

Ensuring stable water supply by centralized administrative control over a large scale water supply network (Outline of the Water Supply Operation Center)



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Today's Topics

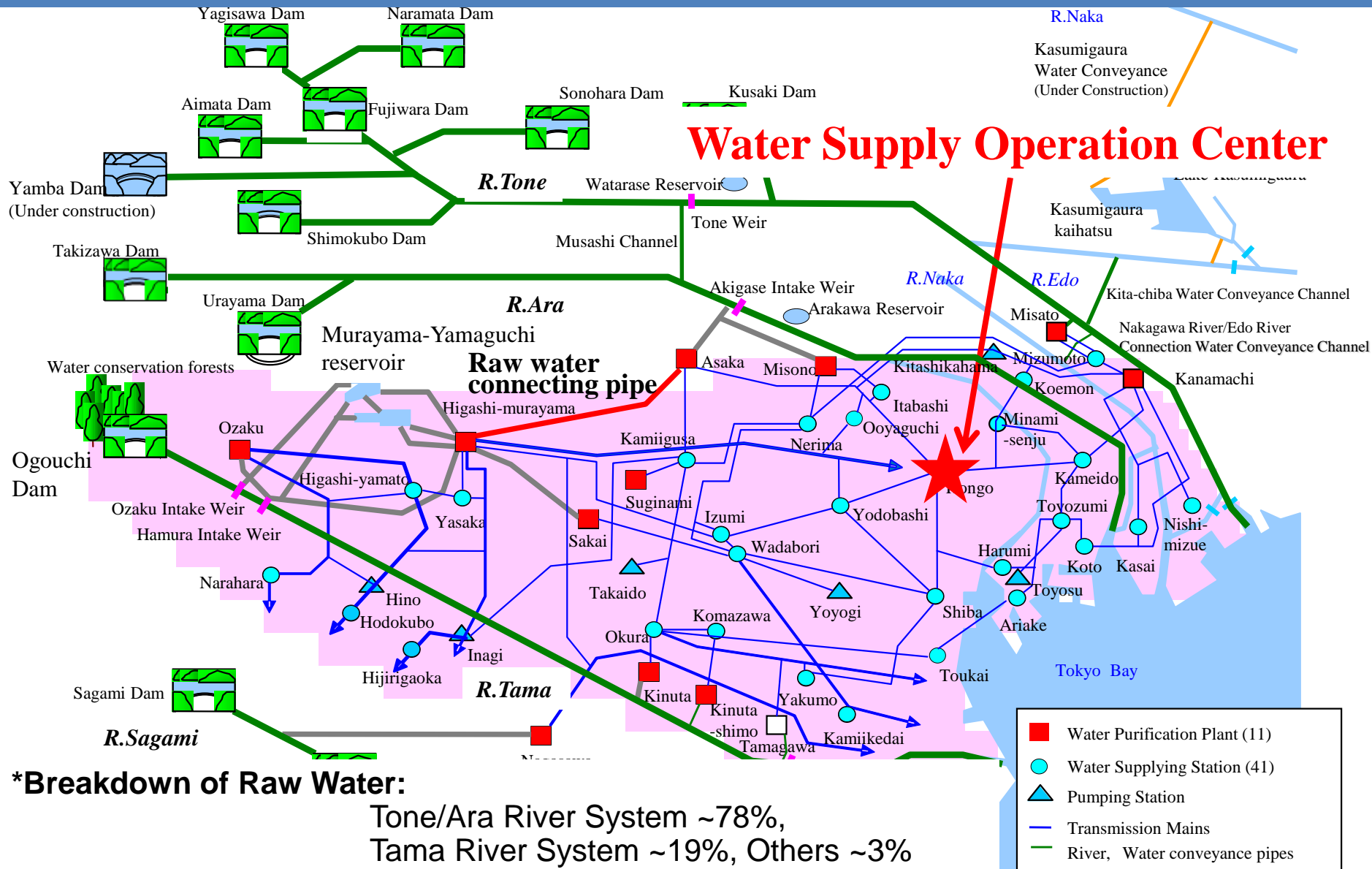
1. Outline of the water supply system of Tokyo
2. Primary roles of the Water Supply Operation Center
3. Examples of fluctuations in water demand

