



Banja Dam Monitoring – January 2021



Devoll Hydropower Project Project Area

- Devoll Hydropower Project is the largest private investment in hydropower in Albania in the last 30 years.
- **Project area**
 - ✓ The Devoll Hydropower Project is located in the Devoll Valley, in the south-eastern part of Albania.
 - ✓ In the Concession Agreement the project or concession area is defined with the area of the Devoll River between 95 and 810 m above sea level, which is located between old Banjë Village in Cërrik Municipality of Elbasan District and Maliq Municipality in Korçë District.
 - ✓ The Devoll catchment area covers the Korçë plateau, the mountainous middle reaches of Devoll and Tomorricë rivers down to Gramsh and the undulating hilly countryside from Gramsh down to Kozare. At Kozare in Kuçovë District the Devoll River joins with Osum River and takes the name of Seman River, which in turn flows into the Adriatic Sea.
 - ✓ The direct project area spreads over the districts Elbasan and Korçë and is implemented in the current Municipalities of Cërrik, Elbasan, Gramsh, Maliq and Korçë.

Devoll Hydropower Project Scheme

- ✓ The Devoll Hydropower Project consists of development, planning, construction and operation of two hydro power plants, Banjë HPP and Moglicë HPP, with an installed capacity of approx. 269 MW and a planned generation of approx. 700 GWh/year. The investment decision for a third hydropower plant, Kokël HPP, will be considered once the first two hydropower plants have been completed.
- ✓ The Project Scheme was developed based on a concept presented by the Austrian company EVN AG, which was the development partner of Statkraft until 2013, when Statkraft acquired EVN's shares and became the sole owner of Devoll Hydropower Sh.A.
- ✓ The Project started its initial site activities as part of the Pre-Construction Phase in 2009, after the approval by the Albanian Parliament of the Concession Agreement. In 2013 started the construction of Banjë HPP, which was finalized and entered into operation in 2016. Construction in Moglicë HPP started in 2015 and entered into operation in 2020.
- ✓ The investment cost of the Devoll Hydropower Project is estimated to be approx. 590 Million Euro.

Banjë HPP

- Banjë HPP is the first HPP in the frame of the Devoll Hydropower Project to enter into operation.
- Banjë HPP is developed in the area of Elbasan District, in the Municipalities of Cërrik, Elbasan and Gramsh. The project incorporated the former unfinished Banja project structures. The new embankment dam with an impervious clay core is approx. 80 m high.
- Prior to the start of the construction, in the period 2009-2013, intensive investigations, surveys and assessments on technical, environmental and social aspects were carried out.
- The construction activities have been implemented in the period 2013-2016 and the works were implemented by specialized international and national contractors.
- Banjë HPP started commercial operations in Autumn 2016. It utilizes a head between 175 and 95 m above sea level.
- The reservoir, in its highest regulated water level of 175 m above sea level has a surface area of approx. 14 km². The reservoir reaches from the dam nearly up to the town of Gramsh. The storage capacity of the reservoir is of approx. 400 million m³
- The Power plant is equipped with two large Francis turbine units and one small Francis turbine unit and has an installed capacity of approx. 72 MW. The average yearly production of energy is approx. 255 GWh.
- Banjë HPP is connected with the Albanian national electricity grid through a 110 kV Transmission Line of approx. 12 Km connecting the Banjë switch-yard to Cërrik Sub-Station.

Banja Reservoir

- Total Area: 14.1 KM2
- Total Volume: 391 Mm3
- Live Storage:
 - Operation Level: 15 m (175 masl–160 masl)
 - Average reservoir fluctuations during operation: 5 m
 - Optimum level: 172 m – 168 m



