

OPENINNOVABILITY CHALLENGE – 21 April 2023

Title

Fiber optic cable installation within operational hydroelectric canals

URL: <https://openinnovability.enel.com/challenges/call/2023/4/cable-installation-hydroelectric-plants>

Subtitle

Enel is seeking solutions to install a fiber optic cable inside hydroelectric plant canals in tunnel while in use and without removing water.

Reward

Collaboration with Enel Green Power

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21/04/2023

Expiration date

29/05/2023

Abstract

Do you have a solution that can install cables in canals in hydroelectric plants during operation? The pipeline systems at these renewable plants can stretch to tens of kilometers, may be pressurized, and have limited access. Your system or solution for cable installation will preserve resources, reduce outages, and ensure continued generation of renewable energy.

We invite your proposals for effective and reusable methods of cable installation.

This is an electronic Request-for-Partners (eRFP) Challenge; the Solver will need to submit a written proposal to be evaluated by Enel Green Power with the goal of establishing a collaborative partnership.

Description

OVERVIEW

To continue its work in renewable energy, Enel Green Power is looking to improve the efficiency and sustainability of cable installation, helping to interconnect the hydraulic plant parts and optimize its management. Enel is looking for proposals or solutions for installing fiber optic cables in waterways that are in tunnel and **in-use**, applicable across different pressures, canal shapes, and lengths.

The canals that interconnect a hydroelectric plant may span multiple kilometers, as well as being either pressurized or open-flow, and away from urban areas/in mountainous regions. Enel see these waterways as providing an opportunity for a connected solution – linking various parts of the plant through a fiber optic network that can be leveraged for monitoring, maintenance, and reporting.

However, currently these canals would need to be emptied of water to install cables and perform maintenance checks. Enel Green Power is therefore looking for proposals around the **best available**

solutions to install cables within in-use canals in tunnel either pressurized or open-flow. In partnership with Enel, your approach will preserve resources, maintain a critical renewable source, and unlock greater sustainability in operation.

This Challenge contributes to the following [UN Sustainable Development Goals](#):

- SDG 7: Ensure access to affordable, reliable, sustainable and modern energy for all
- SDG 9: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation

SCENARIO

Hydroelectric plants and dams are a critical part of the future of renewable energy, representing an estimated 40% of total renewable capacity according to the World Economic Forum. These installations are often complex, covering great distances, and varying in sizes.

The canals that bring water to a plant differ in accessibility but are always accessible from the ends. Enel Green Power is looking for a system to unify and optimize cable installation across canal types by implementing a method to install fiber optic in canals in tunnel while plants are in-use.

These waterways present strategic value beyond their water-carrying, as they interconnect distant parts of a plant like a dam, water intake, and other civil infrastructures. The sprawl of these plants and installations mean that they are very difficult to interconnect through regular communication systems (DSL, Hyper LAN etc). Enel wants to use the large amounts of waterways and canals to create a fiber optic network between various parts of the plant, without the need for external infrastructure.

Installation of fiber optic cables normally requires many days of outage: operators need to overcome access issues, distance, and the limiting criteria of the canals themselves. It also results in a relative waste of water, lack of energy produced, and can mean the work itself is unsustainable.

Developments in this area will allow advanced communication of hydraulic parts (the intake, dam, etc) which will mean operating teams can better manage water resource and reduce manual inspection. The real-time data that this long-term solution can provide will enable swift action in the event of problems and continued smooth operation of this key part of renewable energy.

THE CHALLENGE

Enel Green Power is searching for proposals of innovative systems that can install a fiber optic cable inside the canals of hydroelectric plants, without removing the water or ceasing operations.

We are looking for new technologies, systems, and methods for installing these cables while the plant is in use. Improving the method for installation will not only save time and preserve resources, but this network of cables will provide fast and reliable communication across the plants. Being better connected to remote areas allows for greater remote-control systems and video streams, as well as potential development of damage monitoring and leakage detection.

While in use, the installed cable must not interfere or present a danger to the equipment of the plant, including if 'detached' and passing through a turbine. Your proposal, method, solution, or technology should address the solution requirements and provide the potential for development of a monitoring system for damage and leakages.

Enel Green Power is therefore looking for proposals around the best available solutions to install cables in in-use canals in tunnel either pressurized or open-flow.