Outline of Tokyo's Waterworks

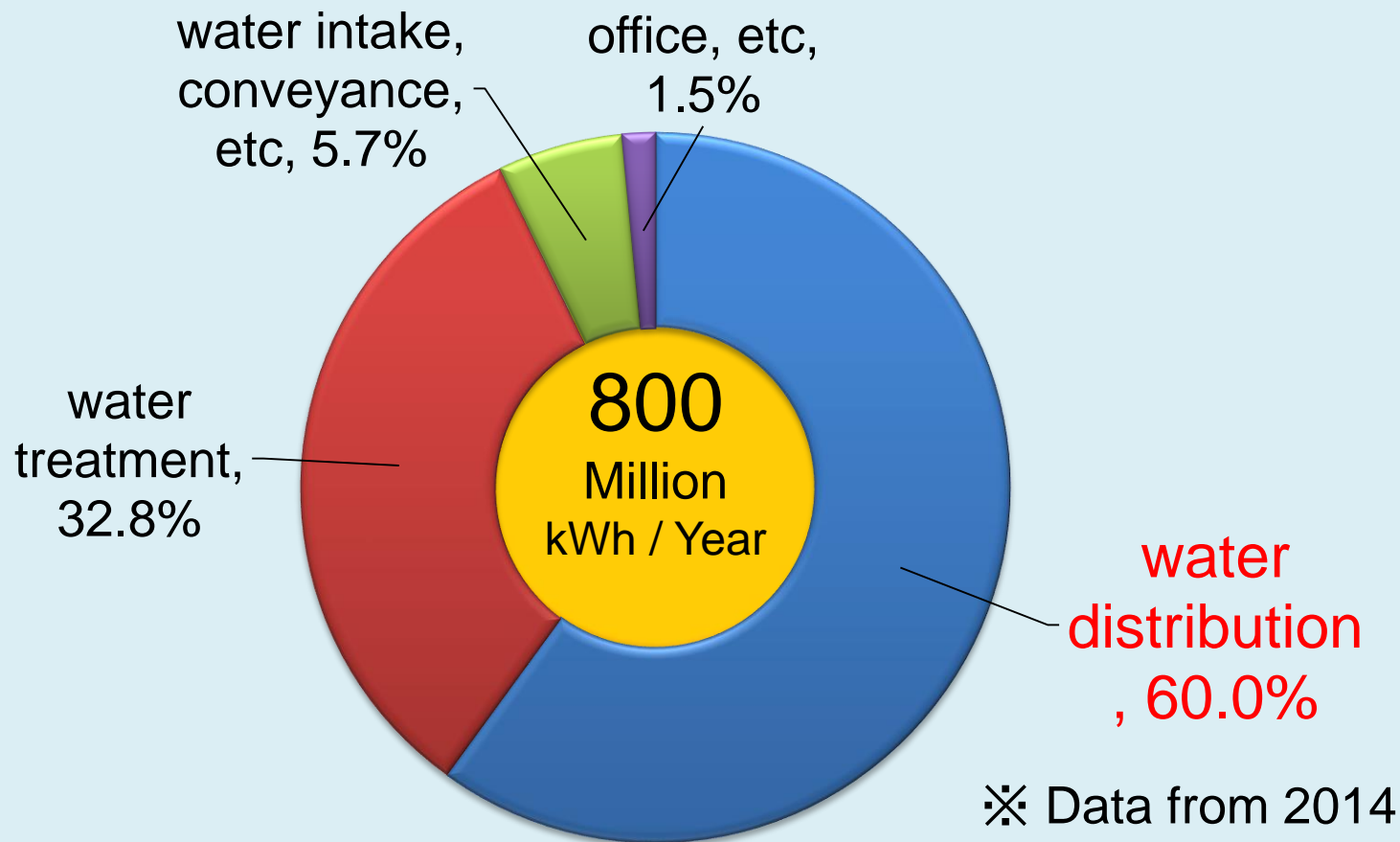
As of the end of March, 2017

Date of Initial service	December 1st, 1898 (Meiji 31)
Service area	1,239 km ²
Population served	13,295,385 people
Number of service connections	7,443,762 cases
Total capacity of facilities	6,859,500 m ³ /day (11 purification plants)
Water resource amount	6,300,000 m ³ /day
Total length of water mains	27,038 km
Main water supply stations	41 places (reservoir capacity $\geq 10,000\text{m}^3$)
Average distribution amount per day	4,192,300 m ³ /day
Maximum distribution amount per day	4,511,000 m ³ /day
Number of staff	3,750 people

Water Resources and Major Facilities



Electricity Consumption Breakdown



800 million kWh per year is comparable to
1% of Tokyo's total electricity consumption.

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Roles of the Water Supply Operation Center

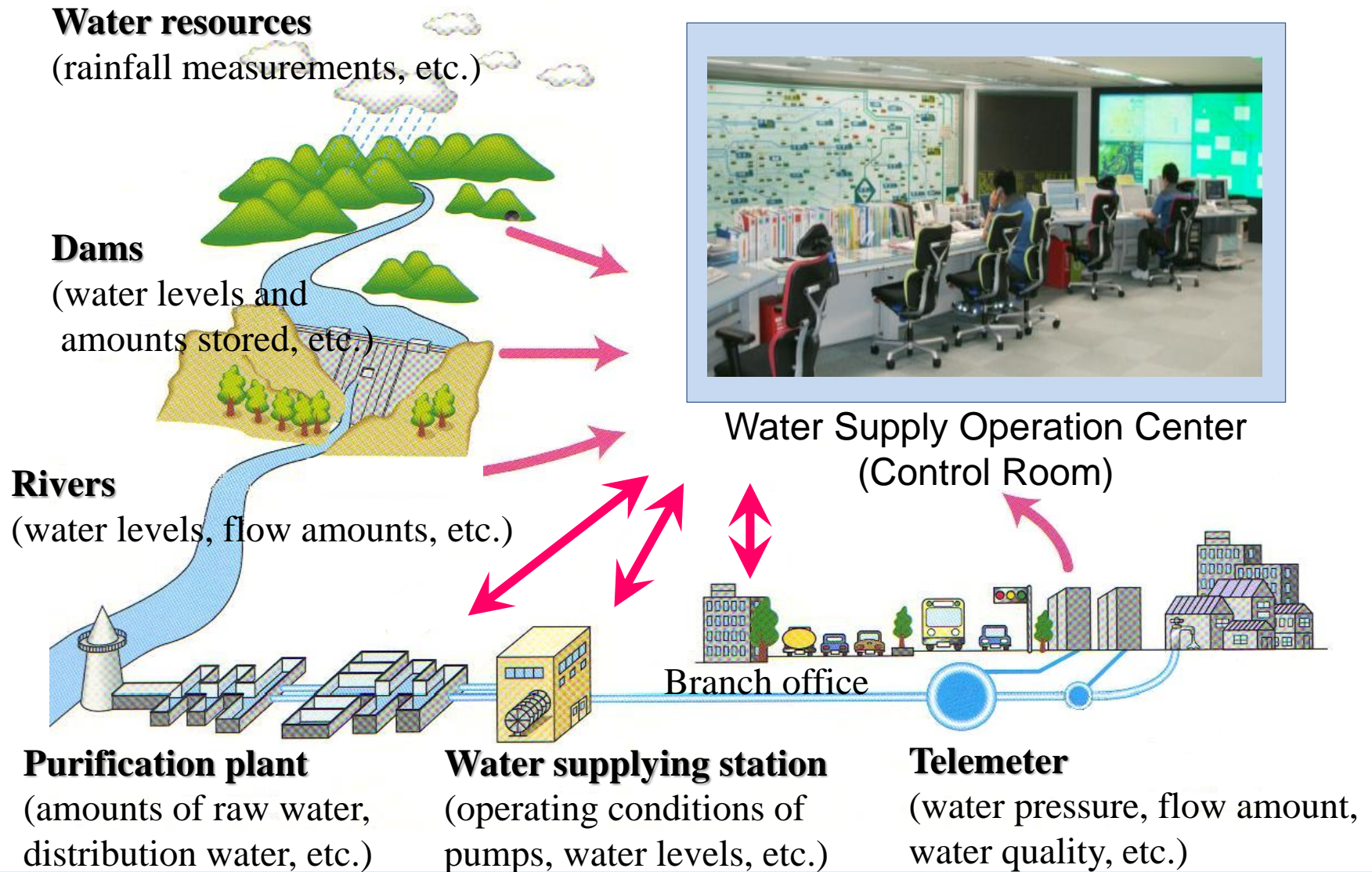
Established: 1979 (Showa 54)