INSPECTION OVERVIEW



Banja Dam Monitoring

- **Scope of Banja Dam Instrumentation:**
 - ✓ Aid in understanding actual dam performance
 - ✓ Warn of a potential problem
 - ✓ Aid in the definition of a problem
 - ✓ Evaluate remedial actions
 - ✓ Prove behaviour is as expected
 - ✓ Aid in research
- **Referencat e Bazës ligjore :**
 - ✓ Law 10083 dated 23.03.2009, “ On the approval of the Concession Agreement entered into between Ministry of Energy and Industry, as Contracting Authority and Statkraft AS, Devoll Hydropower Sh.A , as Concessionaire related to related to the design, financing, construction, ownership, operation, maintenance and transfer of the Devoll River Hydropower Project in the Republic of Albania”, as amended with the 1st , 2nd and 3rd Supplements to the Concession Agreement
 - ✓ Law no.8681 dated 01.11.2000 “On the Design, construction, operation and maintenance of dams and dykes” and its bylaws.
 - ✓ Decision of Council of Minister 147 dated 18.03.2004 “For the approval of the Regulation for the safety of dams and dykes.
 - ✓ Statkraft policies and requirements on operation and maintenance of dams, described in Statkraft Practices (Statkraft Managment System).

Banja Dam Instrumentation

- **Banja Dam Instrumentation:**

- ✓ Piezometers in clay core for pore water pressure measurement - Automatic
- ✓ Piezometers in foundation for checking the grouting curtain - Automatic
- ✓ Piezometers in spillway for measuring uplift pressure- Automatic
- ✓ Settlement Gauges for settlements in clay core - Automatic
- ✓ Fibre optic leakage detection system for water leakage detection- Automatic
- ✓ Standpipe piezometers at the dam toe for water level measurement- Manual
- ✓ Accelerometers in dam crest, gallery and near the powerhouse for seismic measurement - Automatic
- ✓ V-Notches for seepages at dam body and filters - Manual

