



vgbe/uniper Expert Event

Digitalisation in Hydropower 2024

Innovative data-driven measures for performance optimisation and resilience

Event in Garmisch-Partenkirchen, Germany

15/16 October 2024

Site visit and demonstration at uniper's digital storage hydropower plant at Walchensee and at TUM's Research Institute at Obernach



Individual success through exchange of knowledge

vgbe/uniper | Expert Event Digitalisation in Hydropower 2024

The 7th international vgbe Expert Event "Digitalisation in Hydropower" in cooperation with uniper will provide again a comprehensive overview of important topics regarding digitalisation in hydropower dealing mainly with the results and practical experiences of newly developed and implemented innovative digital measures, tested products and tools from the view of the operators. Topics of the lectures are:

- Asset Management
- Workforce Management
- Advanced Data Analytics
- Platform Solutions
- Digital Twins
- Inspection & Measurement
- Visualization (VR, AR, 3D GIS ...)

Based on practical examples, you will gain insights into how to implement and apply digital solutions successfully.

EVENT VENUES

First day: 15 Oct. 2024 (presentations in the forum)

Riessersee Hotel
Riess 5 | 82467 | Garmisch-Partenkirchen, Germany
www.riessersee-hotel.de

Second day: 16 Oct. 2024 (site visit with stations)

Storage hydropower plant Walchensee Altjoch 21, 82431 Kochel am See, Germany	Research Institute of TUM at Obernach Obernach 15, 82432 Walchensee, Germany
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CONFERENCE LANGUAGE AND OFFICE

The conference language is English and the office will be open from 09.00 a.m.

EVENING EVENT

On Tuesday, 15 October 2024, starting at 7:30 p.m., all conference participants are invited to a get-together at the event venue.

CONFERENCE TICKET

Participation (for 1 st and 2 nd day)	Single ticket (1 participant)	Package ticket (3 participants)
vgbe non-members	€ 1,100.--	€ 2,900.--
vgbe members	€ 850.--	€ 2,200.--
Universities, Authorities	€ 400.--	€ 1,000.--

The participation fees include the conference presentations (after the conference), coffee breaks, lunch, participation in the evening dinner event and bus shuttle on the 2nd day. All participants of the conference are requested to register online. It is not possible to accept credit cards or currency on-site at the conference office.

EXHIBITION OPPORTUNITY

Promote your company activities directly in the conference room on 15 October 2024 by booking our exhibition package (€ 450.- plus VAT, 1 roll-up + own brochure display).

ONLINE REGISTRATION

<https://register.vgbe.energy/30624/>

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45257 Essen, Germany
Ms. Akalya Theivendran
t +49 201 8128-230
e vgbe-digi-hpp@vgbe.energy



Have direct access to the event [website](#).

PRIVACY POLICY & GENERAL TERMS

Detailed information on data protection as well as the general terms and conditions can be found [here](#).

MEDIAPARTNER



vgbe/uniper | Expert Event Digitalisation in Hydropower 2024

Enhanced digital controls can boost hydropower performance, cut costs, and optimize asset management. These systems aid decision-making and enhance operational efficiency, which is crucial as many hydropower plants require refurbishment and modernization in the coming years. Based on practical examples you will gain insights into how digital solutions are already successfully implemented and applied.

In this context and as a valuable complement to the lectures, on October 16th all participants are invited to visit the storage hydropower plant at Walchensee where uniper will present implemented and currently tested digitalisation techniques as well as the Research Institute of the Technical University of Munich at Obernach.



Site of Storage hydropower plant Walchensee



Site of the Research Institute at Obernach

The imposing storage hydropower station is considered the cradle of industrial power generation in Bavaria. Completed in 1924, it was one of the largest hydroelectric power plants in the world at the time with an output of 124 MW. Down the road in Obernach, the Institute of Hydraulic Engineering and Water Resources at TUM carries out numerous research projects at its satellite Research Institute.

