Flood management : combining safety, environment & economic performance

The challenge

Floods frequently cause major damage to hydroelectric facilities. It is estimated that 40% of dam breaches are due to flood waters and their inadequate management.

The requirements of flood management may challenge the economics of a hydropower facility, due to operational restrictions on water levels or energy management.

You would like to have a safe, efficient and easy-to-implement methodology for flood management at your hydro facilities.

You want to leverage the potential of your reservoir and use a panel of predictive and training tools adapted to your needs.

Backed by our experience as Engineer/Operator, EDF Hydro Engineering has developed revolutionary methods and tools to help you meet these challenges.

These technologies reduce the need for operating restrictions, while delivering a gain in producible power of approximately... **2%**

The **40** major lakes in the EDF fleet are being equipped with a Trajectoire Linéaire® operation law and a Game of Gates model

Our solutions

Defining more efficient operation laws in flood conditions

Thanks to our new algorithm named **Trajectoire Linéaire** © EDF 2016, it is easier to determine the necessary manoeuvres, without requiring any in situ calculation or knowing the inflow rate. **Linear Trajectory®** is compatible with automated control and enables precise parameter settings.

Proposing assistance and predictive tools

Based on hydrological and energy forecasts, we offer tools designed to prepare the reservoir in anticipation of flood waters. By adjusting the flow-through rate, it is possible to control the probability of the need for overflow discharges without dictating permanent restrictions on the operational level.

Anticipating with Game of Gates

Game of Gates is a simulation and anticipation serious game developed by EDF Hydro as a decision-making aid. It helps you simulate and prepare for flood management of a dam similar to yours, by benchmarking your methodology against the method developed by EDF.
Read more at www.game-of-gates.fr

Training site staff

In order to keep up and upgrade the operators' skills, we offer training sessions to fit any situation. Thanks to its virtual reality interface, our flood management simulator **SIMBA** generates highly realistic mock situations. For training focused on flooding operation strategy, **Game of Gates** can quickly simulate many different scenarios.

Optimizing the economic efficiency of reservoirs

We conduct sensitivity analyses to assess optimal operational modes according to the predictable frequency of flood events in large lakes. Our methodology enables the best multicriteria operating strategies to be designed, based on the processing of large panels of hydrograms generated by our hydrometeorological models.

A team of experts

Our experts understand the market perfectly and can offer the best technical solutions for your projects.

EDF - Hydro Engineering Center - Savoie Technolac
F-73290 La Motte Servolex +33 (0) 4 79 60 60 60

contact-hydro@edf.fr

Proof by example

Long-lasting floods, giant reservoir and simplified management

Brazil - Sinop (408 MW)

The challenge: set up an efficient flood management method adapted to this newly commissioned facility with a very large reservoir.

The context: commissioning of this facility subjected to long-lasting flooding periods (around one month). Flood management must fit into the contractual framework agreed with all stakeholders in the Brazilian network.

Our response: in cooperation with the operator, implementation of a Trajectoire Linéaire© management system with dedicated parameter settings. Analysis and consulting to establish operational flood instructions, followed by in-situ training and e-learning sessions via the **Game of Gates** simulation tool.

The results: high technical efficiency of the entire system, greatly appreciated by the operator.

Upgraded algorithm and improved cost-efficiency

France - Vouglans (285 MW)

The challenge: determine the economic value of the power output in the Ain valley based on the calculated probable frequency of occurrence of flooding events at the Vouglans dam in order to upgrade the reservoir management algorithm.

The context: challenge the relevance of the very low frequency of occurrence of flooding events.

Our response: propose a technical and economic strategy for reservoir management, with upgraded flooding frequency trends and economic gains.

The results: economic gain of approximately 2% in producible output in the valley.

Game of Gates: Playing against chance

France - Vallée de la Truyère

The challenge: have a real-time operation management tool to optimize the anticipation of flood events.

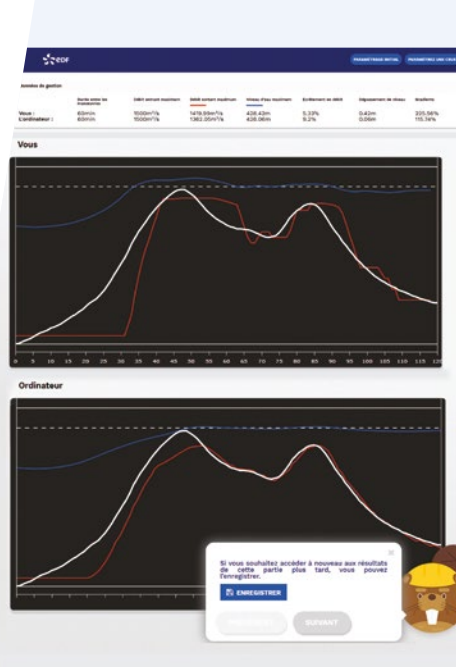
The context: reservoir management for short-term anticipation of flooding events to eliminate the need for permanent restrictions on energy regulation in this valley of strategic importance for the country.

Our response: implementation of **Game of Gates** simulation serious game to optimize the regulation in lakes when flooding is expected within a minimum of one week. The strategy is then confirmed objectively and shared among the stakeholders in order to anticipate the flooding events.

The results: optimized management of the valley's head reservoir at Grandval, 50% reduction of effective frequency of flooding events.

> We have revolutionized flooding operation management via a comprehensive approach combining safety, economics and ergonomics for our top 50 hydropower facilities. We are now offering to share our know-how and experience on the subject.

Manuel Antunes-Vallerey,
Flood Expert at EDF Hydro



Game of Gates, our decision-making tool

Advantages of EDF Hydro

In order to meet the challenges raised by the integration of renewable energy sources, EDF Hydro Engineering relies on the unparalleled experience of its engineers and experts in flood management.

We have been upgrading our expertise constantly for over 70 years of operating the EDF hydropower fleet, supporting operators to control all aspects of the flooding risk.

contact-hydro@edf.fr

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