Major roles:



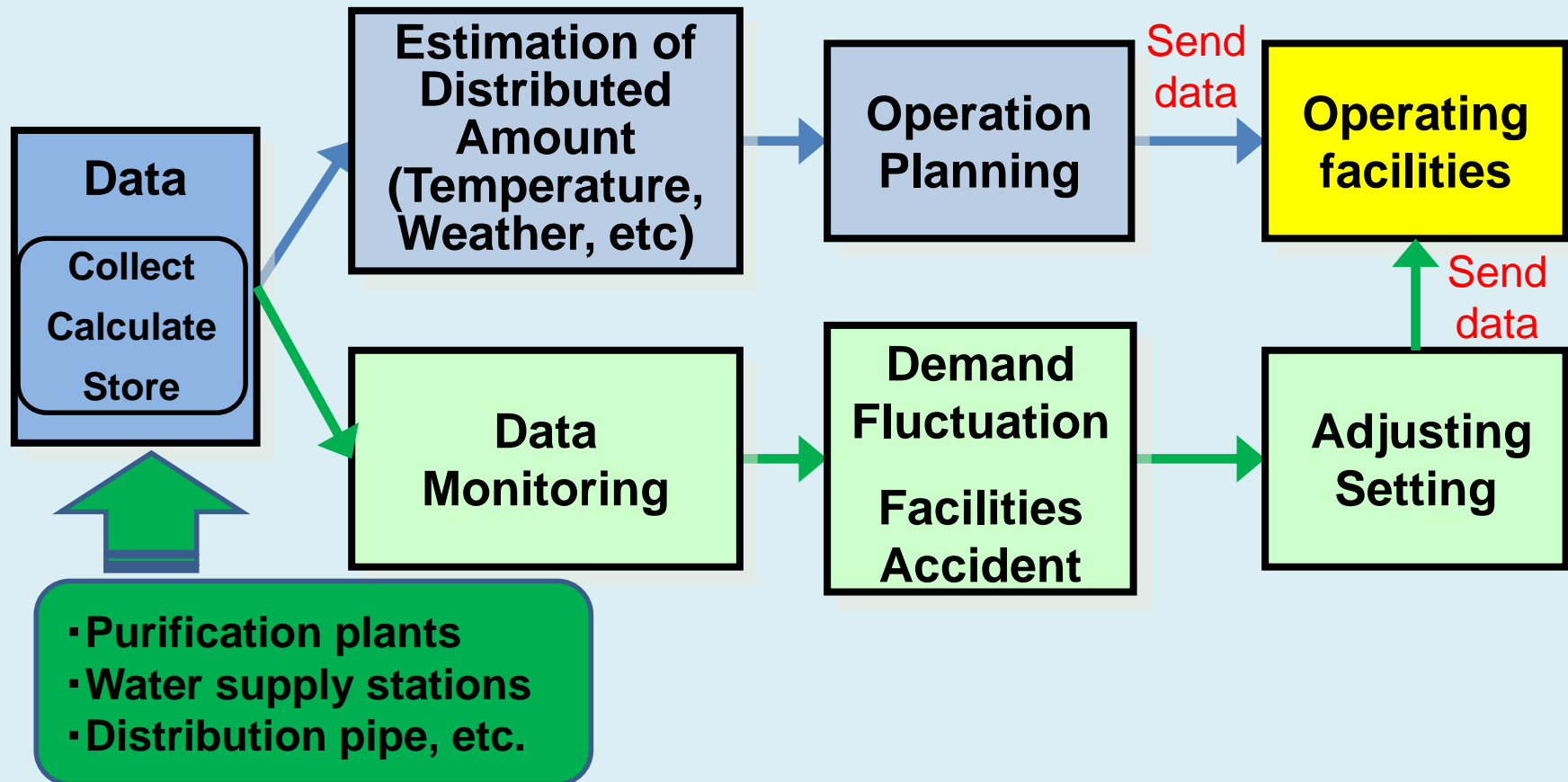
1. To control the water flow from water-intake to distribution in response to water usage or accidents.
2. To maintain waterworks facilities such as water supplying stations.