The Expert Event will bring together experts from leading operator and manufacturer companies as well as related stakeholders to discuss challenges and opportunities for the operation of hydropower fleets accruing from digital transformation.

CEST THUESDAY, 15 OCTOBER 2024

10:00 Welcome and opening of the vgbe/uniper | Expert Event
K. Engels, uniper

Current activities of vgbe in digitalisation on hydropower
M. Bachhiesl, vgbe energy

10:30 SESSION 1

Lecture 1
Fortum's journey towards value drive operations
A. Ferraris, Fortum

Lecture 2
A Digital Twin for Alpiq's hydropower waterways safety
B. Valluy, Alpiq; C. Nicolet, PowerVision

Lecture 3
EDP experience in advancing hydro flexibility to be relevant in future electrical system
P.D. Pinto, EDP

12:00 Lunch

13:30 SESSION 2

Lecture 4
Halving maintenance downtime at Hafslund Eco by advanced analytics in Visplöre
H. Piringar, Visplöre

Lecture 5
RELY - Reliable reinforcement learning for flexible energy systems
C. Tubeuf, Technical University of Vienna; H. Götsch, TIWAG

Lecture 6
Harnessing high-resolution vibration data to improve hydraulic machinery operation
M. Titzschkau, Kraftwerk Oberhasli; T. Steinbacher, IFTA

15:00 Coffee Break

CEST THUESDAY, 15 OCTOBER 2024

15:40 SESSION 3

Lecture 7
Digital transformation journey with Senkron at Enerjisa Uretim
S. Özek, Enerjisa Üretim; S. Özgür, Enerjisa Üretim

Lecture 8
More green renewable energy with digitalisation
H. G. Nilsen, NTE Energi

Lecture 9
Digital inspection management (Smart check) for improved Asset Management
M. Cappicciola, ENEL Green Power

17:10 Outlook for the visit to the TUM Research Institute at Obernach and the Walchensee storage hydropower plant
C. Kunze, uniper

17:40 Closing words

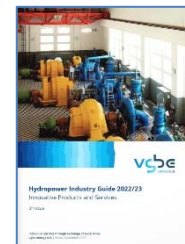
19:30 Evening Dinner and Get-Together at Riessersee Hotel
Riess 5 | 82467 | Garmisch-Partenkirchen

Information about our Hydropower Industry Guide 2022/23

Get an overview of the leading companies in the hydropower industry and find out about the many topic-specific offers of our media partners.

Free download here:

<https://www.vgbe.energy/en/hydropower>



Site visit and demonstration of uniper's hydropower plant at Walchensee

On the second day of the Expert Event, uniper, Technical University of Munich and partners will present digital solutions in the hydropower plant Walchensee. Participants can take part in a guided tour, and experts will be on hand to answer questions and be available for further in-depth technical discussions.

Please note: Sturdy shoes are required for the plant visit!

CEST WEDNESDAY, 16 OCTOBER 2024

07:30	Departure via bus shuttle to uniper's Walchensee hydropower plant and to TUM's Research Institute Obernach
08:30	Welcome and grouping of participants for visit of stations Guided visit to the demonstration stations
11:00	Networking Snacks, soft drinks, coffee
12:00	Transfer to the other site event
12:30	Welcome and grouping of participants for visit of stations Guided visit to the demonstration stations
15:00	End of visit
15:00 - 15:40	Departure by bus shuttle to S7 Train Station Wolfratshausen / Munich with public connection to the main railway station and airport of Munich

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Demonstration stations and the presenters

