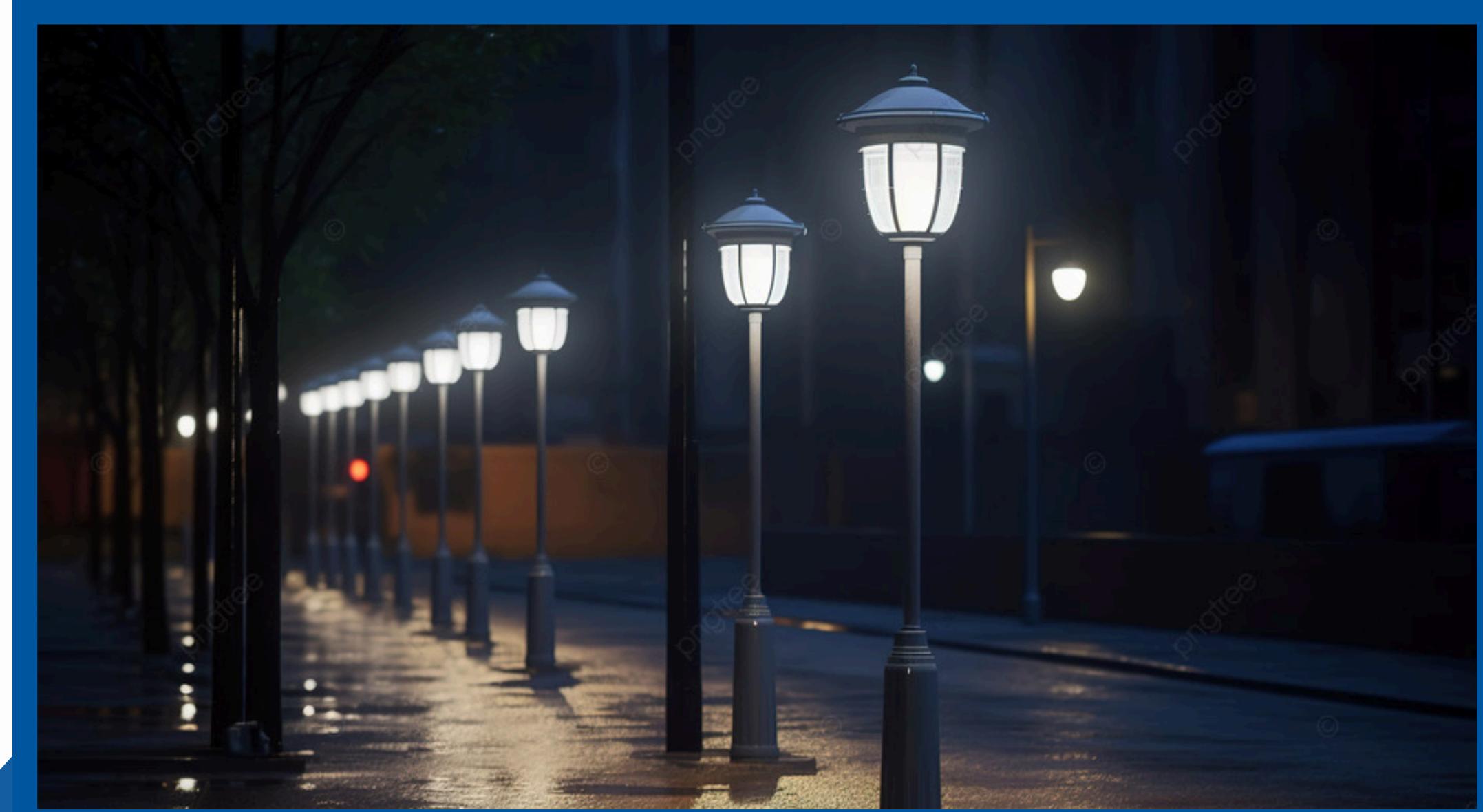


EXTENDED LIGHTING

GROUP 21

- **RUDRAKSHI MARICK**
- **SHREYA SHILL**
- **SRINITHI**
- **PRIYA JAIN**





EMPATHIZE

- India is a country that has seen some of the worst floods in history. The water overflows and renders day-to-day lives impossible.
- Main motivation- Establish lighting systems in the face of such calamity.
- Our system should be capable of procuring light in such areas.