INSTRUMENT OVERVIEW

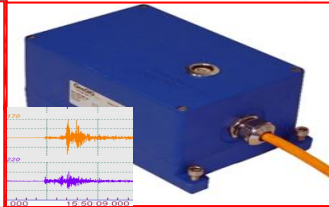
PIEZOMETERS

CORE
SPILLWAY
GALLERY
B.OUTLET



ACCELERATORS

CREST
GALLERY
SWITCHYARD



SETTLEMENT GAUGE

CLAY CORE



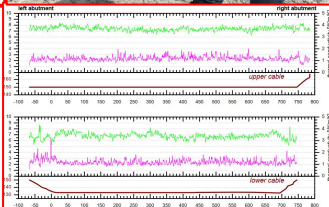
STANDPIPES

DAM D/S - TOE



FIBRE OPTIC CABLE

D/S FILTER
UPPER LEVEL
LOWER LEVEL



MONITORING PEGS

CLAY CORE
US/DS DAM

SETTLEMENT

PORE PRESSURE

SEISMIC ACTIVITY

CORE SETTLEMENTS

GROUND WATER LVL

LEAKAGE DETECTION

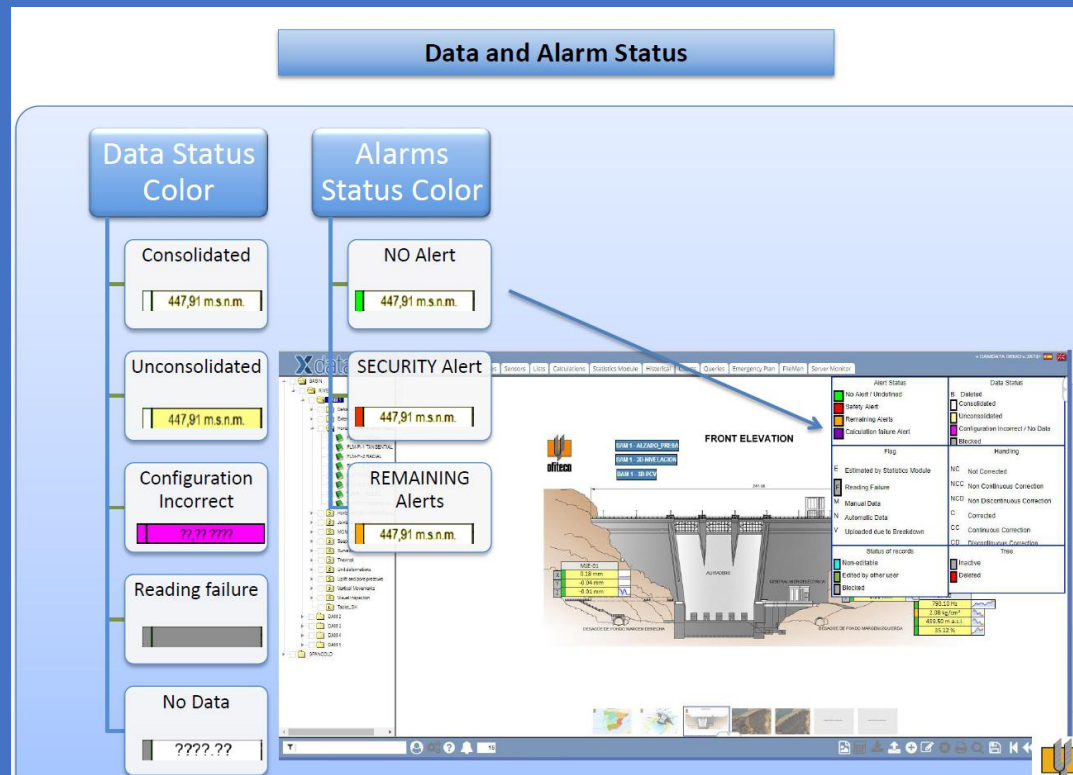
Accelerometers



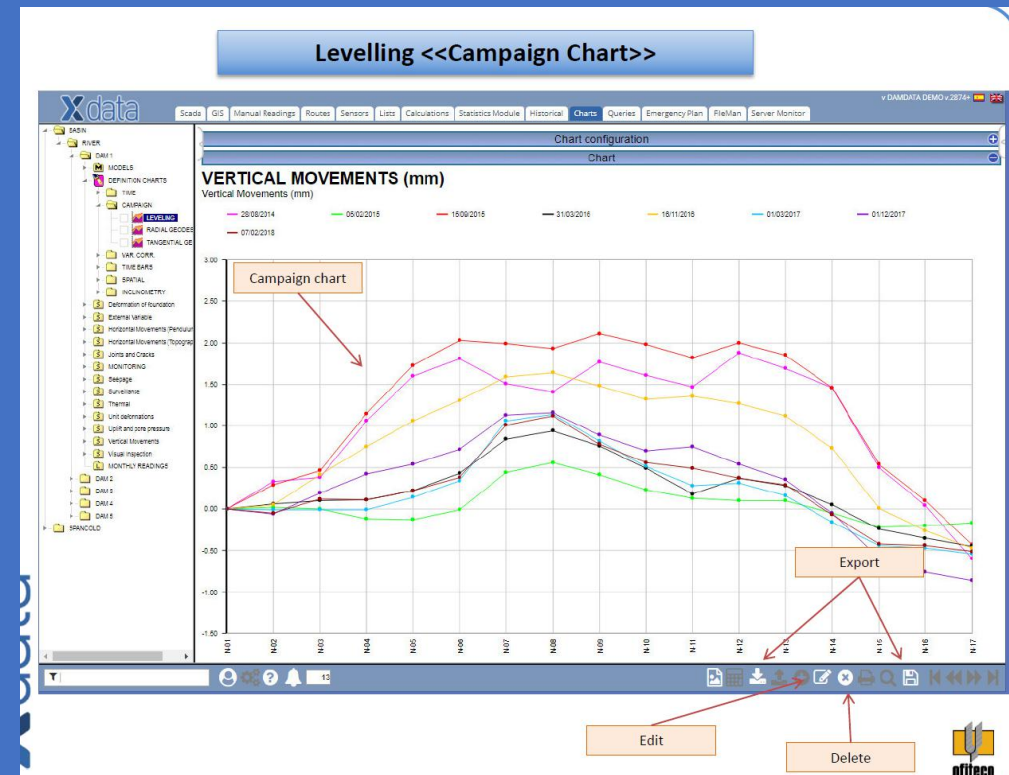
- Data achieved from accelerometers are a very important element in understanding how a seismic movement affects human-made structures.
- All data are collected through fibre optics at Banja Operational Control Room (manned 24/7).
- Three accelerometers are installed at Banja dam:
 - In the middle of the dam crest.
 - Grouting gallery, right below the dam crest.
 - Close to electric switchyard, to better understand the wave propagation in an open field.