Station 1



uniper's Hydro App-World Info Basis Mobile

Live Demo and User Story (operational)
Presented by uniper GER

Station 2



uniper's Hydro App-World Digital Workforce Management

Live Demo and User Story (operational)
Presented by uniper GER

Station 3



uniper's Hydro App-World Dam Control App

Live Demo and User Story (operational)
Presented by uniper GER

Station 4



Advanced Analytics Seq Tool - Dynamic Data Compilation

Live Demo and User Story (POC)
Presented by uniper SWE

Station 5



Advanced Analytics Condition Monitoring via Advanced Analytics

Live Demo and User Story (operational)
Presented by uniper COODE

Demonstration stations and the presenters

Station 6



Advanced Analytics Condition Evaluation Platform

Live Demo and User Story (POC)
Presented by uniper COODE and GER

Station 7



Advanced Analytics Celonis Process Mining in Operations

Live Demo and User Story (operational)
Presented by uniper GER

Station 8



Business Intelligence & AI GenAI: First Applications in Operation

Live Demo and User Story (POC)
Presented by uniper COODE and GER

Station 9



Business Intelligence & AI AI for Fish Detection

Live Demo and User Story (operational)
Presented by uniper GER

Station 10



Business Intelligence & AI Insights into uniper's Data, Cloud- & AI-Structures

User Story (operational)
Presented by uniper COODE

Site visit and demonstration of TUM's Research Institute Obernach

On the second day of the Expert Event, uniper, Technical University of Munich and partners will present digital solutions in the hydropower plant Walchensee. Participants can take part in a guided tour, and experts will be on hand to answer questions and be available for further in-depth technical discussions.

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Demonstration stations and the presenters

Station 1



Data Modelling

Digital Twin for Operational Training

Live Demo and User Story (Research)
Presented by uniper GER and Oceanmaps

Station 2



Data Modelling

Advanced Flood Simulator

Live Demo and User Story (Research)
Presented by uniper GER

Station 3



Data Modelling

Hydraulic Modelling (TBD)

Live Demo and User Story (Research)
Presented by TU Kassel

Station 4



Data Modelling

Hydraulic Test Model – Optimisation of Water Intake

Live Demo and User Story (Research)
Presented by Research Institute Obernach

Station 5



Advanced Analytics

Hydraulic Test Model - Optimisation of Weir

Live Demo and User Story (Research)
Presented by Research Institute Obernach

Demonstration stations and the presenters

Station 6



Asset-based Digitalisation

Digital Dam Surveillance Germany

Live Demo and User Story (operational)
Presented by uniper GER

Station 7



Asset-based Digitalisation

Dam Safety – Monitoring and Surveillance 2.0

Live Demo and User Story (operational)
Presented by uniper SWE

Station 8



Asset-based Digitalisation

State of the Art Drone Inspections

Live Demo and User Story (operational)
Presented by uniper SWE and Uwtech

Station 9



Asset-based Digitalisation

Sensor Fish - Advanced Fish Monitoring

User Story (operational)
Presented by uniper GER and TU Munich

Station 10



Asset-based Digitalisation

Process networks (OT) for scale-up of Digitalisation

Live Demo and User Story (operational)
Presented by uniper COODE and GER

PRESENTATION CONTENT FROM THE SPEAKERS

Welcome and opening of the vgbe/uniper Expert Event



Speaker: Dr. **Klaus Engels**, Director Hydropower Germany, Uniper Kraftwerke GmbH

The rapid evolution of digital technologies presents both opportunities and challenges alike. As we embrace this digital transformation, the landscape of the hydropower industry continually shifts, offering opportunities to enhance efficiency and safety for our workforce. However, this progress also introduces complexities that demand our attention. Emerging technologies such as artificial intelligence or virtual realities are reshaping the operation and maintenance of hydropower plants. At Uniper, we embark on this journey, striving to find the optimal balance between challenges and opportunities to ensure the sustainable future of our business. Therefore, the continuous adaptation of our workforce to new capabilities, as well as the exchange between all stakeholders in the hydropower community, are crucial elements in successfully implementing the right solutions and avoiding missteps on our ascent up the digital staircase.

Current activities of vgbe energy in digitalisation in hydropower



Speaker: Dr. **Mario Bachhiesl**, Head of Department Renewables, vgbe energy e.V.