DEFINE

- Ensure lighting of the streets and the shelter home during a flood
- Efficient and cost-effective underground hydropower generation unit without dams.
- Ensure the safety of the system and working of the transmission lines even during flood
- Optimize power consumption to save energy

IDEATE

WHY LIGHTS DURING FLOOD?

- Search and Rescue
- Evacuation and Sheltering
- Improved Awareness
- Improved Communication
- Reduced Anxiety
- Flood Monitoring
-

WHY MICRO-HYDRO TURBINE PLANT?

- FLOOD – not just threat, a source of energy.
- Simpler construction and flexible installation
- Lower maintenance
- Reliable and Renewable – do not depend on weather conditions like solar or wind.

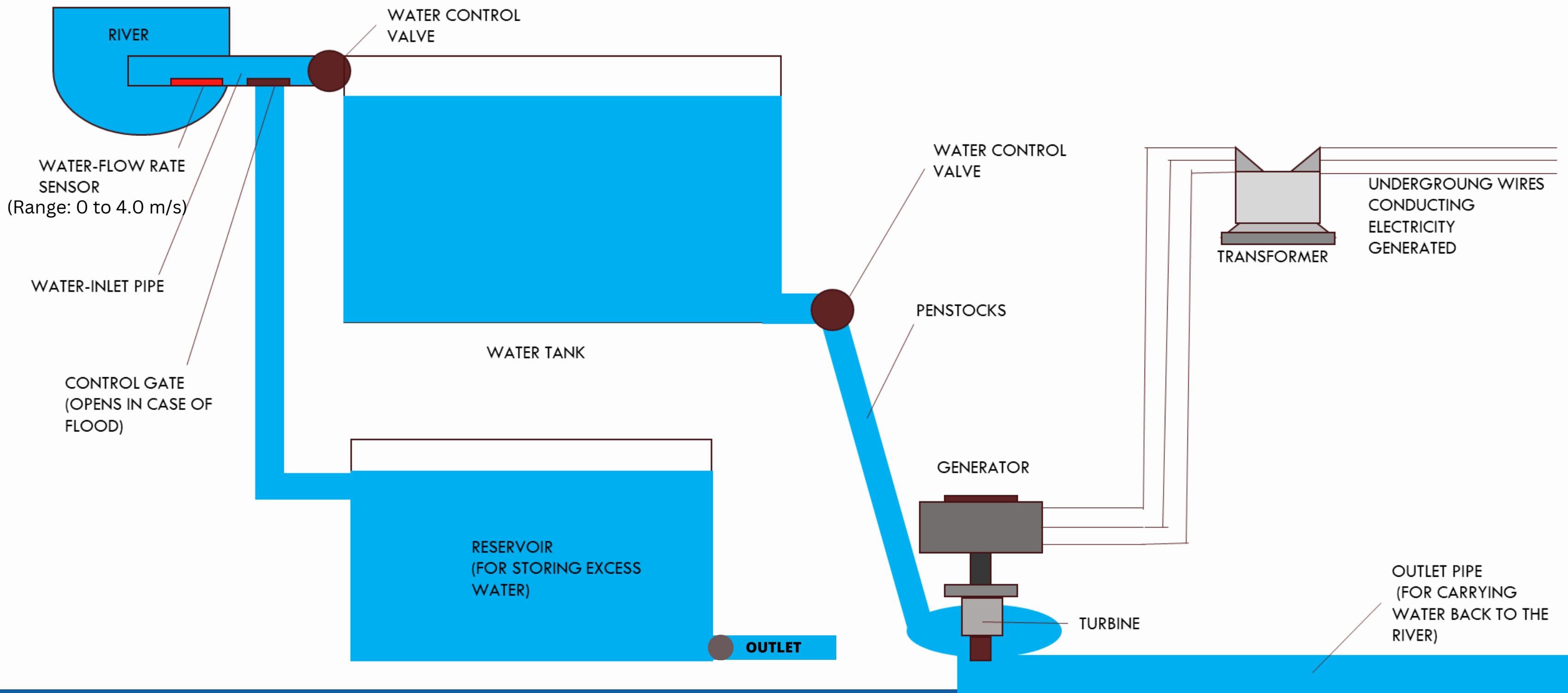
IDEAS

- Underground micro-hydro plant with **centralized iot** to monitor the system and **optimize power consumption**.
- Community grid to **improve grid reliability**.
- Flood-proof infrastructure to **ensure resilience of the system and safety of public**.