Figure 1: Hydraulic scheme, example of a non-pressurized canal

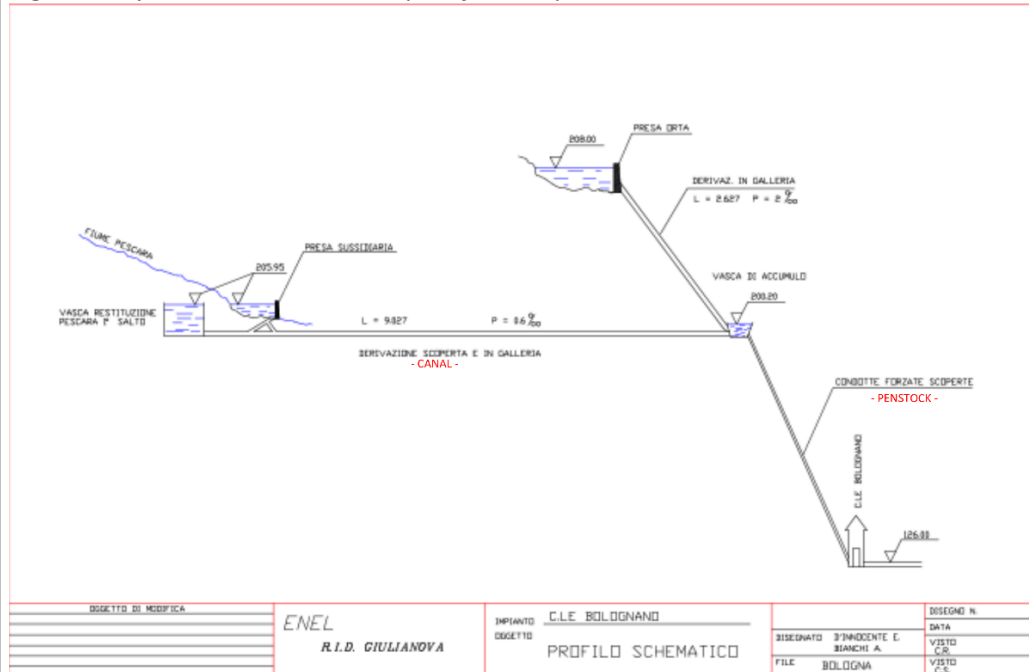
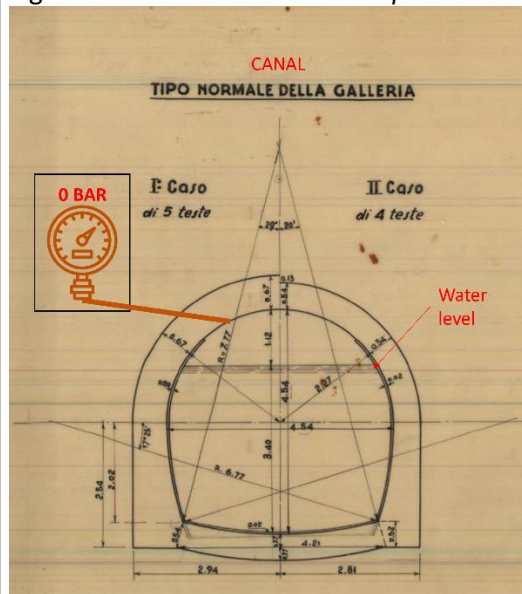


Figure 2: Canals in tunnel either pressurized or open-flow





Figures 3, 4, and 5: examples of Enel canals.

Technical Criteria

Your system and proposal should be applicable in different contexts, canal types, and comply with the maximum range of pressure/lengths of waterways. We list more information, potentially limiting criteria, and necessary operating conditions below:

- **Cost per meter of system** for cable installation – proposal must remain competitive with existing financial implications of plant shutdown
- Canals in tunnels have **dimensions** of up to 20 square meters, and lengths of tens of kilometers
- **Material** – water canals are mostly made of concrete or steel
- Canals in tunnel are often **pressurized** – up to 20 bar
- Cables must remain **submerged**
- System cable installed must contain **12 x 9/125 optical fibers** for compatibility with Enel network equipment
- **Temperature** of water is usually around 10C, but varies by 10 degrees with seasonal, location, and night temperatures.

SOLUTION REQUIREMENTS

Your proposed solution or approach **must**:

- **Lay fiber-optic cable** under flowing water
- **Fix these cables** under flowing water,
- Be able to be installed **without the need to stop plant operations or empty the waterway**,
- **Not affect normal operation** or output of plant when in place,
- **Be reusable in different types** of canals, with small customizations,
 - Canals in tunnel may contain curves, cross-sectional variations, varying pressures, and widths.
- **Not constitute a danger** to machinery or operators – either in use or if it breaks away.

