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Five technical advances in the recovery of the Ituango Hydroelectric Project

- **Work is concentrated on water drainage in the powerhouse.**
- **Installation of the plastic concrete screen has already been completed at the dam.**
- **The spillway is operating optimally, and maintains water flow to the Cauca River**

EPM is making progress in overcoming the current contingency at the Ituango Hydroelectric Project. This is to mitigate the risk for the communities located downstream, and protect their lives, take care of the environment and recover control of the future power generation plant. The plant will provide 17% of the energy the country needs to continue growing and contribute to the well-being of Colombians.

Step by step, EPM is working on different work fronts, with the establishment of the National Environmental Licensing Authority (ANLA) Resolution 0820, which limits or restricts the advancement of any other non-contingency-related activity.

This is the current situation of the Ituango Hydroelectric Project:

1. Powerhouse

The process of aeration and drainage of the water into the cavern began. Today we are working with six motor pumps that drain 1.6 m³/s of water. In parallel fashion, the galleries and the access tunnel are being repaired to extract the stagnant waste in the areas.

To the extent that drainage of the water from the caverns progresses, and when inflow can be assured to prevent accidents, the structure and its condition will be inspected and evaluated.

It is important to remember that for power generation, the project has an underground plant of 2,400 MW (megawatts) of installed capacity and 13,930 GWh. (gigawatt-hour) of average annual energy. The powerhouse cavern is 240 meters long, 23 meters wide and 49 meters high, equivalent to a 17-story building. It will house eight Francis turbines of 300 MW (megawatts) capacity each.

2. The dam

After finishing the installation of the plastic concrete screen or short flow screen, between 380 and 418 meters above sea level (masl), work began to enhance the wall to its final height. This screen, 38 meters high, one-meter-wide and 550 meters long between mountain and mountain, ensures greater waterproofing of the dam.

Bringing the dam to the original design condition of elevation or height 435 masl allows the maximum possible risk of surpassing the structure in any event to be controlled, as an important safeguard for those who live downstream. Another important factor of having the dam at this height is that it will allow unrestricted mobility to and from the township of Ituango.

The dam has a final height of 225 meters and a volume of 20 million m³. The reservoir has a length of 78 kilometers and a volume of 2,800 million m³ of water, at the maximum operating level.

3. Closing the Deviation Tunnels

The closure or technical plugging of the auxiliary diversion tunnel or auxiliary diversion gallery (GAD), where the contingency originated on April 28, 2018, is on the right track.

After removing the material that was deposited obstructing the area of this gallery's floodgate chamber, the process of installing them began. One gate is already assembled and the other is in the final assembly process. Once the two gates are positioned and fully operational, the auxiliary diversion tunnel will be properly pre-positioned and construction will begin on the final 22-meter-long plug.

In the right deviation tunnel (which opened naturally on May 12, 2018, causing the sudden increase that affected the town of Puerto Valdivia), activities are carried out to consolidate a pre-plug, with injections of concrete slurries and other materials that are made from the intermediate discharge tunnel. Micropiles or metal bars are also used. This pre-plug will allow safe access to begin building the final concrete plug, 22 meters long, that will seal this tunnel definitively.

The measurements of these two tunnels (the auxiliary diversion, GAD and the right one) that served toward the diversion of the Cauca river, are 14 meters high by 14 meters wide.

4. The intermediate discharge tunnel

The tunnel is located at an altitude of 260 masl, below the spillway elevation located at an elevation of 401 masl. This tunnel took on a special meaning in the contingency, since there are advances in the pre-plugging of the auxiliary deviation tunnel, with the installation of the right tunnel with the concrete injections.

5. Spillway

Since the water inlet from the powerhouse was definitively closed on February 5, the spillway has been functioning normally. Today it operates with gates 2, 3 and 4. Gate 1, which is the single channel gate, is closed. The average discharge of water from the reservoir spillway amounts to 600 m³/s, practically the same flow that is entering the reservoir through the municipality of Olaya. This means that Ituango Hydroelectric Project has no influence on the changes in flows in the last



few days. These are due to the behavior of the rains along the areas that the Cauca River runs through the center of the Colombia.

From the EPM Technical Monitoring Center, in the Tacu camp, there is a permanent follow-up to spillway, among other 600 variables of all the work fronts of Ituango Hydroelectric Project. At the Center, there are three reservoir measurement system levels, there is constant, permanent control of the hydraulic behavior of each gate, temperature, oil levels, pressures, as well as the electrical variables associated with feeding of each one of the available pumps to operate the four gates. In addition to other geotechnical instrumentation in the structure.

In the midst of the complexity of a project of the magnitude of Ituango Hydroelectric Project and the technical, social and environmental challenges faced by EPM, the company is making progress in the recovery of the future power plant, with the reduction of risks for people living downstream as its top priority.

If everything evolves as planned, the plant will contribute its energy at the end of 2021 for the well-being of Colombians and the development of this country, because Ituango Hydroelectric Project is Colombia.

About EPM

EPM is the largest power generation company in Colombia. The country has 24 hydroelectric plants, a gas-fired thermal plant and a wind farm, with a total capacity of approximately 3,200 MW. These plants generate, on average, 22% of the energy used by Colombians.

At the construction of Ituango Hydroelectric Project, EPM has arrived after having managed the development of large hydroelectric plants such as: Porce III, Porce II, Tasajera, Playas, Guatapé, Guadalupe IV, Guadalupe III and Troneras, in addition to small hydroelectric plants that it owns such as: La Vuelta, La Herradura, Riogrande I, Pajarito, Dolores and Niqua, among others, thanks to their experience, engineering, technical rigor and knowledge management.