PROPOSED SOLUTION

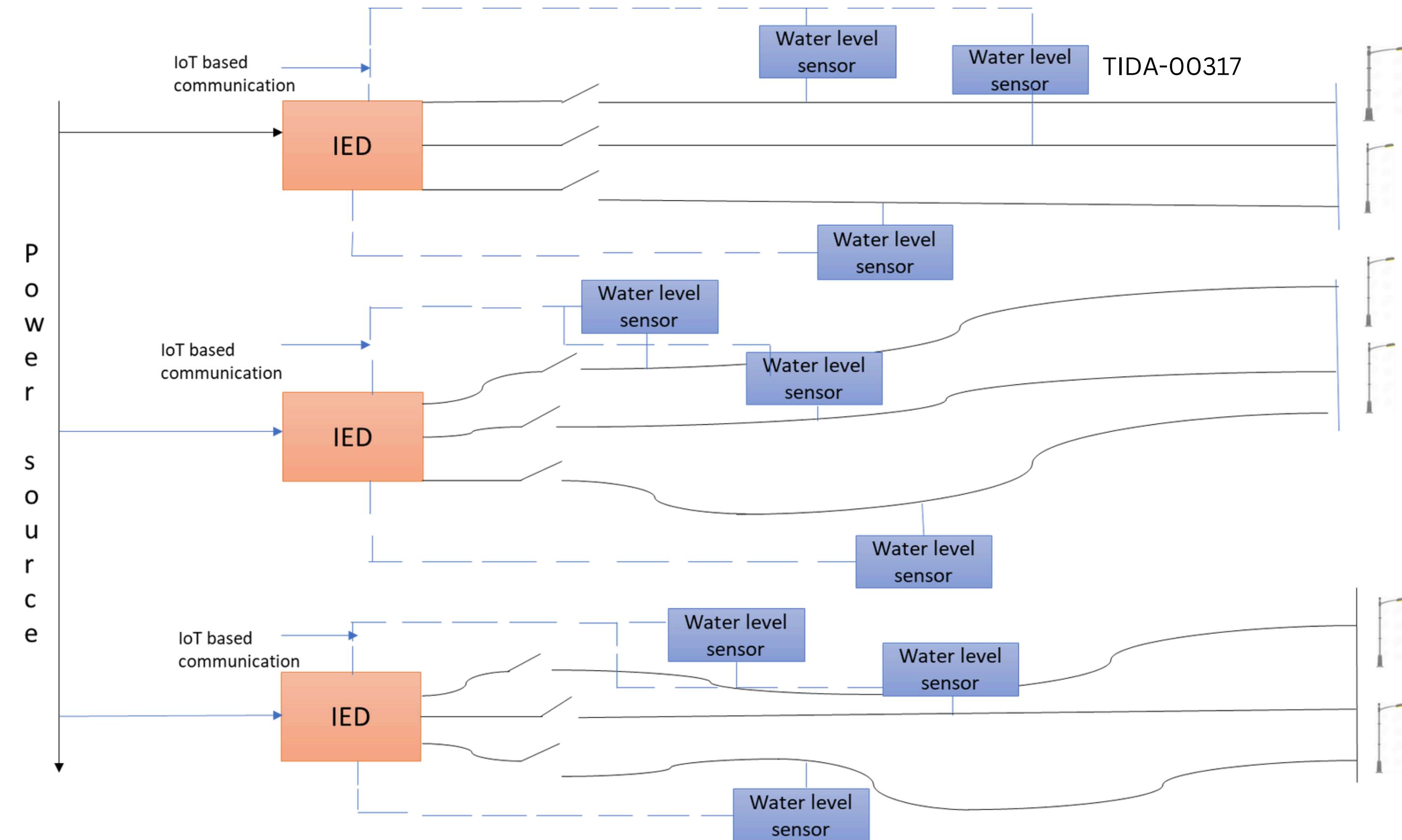


UNDERGROUND HYDRO-POWER GENERATION UNIT



TRANSMISSION NETWORK

- **01**
 - Our transmission network is a micro-grid based ring form of network. The first key element in our mechanism is IED which are mainly microprocessor-based relays(employ circuit breakers as per combination)
- **02**
 - Fault location framework using distribution systems. To locate the faulted zone, We use the Dijkstra algorithm.The arc weights are related to the current measurements
- **03**
 - Water level measurement sensor will measure the water level and as soon as it exceeds a given value it will notify the IED.
- **04**
 - The entire system will have more circuit paths to ensure hardware redundancy. The IED will switch to the path which is considered safe



