Boes, VAW, ETH Zurich, Switzerland; A. Abgottspon, HSLU, Switzerland*
- 10.06: Turbine abrasion: When is a shut-down profitable? – *Y.C. Agrawal, Sequoia Scientific, Inc, USA*
- 10.19: Discussion
- 10.30: Coffee

**Session 28: Valuing hydropower services (IEA session)
Albaicín (11.00hrs – 12.30hrs)**

Chairman A. Beckitt, Hydro Tasmania, Australia

Multipurpose hydropower schemes provide significant benefits both to the electricity network and to other users of the water resource. However, this broad range of services have generally not been explicitly valued, nor reimbursed by the beneficiaries. With the penetration of variable renewables increasing in many jurisdictions, hydropower is becoming an important provider of balancing services. Similarly, there is increasing awareness and take-up of the water management services that multi-purpose reservoirs provide. The session will start with the launch of the IEA Hydro Summary Report on Valuing Hydropower Services, followed by an overview of the Annex. The work programme covered the energy and water management services provided by hydropower and enhanced the understanding of their economic values and costs, with appropriate methodologies to estimate their value.

- 11.05: Valuing energy and water management services – *N.M. Nielsen, IEA Hydro, Australia*
- 11.15: The role of pumped storage in providing energy services in the western USA – *V. Koritarov, Argonne National Laboratory, USA*
- 11.25: Benefits of Norwegian hydropower reservoirs in combating flood damage in a changing climate – *K.L. Walløe and Dr B. Glover, Multiconsult ASA, Norway*
- 11.35: Hydropower in the next generation power system – *E. Bianco, International Energy Agency, France*
- 11.45: Panel Discussion

A panel discussion will address: “When, how, what and where to maximize the full potential of hydro balancing in decarbonizing electricity markets”. Discussions around the three bullet points below will be led by A. Beckitt, Hydro Tasmania, Australia.

- Effective power system management is reasonably generic globally. When is it optimal to incentivize the availability of dispatchable hydro to support the integration and deployment of VRE?
- How can individual hydro plants be reconfigured to exploit the full benefits of hydro balancing to ensure local and interconnected grids evolve sustainably?
- Scenario planning is essential to foreshadow inter-region and Intra-region market evolution as the penetration of VRE increases. Where are system balancing requirements most needed to be readily identifiable (including the potential role for hydropower) and how is that value best shared?

12.30: Lunch

Session 29 **Upgrading and refurbishment II** *Itálica* **(11.00hrs – 12.30hrs)**

Co-Chairs **Prof L. Lia, NTNU, Norway; F. Coelho da Rocha e Silva,**
Senior Advisor for REN (Portugal), Mozambique

- 11.05: How a combination of hydro expertise, condition monitoring, and digital technology provides more flexible hydro turbines – *P. Pépin, P-Y. Lowys, V. Bouillet and F. André, GE Renewable Energy, France*
- 11.20: Torrejon power station generating unit refurbishment: Challenges of diagonal flow turbine guidevane design – *V.S. Bonet, Iberdrola Generacion, Spain*
- 11.35: Technical challenges of refurbishment and upgrading of two bulb units – *M. Hrovat and D. Dolenc, Litostrój Power d.o.o., Slovenia; B. Petersen, Akershus Energi Vannkraft AS, Norway*
- 11.50: Thermodynamic efficiency tests used to improve upgrading projects – *G. Brand, Sweco Norge AS, Norway*
- 12.05: Refurbishment of a Kaplan turbine with new optimized blades, oil-less Kaplan hub and new lubrication and regulation systems – *E.S. Recondo and L.L. Angós, Endesa Generación, Spain; R.T. Martínez and J.R. Infanzón, Voith Hydro SL, Spain*
- 12.20: Discussion
- 12.30: Lunch

Session 30 **Small hydro: National case studies** *Ronda* **(11.00hrs – 12.30hrs)**

Co-Chairs **Prof B. Pelikan, University of Natural Resources and Applied Life**
Sciences, Austria; V. Denis, Mhylab, Switzerland

- 11.05: Incentives for small hydropower development in Uganda – *P. Mwesigwa and L. Muwumuza, Ministry of Energy and Mineral Development, Uganda; M. Alesi, Host Consult Uganda Ltd, Uganda; J. Lwanga, Uganda Telecom Limited, Uganda*
- 11.15: Rehabilitation of the Thimphu mini hydro plant in Bhutan – *Padsaworn Wannakarn, EGAT, Thailand*