Within the vgbe hydropower community, a comprehensive experience transfer takes place in several committees. Profound experiences on topics regarding digitalisation including the latest findings and examples of implementation are part of the discussion in vgbe's Working Group Hydro "Digitalisation". Based on practical examples members report on how digital solutions have been successfully implemented and how are the practical experiences in operation. Getting information from the view of operators with practical experiences offers valuable insights for your own implementation strategies for digital measures.

Session 1

Fortum's journey towards value drive operations



Speaker: **Alessandro Ferraris**, Manager of Technology Development, Fortum Heat and Power Oy

Fortum Hydro Generation's journey in digitalisation of the hydropower fleet: from scheduled maintenance to real-time supervision of the assets. Successes and challenges with data collection. Overview of areas where digitalisation is supporting today our operations, walk-through of use cases of operation monitoring and failure mode detection.

A Digital Twin for Alpiq's hydropower waterways safety



Speaker: **Bernard Valluy**, Head of Projects and Innovation, Alpiq;
Dr. Christophe Nicolet, Managing Director, Power Vision Engineering S.à.r.l.

Hydropower plants play an important role in electrical power systems stability due to their operational flexibility and their ability to provide ancillary services leading to frequent starts and stops and power variations. As a result, waterways of hydropower plants are subject to increased number of hydraulic transient phenomena, while the installations are aging and subject to more frequent anomalies. The presentation will introduce the physics-based Hydro-Clone digital twin solution deployed at Alpiq's major HPP/PSPP to monitor hydraulic transients. Key results related to the 1,200 MW Cleuson-Dixence HPP and to the 900 MW Nant de Drance PSPP will illustrate Hydro-Clone capabilities.



EDP experience in advancing hydro flexibility to be relevant in future electrical system



Speaker: **Pedro Diogo Pinto**, Hydro Assets Engineering and Optimization,
EDP - Gestão da Produção de Energia S.A.

Over the last years, EDP has been actively engaged in various initiatives aimed at advancing hydro flexibility. Among these activities, one of the most notable was the XFLEX Hydro consortium, where EDP played a significant role by contributing with three demonstrators. Through this participation, EDP leveraged the knowledge and technology developed within the consortium to enhance the flexibility of its power plants. These efforts underscore EDP's commitment to staying at the forefront of innovation in the energy sector and also the effort to keep hydropower relevant in the future electrical system. Here, advanced operation modes like hydraulic short circuit, range extension, fast frequency services, variable speed, among others, will be discussed.

Session 2

Halving maintenance downtime at Hafslund Eco by advanced analytics in Vispløre



Speaker: **Dr. Harald Piringer**, Managing Director, Vispløre GmbH

This lecture presents a case study on how advanced graphical analytics empowered maintenance engineers from Hafslund Eco, Norway, for early anomaly detection and decision-making. Engineers noticed abnormal temperature increases in a bearing of a Francis turbine. An analysis of 3 years of data in the graphical analytics software Vispløre revealed anomalies during the startups and confirmed that a technical issue, not external conditions, caused the problem. Based on these insights, planned maintenance reduced downtime by 50%, saving approximately EUR 1.1 million in avoided revenue loss. Lessons learned can be applied to other locations for early anomaly detection.

RELY - Reliable reinforcement learning for flexible energy systems



Speaker: **Carlotta Tubeuf**, University Assistant Senior Engineer, Technical University of Vienna;
Hugo Götsch, Team Leader Engineering, TIWAG - Tiroler Wasserkraft AG

Due to the increasing complexity, the growing number of players in the energy market and the resulting need for increased flexibility, machine learning algorithms will play a significant role in decision making and coordination of load balancing in the energy system of the future. In this lecture, we present first insights into our research project RELY. To enable the use of machine learning for pumped hydro storage systems despite safety concerns, the goal of RELY is to develop and test a method in which the reliability, robustness, and safety of the artificial intelligence's actions increase highly. Within the project, a reinforcement learning algorithm is being pre-trained on a virtual representation of a reversible pump turbine and then transferred to a lab-scale model machine using a digital twin platform.