IoT BASED COMMUNICATION

KEY FEATURES OF THE SYSTEM

- Key feature of the deployed system- Lora as a link technology in a multi-hop relay network
- A relay network is used which is a type of mesh network that provide connectivity over a considerable distance
- It is a message-passing system

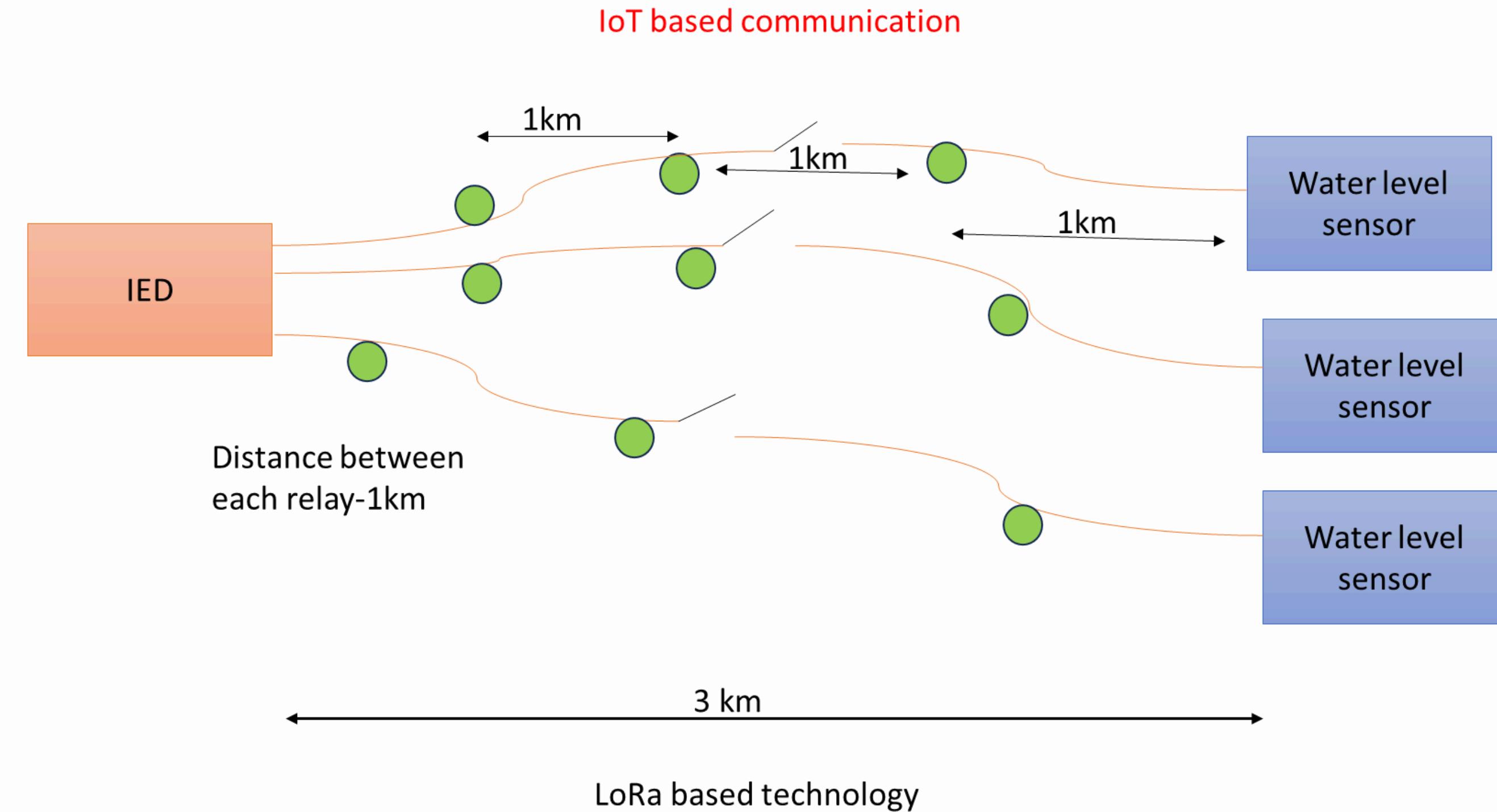
..
.