- 11.25: (a) Current small and mini hydro development in Sarawak: The Kota 2 small hydro plant – *J. Betie and H.L. Houng, Sarawak Energy Berhad, Malaysia*
- 11.30: (b) Current small and mini hydropower development in Sarawak: The Metalun mini hydro scheme – *T.K. Sasak, J.G. Jentry and J.A.J. Blandoi, Sarawak Energy Berhad, Malaysia*
- 11.35: Sustainable small-scale hydropower for local communities – *Y. Miyanaga, Central Research Institute of Electric Power Industry (CRIEPI), Japan; M. Kashiwayanagi, Electric Power Development Co Ltd, (J Power), Japan; M. Hashimoto, New Energy Foundation (NEF), Japan; T. Kasahara, Japan Electric Power Information Centre, Japan*
- 11.45: Small hydro installations in Albania: A benchmark case study – *F. Tartaro, S. Iorda and M. Sebastiani, Hydro Energia, Italy*
- 11.55: Hydropower potential study in the water supply and wastewater collection networks in Tbilisi, Georgia – *D. Kelleher and B. Quigley, Stucky Ltd, Switzerland; G. Matcharadze, Stucky Caucasus Ltd, Georgia; G. Akhvlediani and T. Kurdadze, and Z. Mirtskhulava, Georgian Water & Power Ltd, Georgia; M. Rusconi and M. Goetschi, Stucky Ltd, Switzerland*
- 12.05: Expansion of micro hydro: A key component towards energy transition – *H. Terry, Turbiwatt, France*
- 12.15: Discussion
- 12.30: Lunch

Session 31 **Grid issues**
Bahía **(11.00hrs – 12.30hrs)**

Chairman **Ø. Johansen, Ministry of Petroleum and Energy, Norway**

- 11.05: Benchmarking of hydroelectric generator compliance for the European network code on requirements for grid connection – *F. Perán Montero, Iberdrola, Spain; L. Rouco Rodríguez, Universidad Pontificia Comillas, Spain*
- 11.20: Integration of battery storage systems in hydroelectric plants for supplying primary frequency control – *F. Pasut and M. Pettinà, STE Energy SpA, Italy*
- 11.35: Governor retrofit improves grid stability on an isolated microgrid in Western Africa – *R. Clarke-Johnson, American Governor Company, USA*
- 11.50: Co-existence of islanded and parallel operation mode in 2 MW small hydro plant to supply electricity to rural villages: Problems and optimization of the design – *L.L. Papetti and D. Cazzago, Studio Frosio S.r.l., Italy; G. Marchioretto, Zeco Srl, Italy*
- 12.05: Discussion
- 12.30: Lunch

Wednesday 11 October – Afternoon (4 Parallel Sessions)

Session 32 **Social aspects**
Bahía **(14.00hrs – 15.30hrs)**

Co-Chairs **Dr S. Sparkes, Statkraft, Norway;**
L. Nielsen, IEA Hydro, Australia

- 14.05: Long-term planning for social mitigation – *Dr S. Sparkes, Statkraft AS, Norway*
- 14.20: Innovative fish and pirogue facility to reduce social and environmental impacts at the Maripasoula hydropower plant – *M. Valadié, Voltalia SA, France; G. Le Maux, Voltalia Guyane, French Guiana; V. Lemay, Hydrostadium EDF Group, France*
- 14.35: Livelihood restoration planning for sand mining workers: Practical insights from the Nachtigal hydro project, Cameroon – *C. Gouley and G. Prudent-Richard, Artelia Eau & Environnement, France; F. Nathan, EDF-CIH, France; F. Ardorino, Nachtigal Hydropower Company, Cameroon*

- 14.50: The Mt. Coffee rehabilitation project, Liberia: Unique approaches and lessons learned on social safeguards – *K. Stroup, Manitoba Hydro International, Canada; B. Lammers, Caliqua GmbH, Germany*
- 15.05: Lessons learned from the Murum resettlement and livelihood restoration programme, Malaysia – *J. Abdullah, J. Cho Yian Tan, B. Surang, A.A. Kilon and Z. Hillson, Sarawak Energy Berhad, Malaysia*
- 15.20: Discussion
- 15.30: Coffee