Automatic data collection and online presentation in DamData software

Data and Alarm Status



Graphic presentation



Meteorological measurements

6 meteorological gauging station are installed in different locations of catchment area

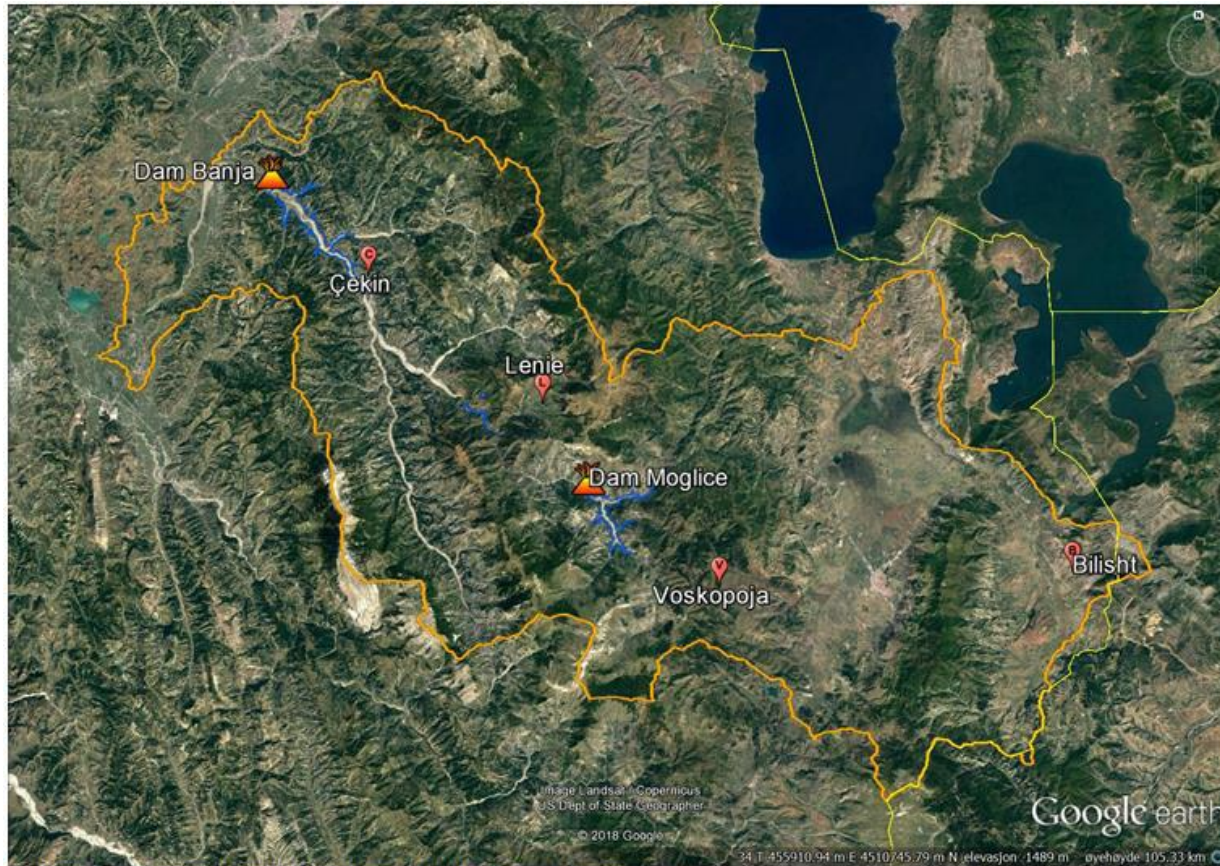
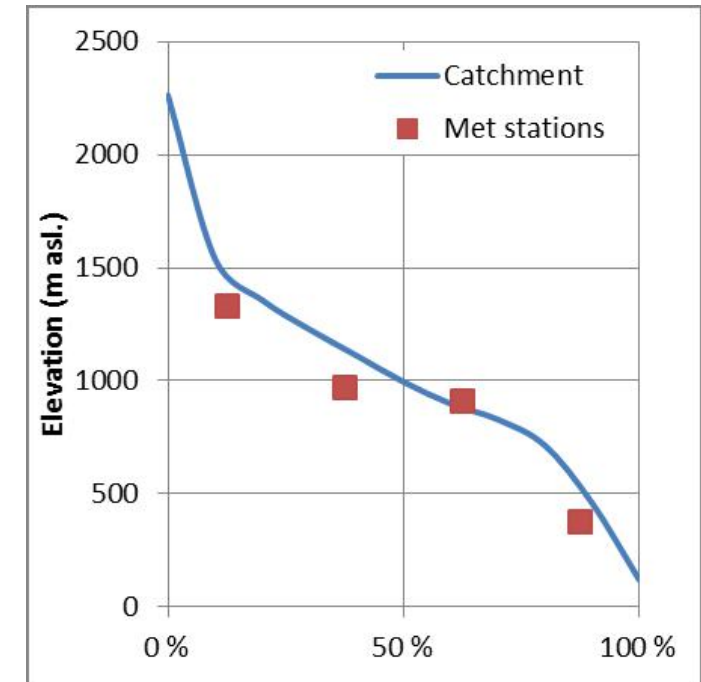


