**Application goal:** Short-term and long-term forecasts of natural inflows in HPP Fierza and tributary inflows in HPP Koman and HPP Vau Dejes. For short-term forecasting, a mathematical model based on Recurrent Neural Networks is developed, while for long-term forecasting, statistical analysis was performed.

**Inputs:**

A. **Observation of inflow data** for at least 4 days before real-time - provided by KESH.

B. **Observed meteorological parameters** (temperature, humidity, precipitation) for specified locations - two meteorological models can be used.

C. **Forecasted meteorological parameters** (temperature, humidity, precipitation) for specified locations- two meteorological models can be used.

The application has **authorization**, with two possible roles: **admin** and **user**. The only difference is that the admin has the ability to change parameters in the Properties tab.

1. **Properties tab**: Settings related to the application that should be defined/configured
2. **General tab**:

* **Option- Use NeoAPI for forecast**: There are 2 meteorological models for acquiring meteorological data: NeoAPI as the main option provided by KESH and OPENMETEO.COM as an alternative option, which represents an open-source weather API. The second model was used during the development of the application. Its usage increases the robustness and reliability of the application's operation.
* **Option-Archive forecast:** If this field is checked, the obtained inflow forecasts are archived at the at selected file location.
* **Option - Archive Excel**: If this field is checked, generated excel report is archived at selected file location.
* **Option -Open Prediction Excel**: If this field is checked, generated excel report is opened automatically.
* **Option - Phyton DLL Path**: This represents a configuration file that is set only during the installation of the application.

1. **Models tab**:

For each location and for each prediction span window, a mathematical model for prediction can be selected. The idea is to have several models so that during the exploitation period, it can be determined which model provides better results.

1. **Coordinates tab**:

Coordinates of the locations from which meteorological parameters are retrieved are defined. Just need to be verified by KESH.

1. **PATH tab**:

* **Option- Path location of inflow file**: As mentioned before, one of the inputs is the observed inflows into the reservoirs of the HPP which is provided by KESH in the form of a CSV file. In this text box, the file location from which this CSV file is loaded should be entered.
* Other paths refer to locations for saving results, and in coordination with KESH, will be defined during program installation.

1. **Measurements Tab**: inflow data with vizualization, validation and editing feature.

The inflow data is displayed in both tabular and graphical formats. The table contains columns with dates (time) and columns with realized inflow values for each HPP. The inflow values in the table can be **manually edited**. Additionally, the inflow values in the table are subject to a **validation process**.

1. **Wheather forecast Tab**: Display of observed and forecasted meteorological parameters.

The first step is selection od location – there is an multiselect option. The second step is selection a meteorological parameter.

A black dashed vertical line represents real-time. The available options on the chart include zoom in/out, zoom selection, pan, reading values...

1. **Inflow prediction Tab:** The RNN (Recurrent Neural Network) mathematical model can be started in order to obtain inflow forecasts.

* **Time resolution**: 15min, 1hour, 4 hours.
* **Prediction span**: 1 day, 3 days, 6 days, 14 days (only possible if NEO API is used).
* **Gut prediction button**: generates a forecast in the application.
* **Gut Excel Result button**: generates excel report and csv file as input for PLEXOS program.

1. **Long term inflow:** Display of long-term statistics of inflow for each HPP.

The statistics are provided for each month and are displayed using a box plot diagram. Here are the labels on the box plot diagram:

* Median: Shown with a solid line.
* Mean value: Shown with a dashed line.
* Upper and lower whiskers: Define the 5% to 95% confidence interval.
* First and third quartile: Define the 25% to 75% confidence interval.

Additionally, there is a graphical representation of typical inflow diagrams for the current month, such as those for a dry year, wet year, and regular year. These graphs can be used as inputs for unit commitment in long-term planning models.