Session 33 **Operation and maintenance**
Itálica **(13.45hrs – 15.30hrs)**

Chairman **Dr D. Paschini, EDF, France**

- 13.50: New World Bank initiatives on operation and maintenance – *N.J-M. Sans, World Bank*
- 14.01: Mitigation of algae growth in hydropower canals using a novel overlay mortar with biocide activity – *I. Segura, Smart Engineering Ltd, Spain; F.J. Conesa Baños, ENDESA Generación SA, Spain; J.M. Vaquero, BASF Construction Chemicals, Spain; M.A. Calvo, Barcelona University, Spain; A. Aguado, University Polytechnic of Catalunya, Spain*
- 14.12: Implementation of a monitoring platform at Endesa – *F.J. Conesa Baños and M.C. Cano, Endesa, Italy; S. Hoppe and L.A. Sober, Ofiteco, Spain*
- 14.23: Aloha: A system for surveillance and safety of hydraulic structures – *P-H. Faure, CNR-CACOH, France; V. Morisseau, Sixense-Digital, France; F. Zenss, CNR, France; V. Gbiorczyk, Société Hydroélectrique du Midi, France*
- 14.34: The use of modern mathematical tools and OPC technology for monitoring and maintenance of hydropower plants – *D. Kranjic, DEM - Drava River Power Company, Slovenia*
- 14.45: Modelling the virtual age of hydropower assets based on inspection, maintenance and replacement actions – *B. Golaz, A. Jordan and M. Genoud, Hydro Exploitation, Switzerland; B. Valluy, Alpiq Suisse, Switzerland*
- 14.56: Systematic methodology for condition assessment and residual lifetime evaluation – *H.O. Nyland and H. Bjørndal, Norconsult AS, Norway*
- 15.07: Correlation between vibrations and acoustic emissions at a hydropower plant – *J.M.N. Diaz and F. Flemming, Voith Digital Solutions GmbH, Germany; K. Engels and F. Kunkel, Uniper Kraftwerke GmbH, Germany*
- 15.18: Discussion
- 15.30: Coffee

Session 34 **Tunnels**
Albaicín **(14.00hrs – 15.30hrs)**

Chairman **R. Taherzadeh, Tractebel Engie, France**

- 14.05: Hard rock tunnelling solutions for hydropower projects – *P. Schmaeh and Dr M. Peters, Herrenknecht AG, Germany*
- 14.17: Development of a portable communication solution for tunnels inspection – *A. Quadrelli and F. Ferrari, Enel Green Power SpA, Italy*
- 14.29: Geomembranes to increase safety and decrease head loss in pressure tunnels and shafts – *A. Scuro, G. Vaschetti and M. Scarella, Carpi Tech, Switzerland*
- 14.41: Design review of the tunnel for the Miguillas EPC hydro project – *P.H. Perazzo and C. Carvalho, ENDE Servicios y Construcciones, Bolivia*
- 14.53: Construction challenges encountered in the headrace tunnel at the Dagachhu project, Bhutan – *Lachu Man Dhungyel and Bhola Nath Pradhan, Druk Green Power Corporation Ltd, Bhutan; Thinley Dorji, Bhutan Hydropower Services Ltd, Bhutan*

15.05: Considering first world alternatives in augmenting the supply of Mthatha dam, South Africa – *M. Wainstein, J. Du Plessis and H.J. Tluczek, Gibb Engineering and Architects, South Africa*

15.17: Discussion

15.30: Coffee

**Session 35 Electrical engineering
Ronda (13.45hrs – 15.30hrs)**

**Co-Chairs R. Bucher, Lahmeyer International, Germany;
Prof J-J. Simond, EPFL, Switzerland**

13.50: Machine-learning technique applied to condition-based monitoring of hydro plants – *Dr A. Bongiovì, ABB SpA, Italy; T. Farinelli, Northern Access, Monaco*

14.00: New developments for an integrated automation solution for hydropower plants – *C. Mann, Andritz Hydro, Austria*

14.10: Required inertia in hydro generators: Design and solutions – *F.B. Estrada and J.P. Argos, Gamesa Electric SAU, Spain*

14.20: Optimized cooling of the refurbished hydro generators at Tierfehd – *H. Baumeister, S. Baumiester and P. Tönnies, GE Renewable Energy, Switzerland*

14.30: Improving energy efficiency at hydro and pumped-storage plants by decreasing the electric power consumption for auxiliaries – *S. Ivanov and K. Fanina, Ukrhydroproject PJSC, Ukraine*

14.40: Upgrading of refurbished generators at the Binga hydro plant: Output increased by 48 per cent – *Z. Milojković, V. Poljančić and M. Brčić, Končar Generators and Motors Inc, Croatia*

14.50: Digital substation 2.0: Overview on reference installations up to 400 kV and how to familiarize with the technology – *R. Bucher, Lahmeyer International GmbH, Germany*

15.00: Commissioning and grid operation of the Mt Coffee generators on the small Monrovia grid – *M. Parameshwaran, Multiconsult, UK*

15.10: Discussion

15.30: Coffee

**HYDRO 2017 Closing Plenary Session: Conclusions and recommendations
Auditorium Al-Andalus (16.00hrs – 17.00hrs)**

Conclusions and recommendations based on Chairmen reports

Welcome to ASIA 2018, Danang, Vietnam

Welcome to HYDRO 2018, Gdansk, Poland

Evening

Conference Dinner

Hacienda San Miguel de Montelirio

Co-Hosted by *Hydropower & Dams* and ENDESA