COMPONENTS

- The initiator- a network of sensors.
- The receiver happens to be IED.
- Each relay can work up to max 1 km. Message gets forwarded by each relay

IDEAS

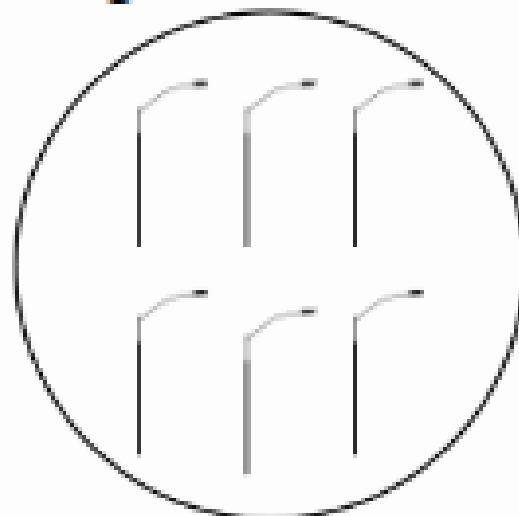
- The algorithm on which the relays function includes a variable that has the value of the maximum relays after it.
- It can continue to broadcast the message in accordance to variable
- With each broadcast, the variable is decremented.



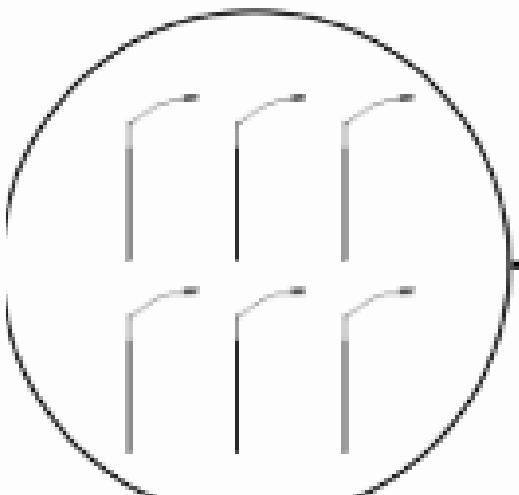
OPTIMIZING POWER CONSUMPTION

Street

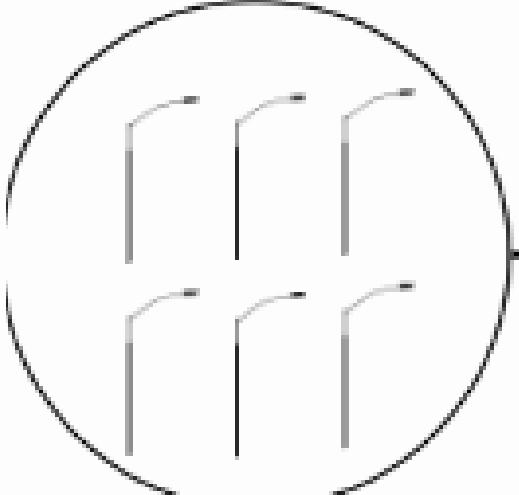
Lights



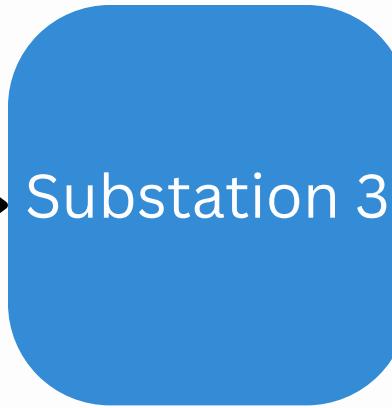
A group of lights get
brightened up in case of
movement and otherwise is
operated at 30% brightness