Overview of Water Supply Operation



Function of the Control Room

- 24hour monitoring of the water flow
- Adjusting operations in response to the fluctuation of demand or accidents.



Planning Work

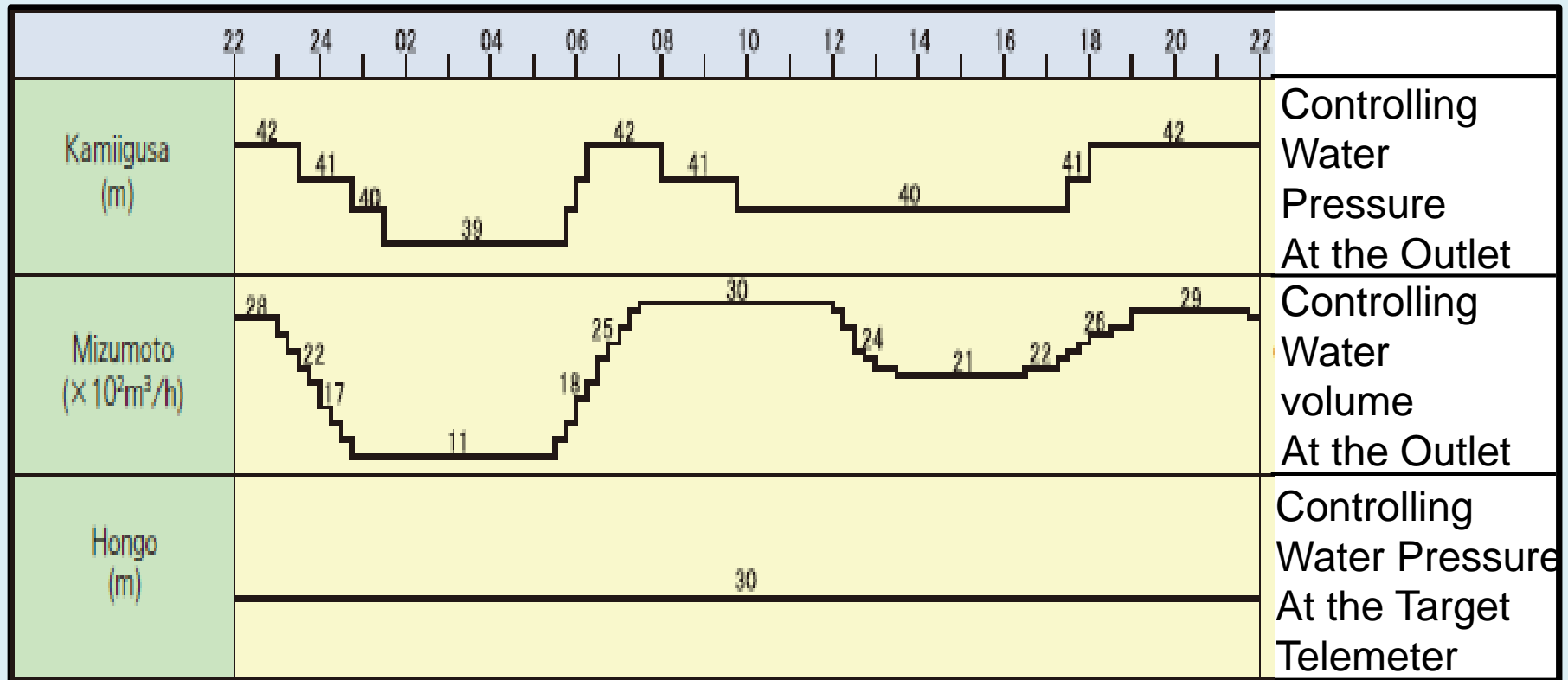
■ Monthly Plan

- Raw Water Operation Plan
- Transmission Main Operation Plan
- Distribution Pump Operation Plan