Figure 1-1 Meteorological stations in the Devoll catchment



- Bi-Annual inspections in all stations

Hydrological measurements

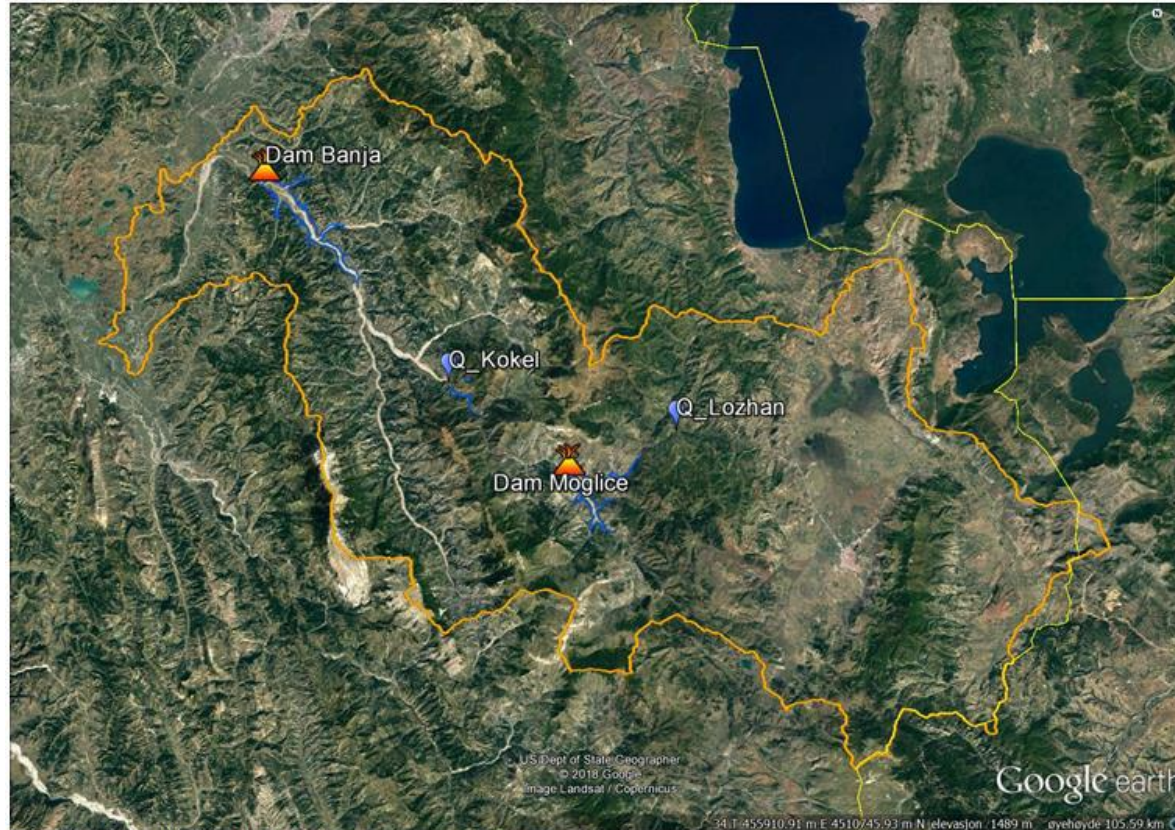


Figure 1-3 Hydrometric stations in the Devoll river

► Kokel

-2010.03.30 → operated by Statkraft (hourly data)