SubStation has many
street lights
connected via ZigBee
network



Street Lights (equipped
with PIR sensors) within
800m radius



Control Station has
many substations
connected via
LoRaWAN network

Control
Station



SAFETY ASPECTS

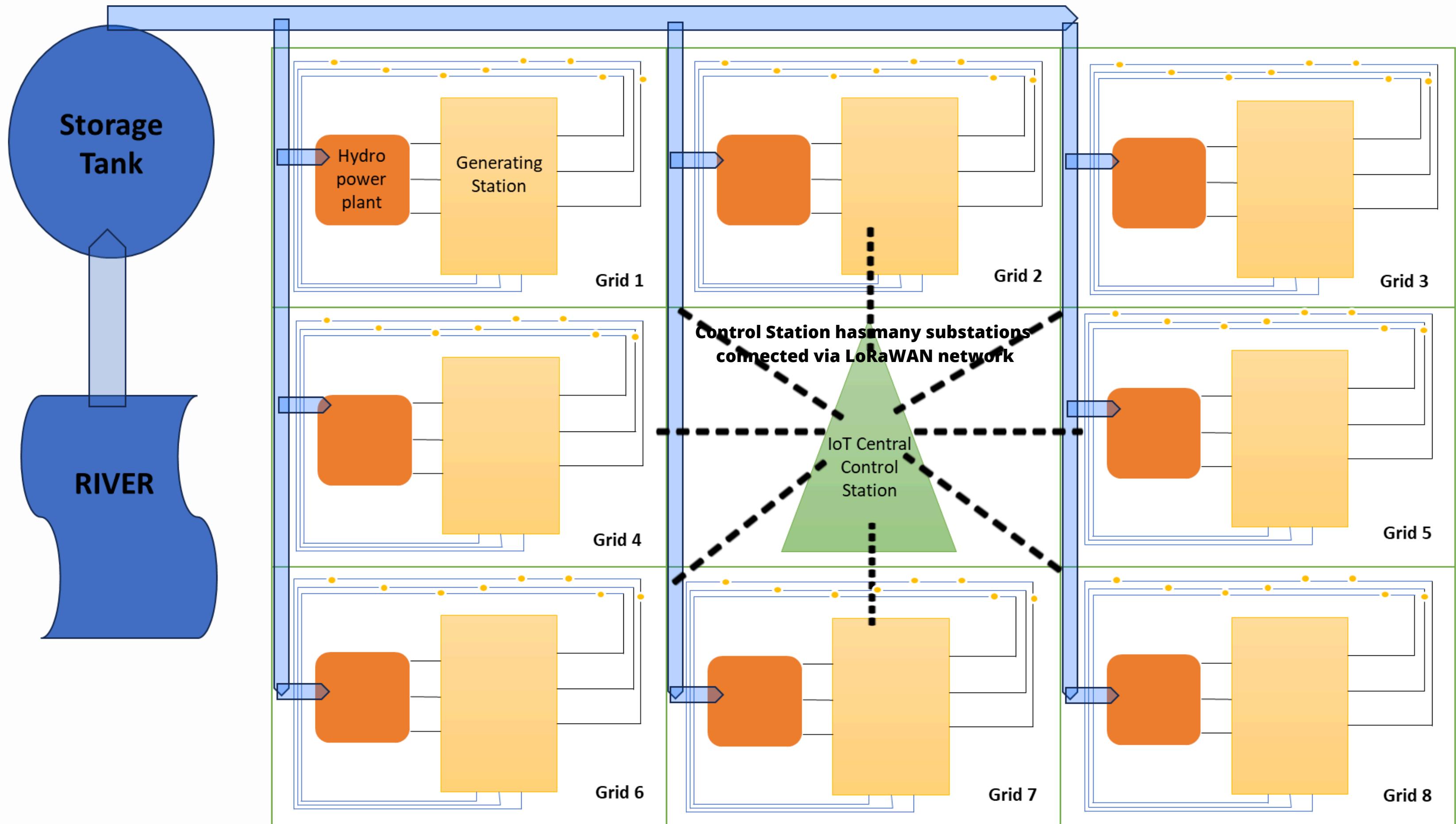
Robust underground transmission system to prevent the system from getting damaged due to external factors and to ensure public safety.

Centralized Monitoring system to monitor the temperature, moisture level of the underground generating stations and to detect faults in the transmission lines.