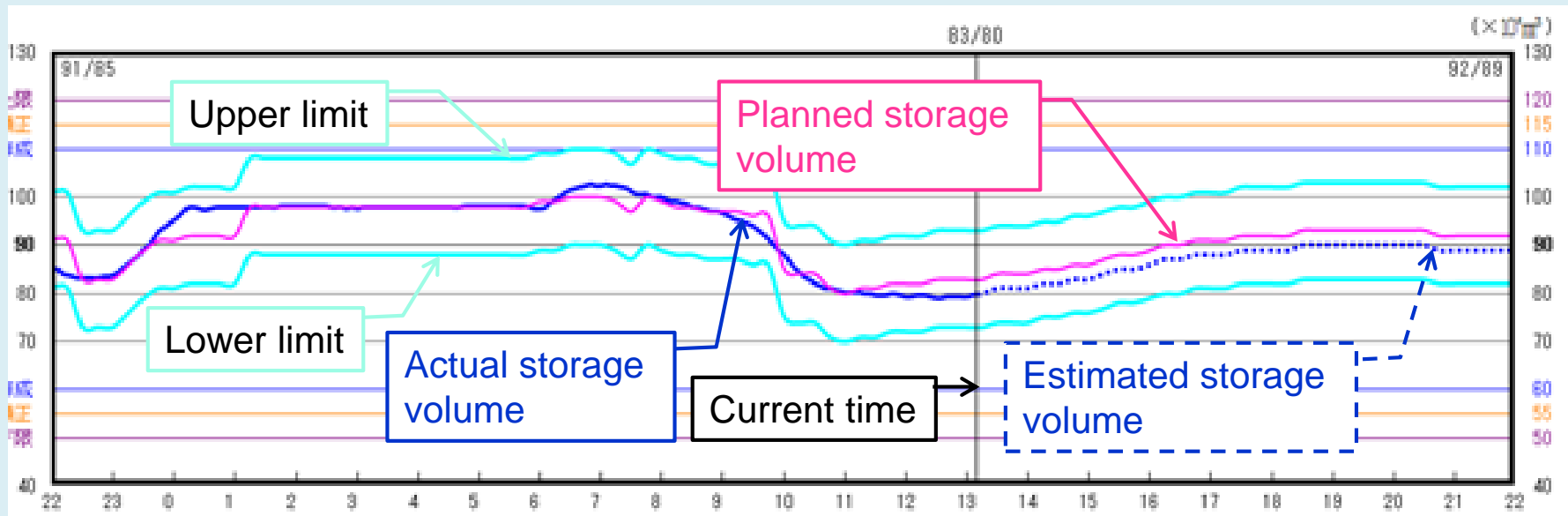
■ Daily Plan

- Distribution Reservoir Operation Plan
- Adjustment Setting

Distribution Pump Operation Plan



Distribution Reservoir Operation Plan

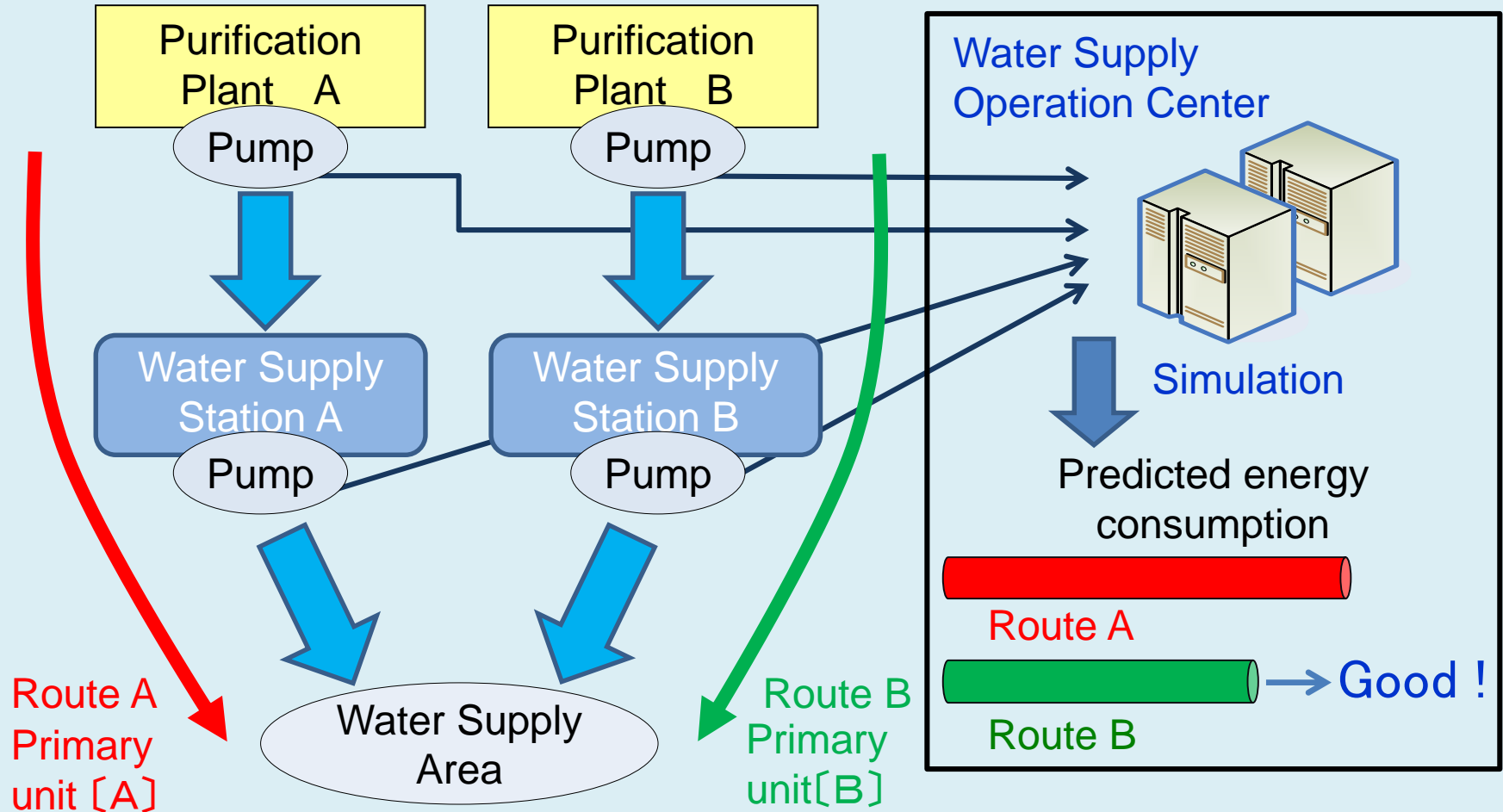


Time fluctuation of storage volume at distribution reservoirs

【Features of the distribution reservoir operation system】

