

# Modernisation and geotechnical automation of the Ilha Solteira and Jupia hydroelectric power plants

## Country

Brazil

## Industry

Infrastructure

## Application Areas

Geotechnical  
Structural

## Context

Geotechnical monitoring of dam structures is a vital pillar of safety management in hydroelectric power projects. In Brazil, these data still tend to be collected manually in many operative sites. In this context, an extensive instrumentation upgrading process was implemented by [G5 Engenharia](#) and [G5 Instrumentos](#) at the Ilha Solteira and Jupia hydroelectric power plants, operated by [CTG Brasil](#). This process focussed on automating a significant share of the geotechnical sensors by adopting [Loadsensing](#) technology.

The initiative resulted in one of the largest dam automation projects ever carried out in South America, consolidating a strategic change in the technological approach. The original architecture was replaced by a solution based on LoRaWAN communication and Loadsensing wireless modules.

The upgrade was implemented at the Ilha Solteira (installed capacity of 3,444 MW) and Jupia (1,551 MW) power plants, which together form the sixth largest hydroelectric complex in the world. The structures monitored include earthen and concrete dams, and cover areas with technical galleries that are difficult to access, which reinforces the importance of adopting autonomous, wireless systems.



## Solution

The Loadsensing architecture implemented consists of:

- LS-G6-VW-1M [dataloggers](#) (1 channel for vibrating wire).
- LS-G6-[gateway](#) with LoRa and NB-IoT connectivity to gather and store the data collected in the field.
- Direct integration with the software management platform via a secure API with periodic synchronisation.

Additionally, traditional dataloggers with multiplexers wired into the concrete dam. This system allows data readings to be continuously taken and automatically sent to the cloud, while also allowing interoperability with CTG Brasil's corporate systems, enabling real-time analysis, traceability of readings and rapid response to any anomalies.



“The adoption of Loadsensing technology at the Ilha Solteira and Jupia power plants represents a milestone in the modernisation of geotechnical instrumentation in Brazilian dams.”

**Giovanni Carvalho Marquesi**

Executive Director

G5 Engenharia, G5 Instrumentos

## Benefits

The project was developed by G5 in two different phases: the conceptual phase, which focused on defining the technical scope and evaluating solutions; and the implementation phase, which included taking detailed measurements and testing with prototypes. A combination of solutions using radio, wired and mixed communication were used, depending on the type of structure (earthen or concrete).

During the design implementation phase, a decision was taken to replace the initial system – based on traditional dataloggers with wired multiplexers – with Loadsensing technology for the earthen dam. This transition was chosen based on criteria of technical feasibility, operational safety and cost optimisation.

The main technical advantages of the Loadsensing solution are:

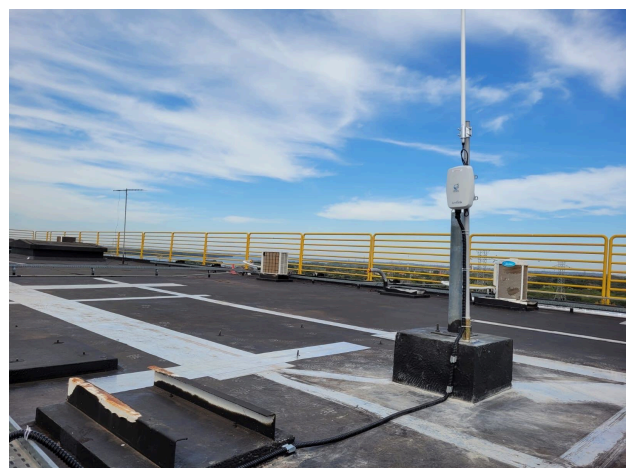
- Reduction of more than 12 km in the cabling required in the monitored structures.
- 30% reduction in the total installation and commissioning time.
- Mitigation of operational risks in confined areas and at heights
- Greater communication reliability in underground areas.
- Scalability and remote reconfiguration of reading intervals.

The data transmission structure consisted of six stations integrated by fibre optics and radio, with a final connection to CTG Brasil's internal switch. The system was integrated into the corporate platform for dam safety, allowing cross-validation of automated readings and historical manual records.

## Advantages

- Robust and adaptable automation in large concrete and earthen structures.
- Significant reduction of civil and electrical infrastructure.
- Full integration with the corporate software platform.
- Successful implementation conducted by G5 Engenharia and G5 instrumentos, with strong adherence to CTG Brasil's technical requirements.

With an effective reading rate of over 90% and the adoption of bi-annual preventive maintenance, the system has proved to be robust and accurate. As a contingency measure, the Ilha Solteira hydroelectric power plant continues to collect data manually, but recognises the added value provided by automation in terms of safety and reliability of monitoring. The experience gained in this project paves the way for the model to be replicated in other hydroelectric projects, serving as a technical and operational reference at national and international level.



DISCLAIMER:

All Content published or distributed by Worldsensing is made available for the purposes of general information. You are not permitted to publish our content or make any commercial use of our content without our express written consent. This material or any portion of this material may not be reproduced, duplicated, copied, sold, resold, edited, or modified without our express written consent.