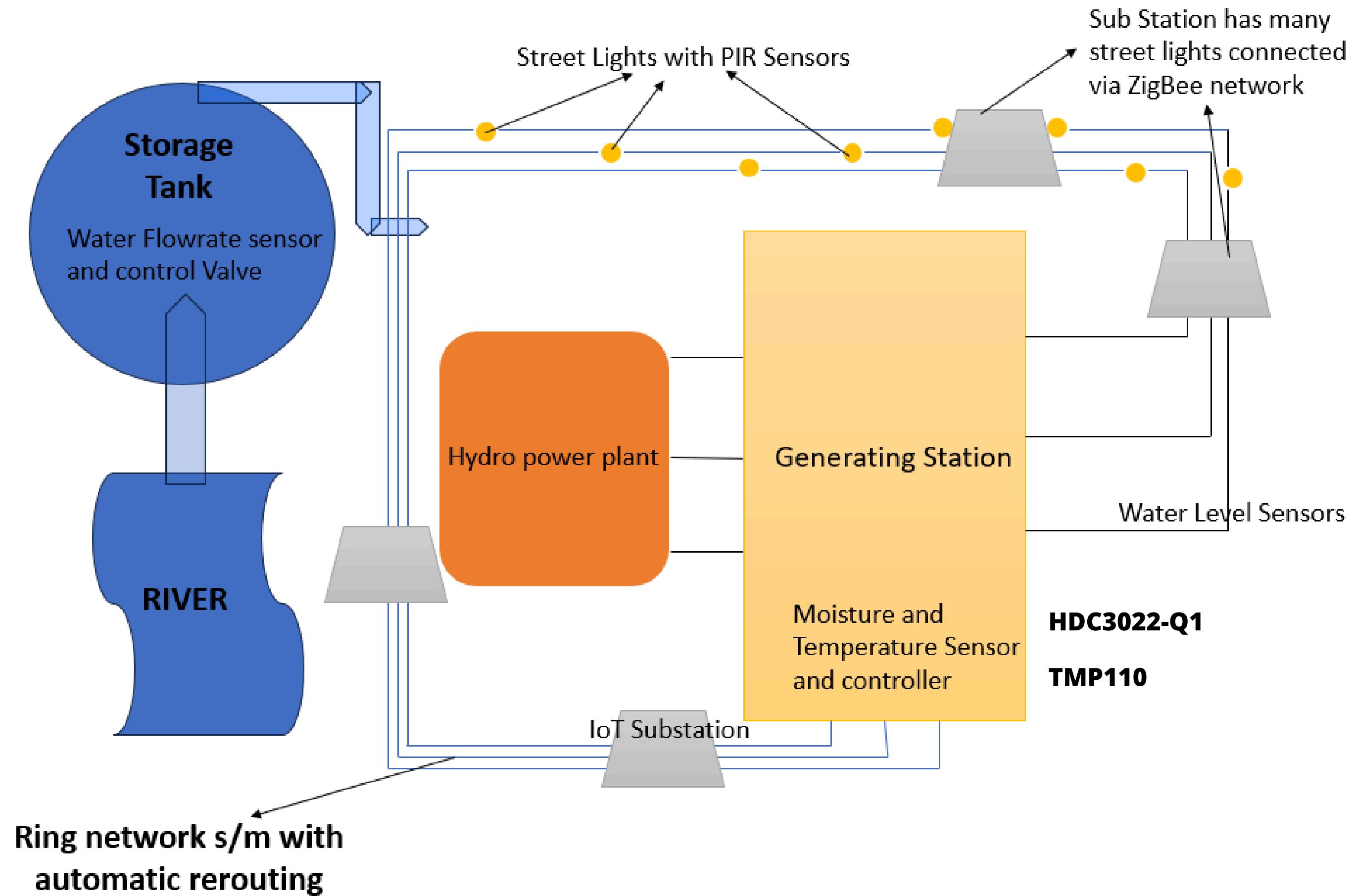
Network optimization for efficient location of generating stations.

Automatic rerouting of transmission paths using the centralized iot, if any of the transmission paths are damaged.