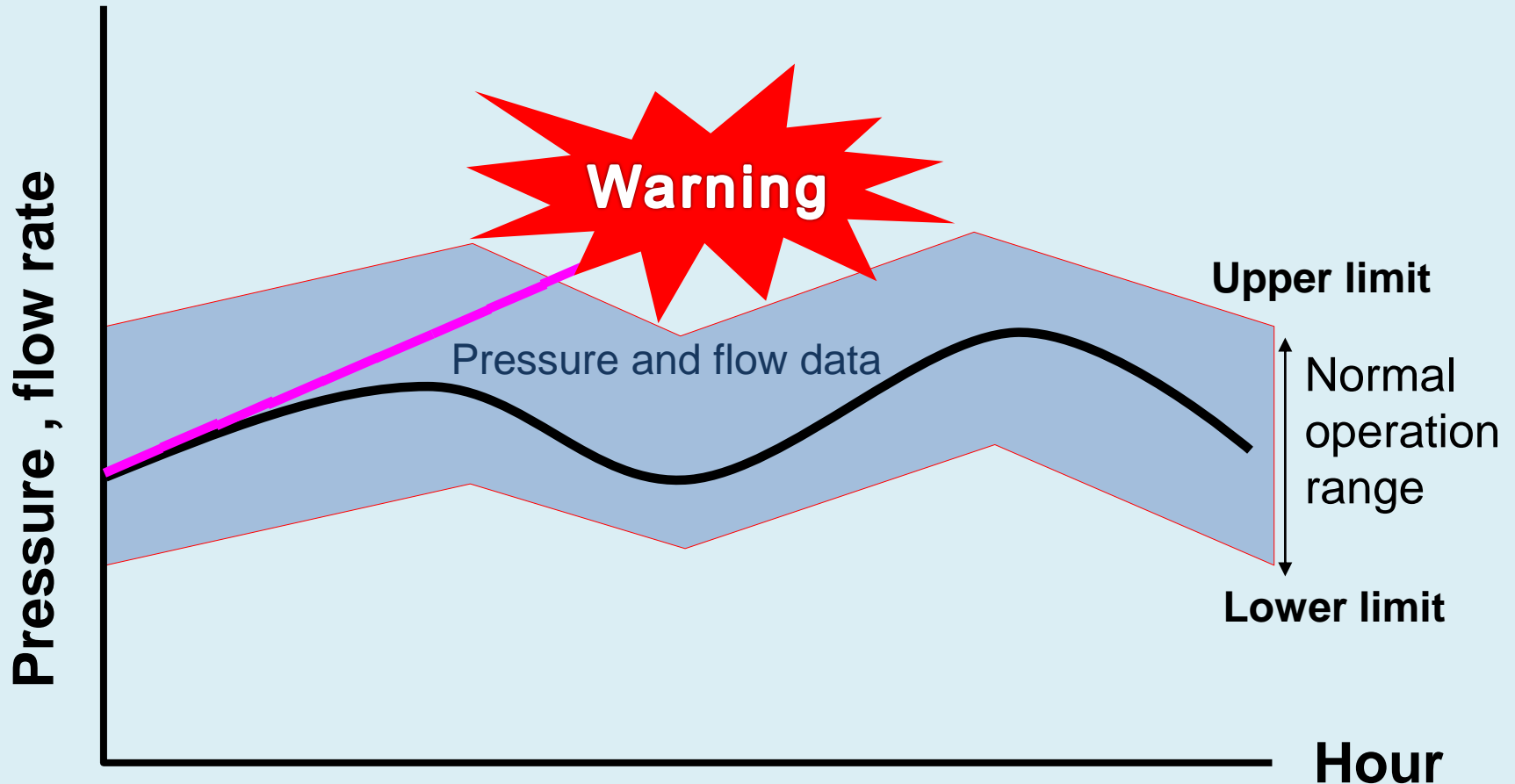
- Estimates subsequent volume of each water supply station and recognizes deviations from planned volume.
- Automatically controls volume pulled into the distribution reservoirs to become closer to the planned volume.
- Installed at all stations, and substantially reduces workload of monitoring staff.