Enel is interested in areas for developing damage monitoring capabilities, so for greater chance of selection, your proposal might also fulfil these **nice-to-have** requirements:

- Leakage monitoring capability
- Cable potential for **identifying damage** in the waterways,
- **Reporting this damage** to a system,
- Determine the **location** and **extent** of the damage.
- Leakage monitoring.

PROJECT DELIVERABLES

The partner proposals for this Challenge will be **assessed by Enel Green Power on the basis of the criteria below**:

1. Compliance with the Challenge's request and the quality of the solution, including must-haves and nice-to-haves, as specified on the Open Innovability® Challenge's page,
2. Degree of innovation,
3. Solutions that are not generally known or easily accessible to experts in the sector,
4. Technical and normative compliance,

5. Replicability in different contexts and countries, and
6. Economic and realization feasibility.

The **submitted proposal** should consist of a detailed technical description including:

- Examples of technology application or prototypes and reference industry if any;
- Advantages and weaknesses of the proposed solution compared to the current way of working;
- Constraints or technological gaps for the solution adoption;
- Data, case studies, patents and journal references or any additional material that supports the proposed solution;
- Cost estimation and Technology readiness level (TRL) of the proposed solutions;
- Description of the most suitable use-cases accordingly to the performance and characteristic of the proposed solution.

Challenge rules

All proposers are invited to read carefully the challenge and the **Regulation** of this challenge, **attached below in the Attachments section**, before submitting a solution.

By submitting a solution they automatically accept the attached Regulations other than the Terms of Use of this platform.

Explain your proposal clearly in English, attach documents (max 5 files, 25MB total size, ZIP, JPG, PDF format) if needed.

Eligibility

The Challenge is reserved to any legal entity not belonging to Enel Group, provided that its shareholders/directors/managers/employees do not include the following persons:

- The spouses, partners and relatives up to the fourth degree (i) of the Seeker's employees who are involved in the organization and management of the Challenge and (ii) of all the people admitted to the Open Innovability® Portal back office, are not eligible for participation in this Challenge.
- Also, the spouses, partners and relatives up to the fourth degree of the employees of the Enel Group's companies who have worked or currently work in the technical sector of Innovation Enel Green Power are not eligible for the participation in this Challenge. It is the Solver's responsibility to verify with the members of his/her kinship or spouse or partners (or with regard to his/her team members') whether any of them is connected in any way to the Challenge or the Open Innovability® Portal and request, if necessary, any additional information through the contact form below.

Challenge, award, IP rights, deadlines

The final award for this Challenge is contingent upon satisfactory completion of the verification process, including acceptance of the Challenge-Specific Agreement (CSA) that is the regulation for this Challenge.

The verification process includes obtaining the following from the Solver: signed affidavit (based on the CSA), employee waiver (if applicable), proof of identify, and Counterparty Analysis Questionnaire (CAQ).

If your eRFP response is selected, you negotiate the terms of the contract (including scope of work, tasks and duration) directly with the Seeker. This Challenge type does not require Intellectual Property (IP) transfer. However, sometimes Seekers request that certain IP arrangements be made should a partnership be formed.

The proposals will be admitted until May 29, 2023 and the evaluation will start after this date. **Late submissions will *not* be considered.**

Specific regulation attached at the bottom of this page.

What happens next?

After the Challenge deadline, the Seeker will complete the review process and make a decision with regards to the Winning Solution(s). All Solvers that submit a proposal will be notified on the status of their submissions.

Enel will evaluate the proposal using the following criteria:

- Overall scientific and technical feasibility of the proposed solution;
- Economic potential of concept (e.g. Total Cost of Ownership);
- Business potential for Enel;
- Novelty and not obviousness;
- Potential for proprietary position (i.e., is the technology novel or protectable);
- User's capabilities and related experience;
- Realism of the proposed solution;
- Maturity level of the proposal.

If the reward includes the opportunity to collaborate with Enel, once one or more suitable solutions have been identified, Enel will reserve the opportunity to start a collaboration, by way of example, on all or part of the following activities:

- Test execution;
- Supply of prototypes (if the solution includes equipment);
- Installation and site tests;
- Follow up and monitoring of the proposed idea behavior.

At the end of the assessment, you will receive feedback.

In case of success, an Enel contact person will get in touch with you to discuss the next steps.