► Lozhan

-2010.04.07 → operated by Statkraft (hourly data)

► Moglica Dam

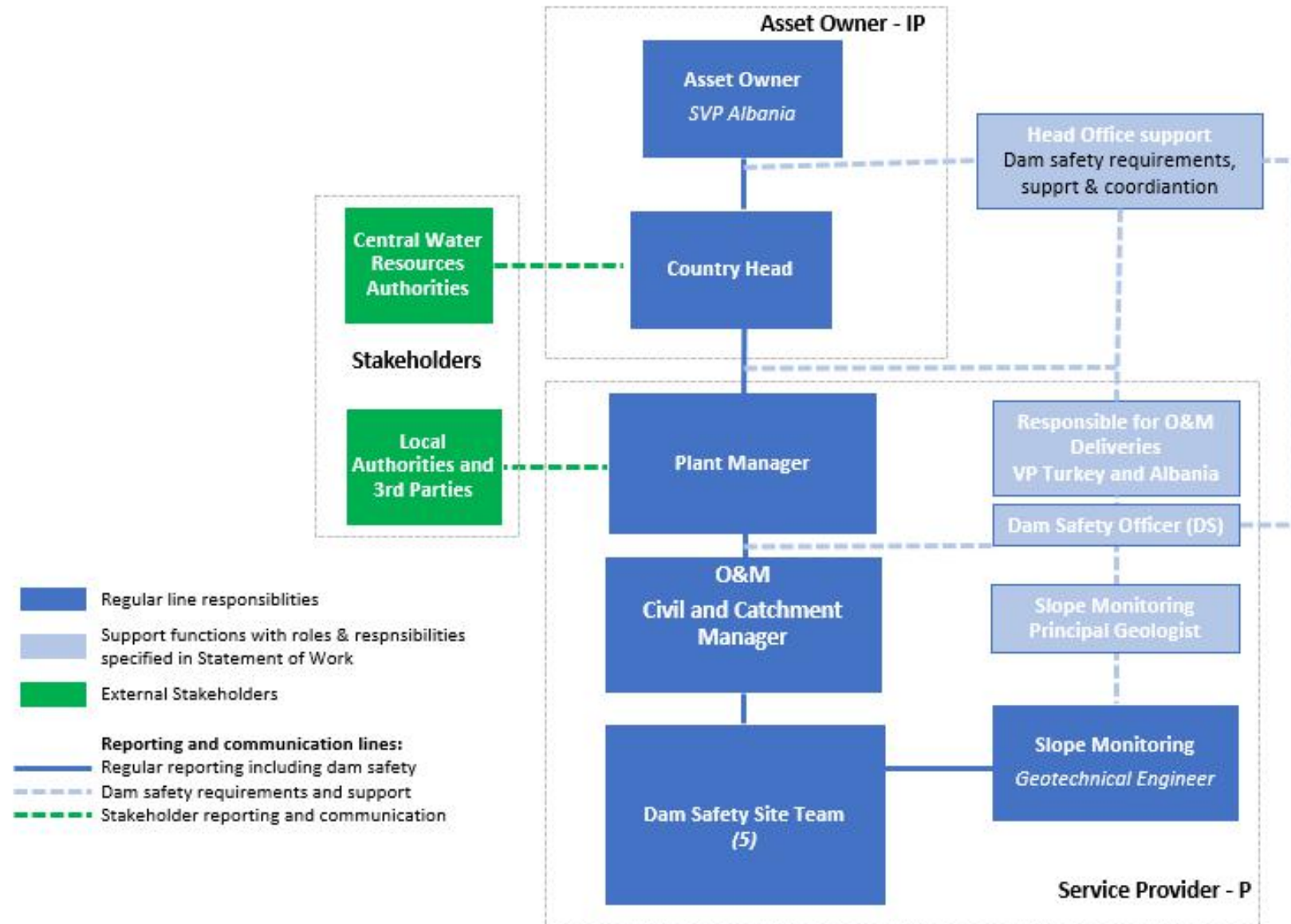
- operated by Statkraft since January 2020 (hourly data)

Banja Dam

- operated by Statkraft since January 2011 (hourly data)

► Bi-Annual inspections in all stations

BANJA DAM MONITORING TEAM



THANK YOU!

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