Total Energy Management System



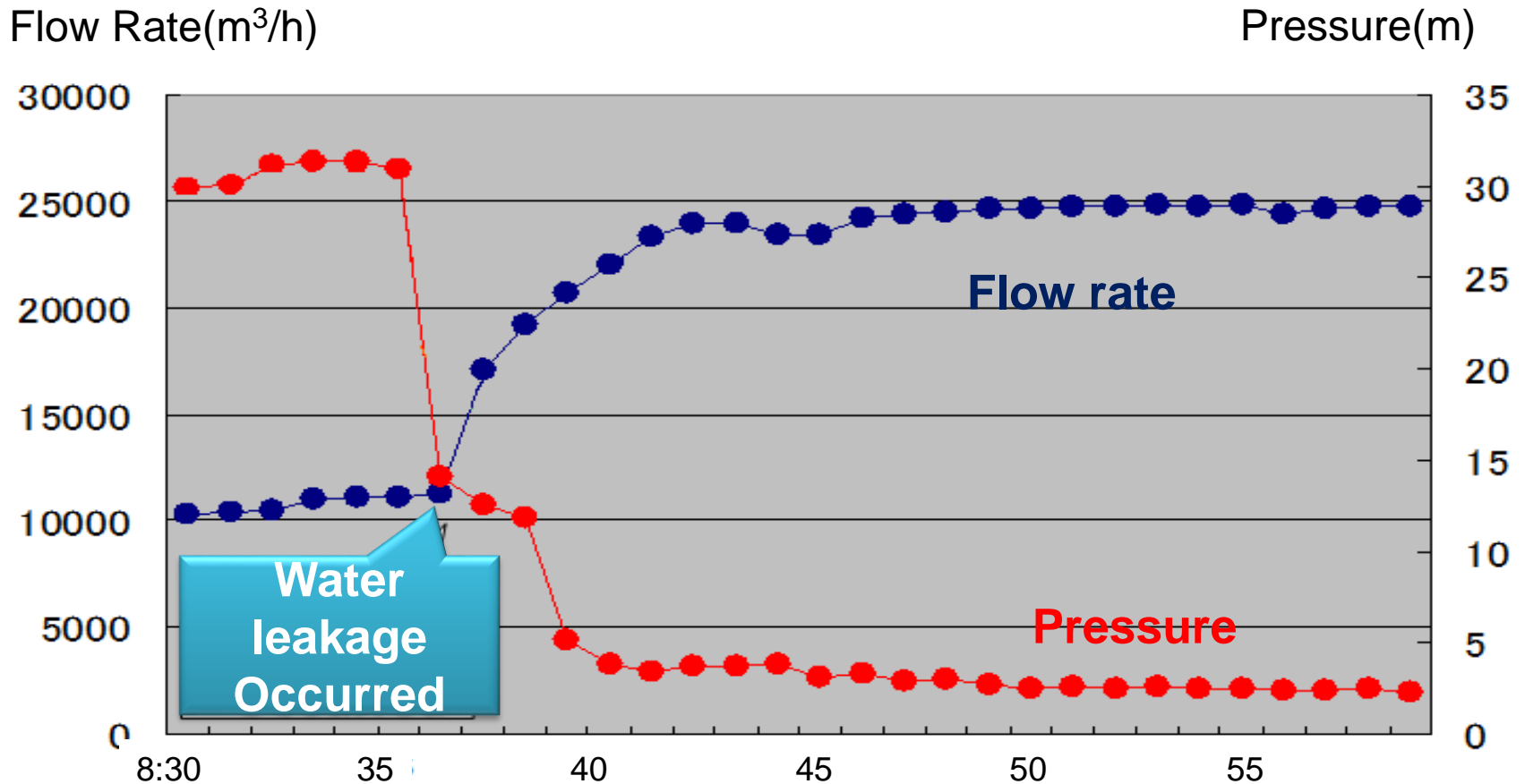
$$\begin{aligned} &\text{Primary unit of distributed water (kWh/m}^3\text{)} \times \text{Flow rate Q(m}^3\text{)} \\ &= \text{Predicted energy consumption (kWh)} \end{aligned}$$

How to Detect Abnormal Data



* A warning sound is issued and the electronic blackboard displays the abnormal data in red.

Pressure and Flow Rate in the case of Leakage



Our system sounds alarms on an event like this.

Pipeline $\phi 1,500\text{mm}$ Leak Incident (2003)