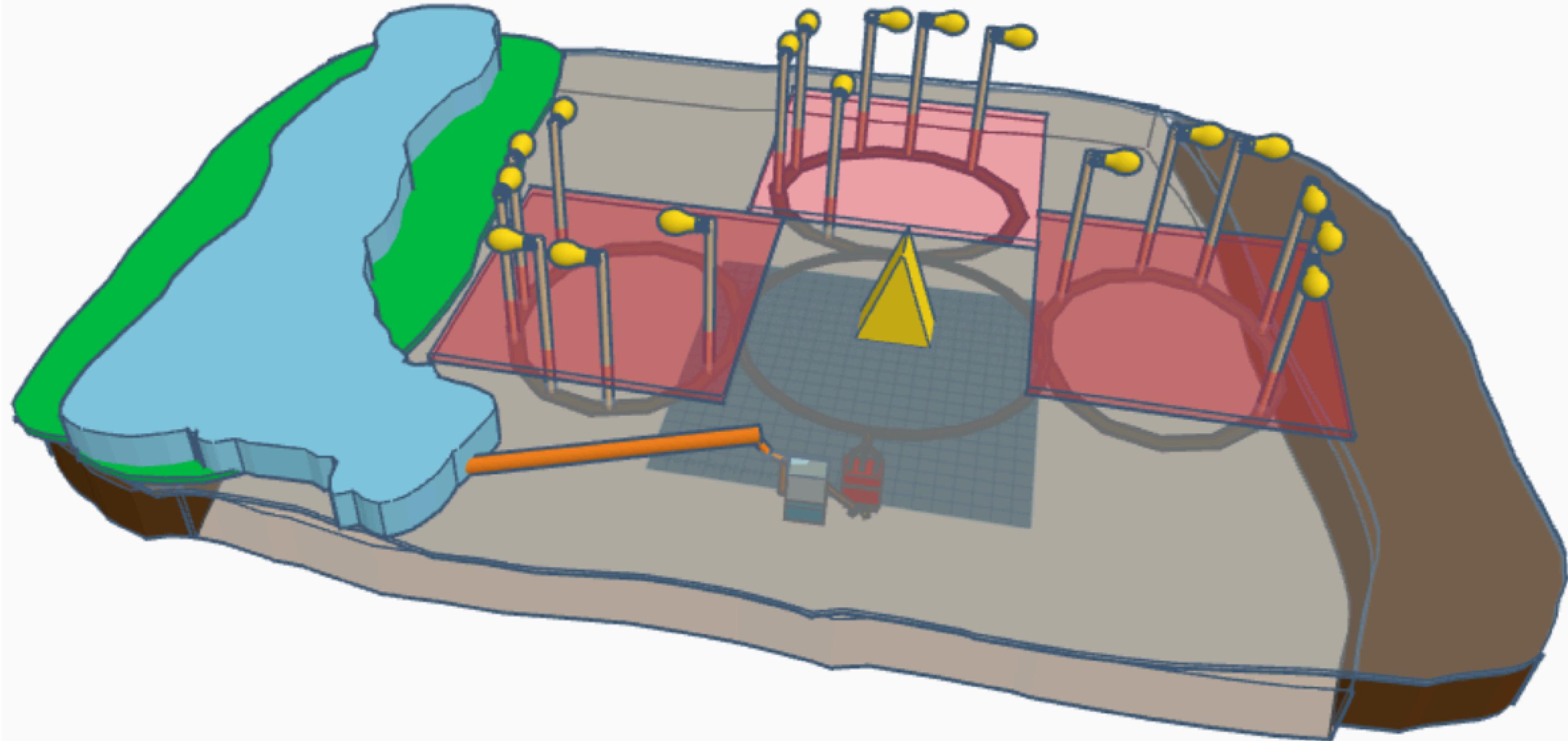
BLOCK DIAGRAM OF THE SYSTEM



SENSORS AND CONTROLLERS PLACEMENT



LAYOUT OF THE SYSTEM



REFERENCES

- https://ntnuopen.ntnu.no/ntnu-xmlui/bitstream/handle/11250/3032073/Panithi+KK+%26+Broch+E_2022_00607+Underground+hydropower+plants.pdf?sequence=1
- A LoRa Relay Based System for Detonating Explosives in Underground Mines. (IEEE paper by Philip Branch , Tony Cricenti)
- Fault Location Framework for Distribution Systems with DG using DSSim- (IEEE paper by David Celeita, Sergio Zambrano ,Gustavo Ramos.
- IEEE Standard for Low-Rate Wireless Networks- ZigBee(IEEE 802.15.4)
- Evaluating infrastructure resilience to extreme weather – the case of the Dutch electricity transmission network
Authors - L. Andrew BollingerEmpa and Delft University of Technology AND Gerard P.J. DijkemaUniversity of Groningen
- Power system resilience to floods: Modeling, impact assessment, and mid-term mitigation strategies, Author links
open overlay panelLaiz Souto a, Joshua Yip b, Wen-Ying Wu d, Brent Austgen c, Erhan Kutoglu c, John Hasenbein c, Zong-Liang Yang d, Carey W. King e, Surya Santoso b

THANK YOU!