Harnessing high-resolution vibration data to improve hydraulic machinery operation



Speaker: **Maximilian Titzschkau**, Expert Data Science/Hydromechanics, Kraftwerke Oberhasli AG;
Dr. Thomas Steinbacher, Technical Sales, IFTA GmbH



KWO and IFTA report on their joint efforts to implement and harness high-resolution vibration data measurement and 24/7 recording systems at four hydraulic machines. This project has been motivated by the essential role of vibration data in optimizing machine operation. Although 27 KWO machines were equipped with state-of-the-art vibration protection systems, for half of them there was no data accessible at all. For the remaining half, only sparse indicators, such as maximum vibration levels, were accessible, which did not allow for deeper analyses. This talk reports on the practical experiences of equipping all four KWO machines with IFTA Argus systems combining continuous high-resolution monitoring and proven machine protection.

This use case is interesting for operators of hydropower plants who face similar challenges due to limited vibration data, but still wish to start with data-driven optimization of machine operation.

IFTA

Session 3

Digital transformation journey with Senkron at Enerjisa Üretim



Speaker: **Serkan Özek**, Hydro Power Plant Maintenance Manager, Enerjisa Üretim;
Salih Özgür, Central Operation, Control, Monitoring and Development Leader, Enerjisa Üretim



Enerjisa Üretim is the leading generator in Turkey, with a total capacity of about 3748 megawatts, spread across various types of power plants in different locations of the country. These include natural gas (43%), hydroelectric (37%), domestic lignite (12%), wind and solar (8%) plants. With our Senkron Remote Operation Control Room in Istanbul, we monitor our operations 24/7 without interruption and manage them remotely. Our digital journey started in 2018, with a data driven approach for operation and maintenance activities. We created our own digital solutions including robotics, cybersecurity and digital twin with AI. We still keep exploring new ways and technologies every day.

ENERJISA ÜRETİM

More green renewable energy with digitalization



Speaker: **Håvard Grøtan Nilsen**, Digitalization Lead, NTE Energi

In NTE we started our digitalization journey in 2020, and have since then worked focused on reducing downtime and increasing predictability in maintenance on our hydroelectric power plants through digital solutions. In this lecture we will explain our approach to distributing data insights, data-assisted decision making and predictive maintenance and of course, the results we have seen so far. By sharing our experiences with other producers both in Norway and abroad, we believe this will enable increased availability of green renewable energy.



Digital inspection management (Smart check) for improved Asset Management



Speaker: **Marco Cappicciola**, O&M Hydroelectric, ENEL Green Power

Integrated and digital asset management plays a crucial role in enhancing the efficiency of maintenance and risk assessment processes. The upcoming presentation will delve into the interconnection between maintenance strategies such as preventive, predictive, and prescriptive approaches. Additionally, it will highlight the significance of failure mode classification as a pivotal aspect in asset management. Furthermore, the presentation will underscore the importance of inspections within the framework of Reliability Centered Maintenance, particularly emphasizing the integration of digitalized inspection outcomes through programs like Smart Check for comprehensive analysis.



Outlook for the site visits

Outlook for the visit to the TUM research centre in Obernach and the Walchensee storage power plant



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Speaker: Dr. Christian Kunze, Head of Hydro Development & Steering, Uniper Hydro Power

On the second day of the conference, we extend a warm invitation for you to explore and experience the digital solutions presented by Uniper and our esteemed partners. Spanning across 20 stations, our showcase will encompass a diverse array of solutions, including mobile apps, data modeling, advanced analytics, assetbased digitalization, and business intelligence & AI. You'll have the opportunity to tap into the expertise of our Uniper Hydropower specialists in Germany and Sweden, as well as our central Uniper Digitalization unit, alongside our valued partners. We are particularly excited to welcome our research partners, notably the TUM Research Center in Obernach, renowned for its unique real-world test facilities that often provide crucial data for enabling advanced digital modeling.

We eagerly anticipate your presence and engagement at this event.