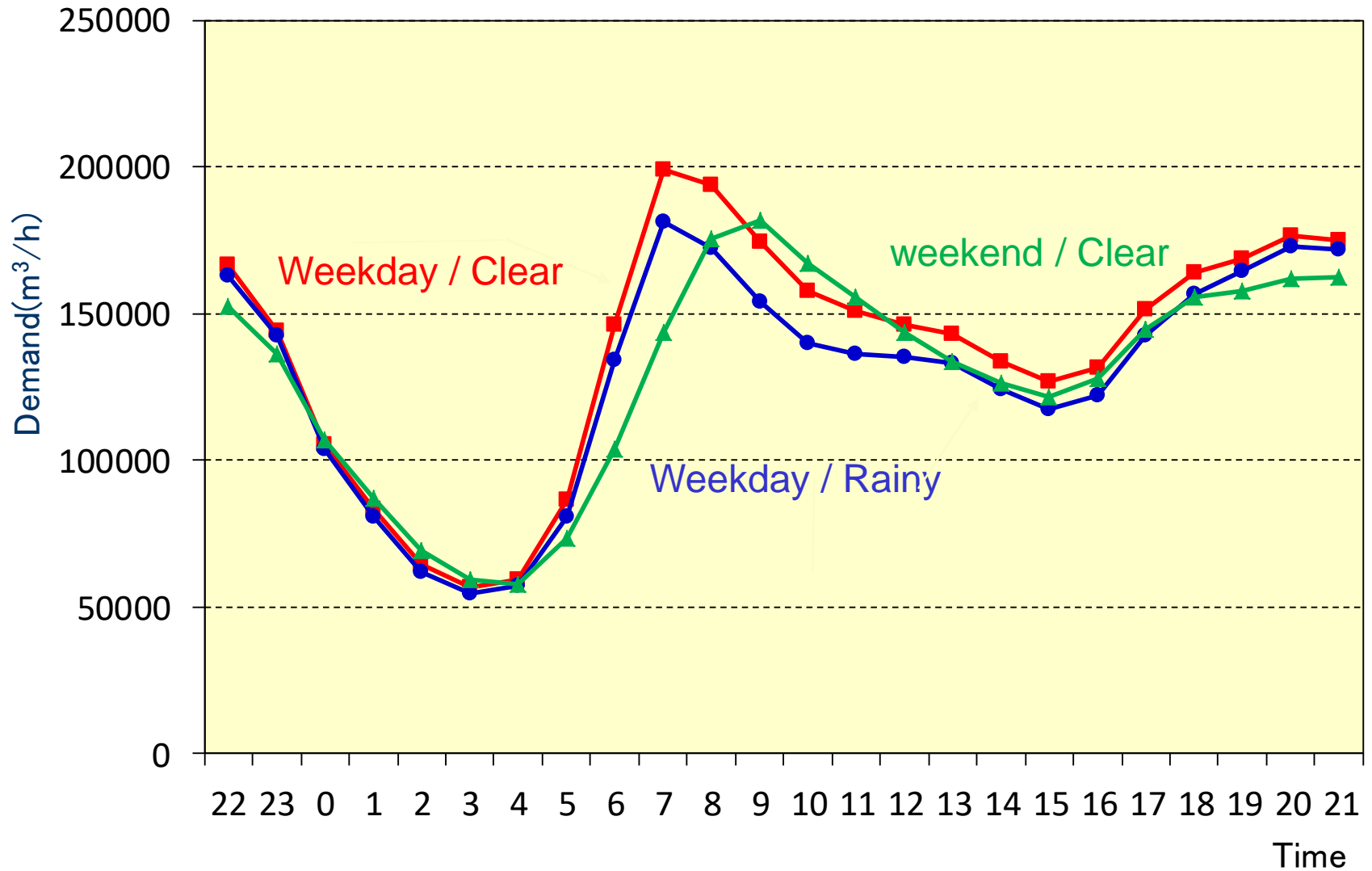
A Piece of The Broken Pipe

The leakage occurred in the riverbed.

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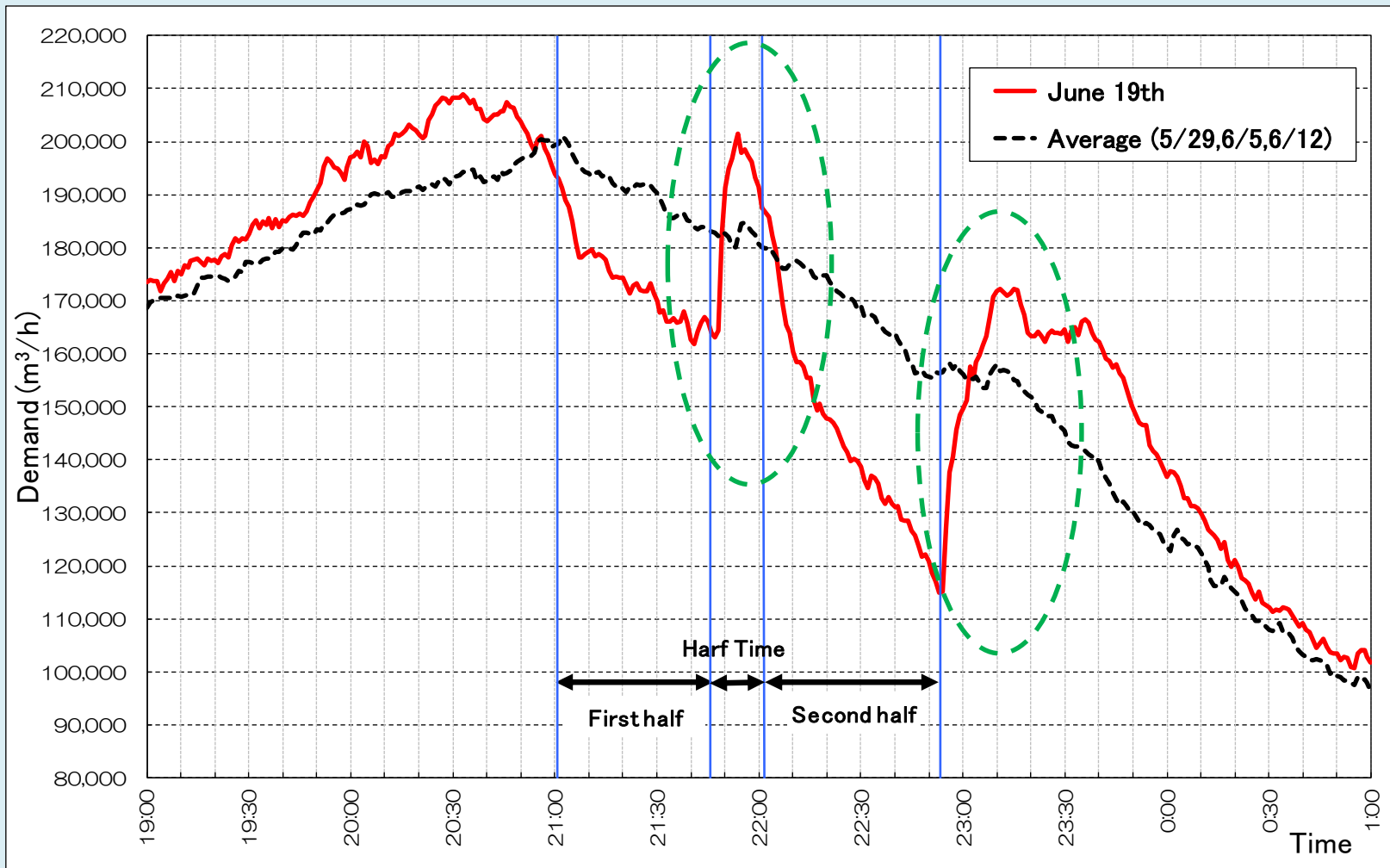
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Demand Fluctuation in a Day



Fluctuation in Water Demand

FIFA World Cup RUSSIA 2018: Japan vs. Colombia (Tuesday, June 19th, 2018)



Merits of Water Supply Operation Center

1. Centralized management of water amount, water pressure, electricity consumption, etc.
2. Stable water supply through adequate management of water amount and water pressure
3. Early discovery of accidents and swift response

**Thank you very much
for your attention.**

