National Technical University of Athens

Department of Water Resources, Hydraulic and Maritime Engineering

Hydronomeas

A Decision Support System for the Management of Water Resources

G. Karavokiros
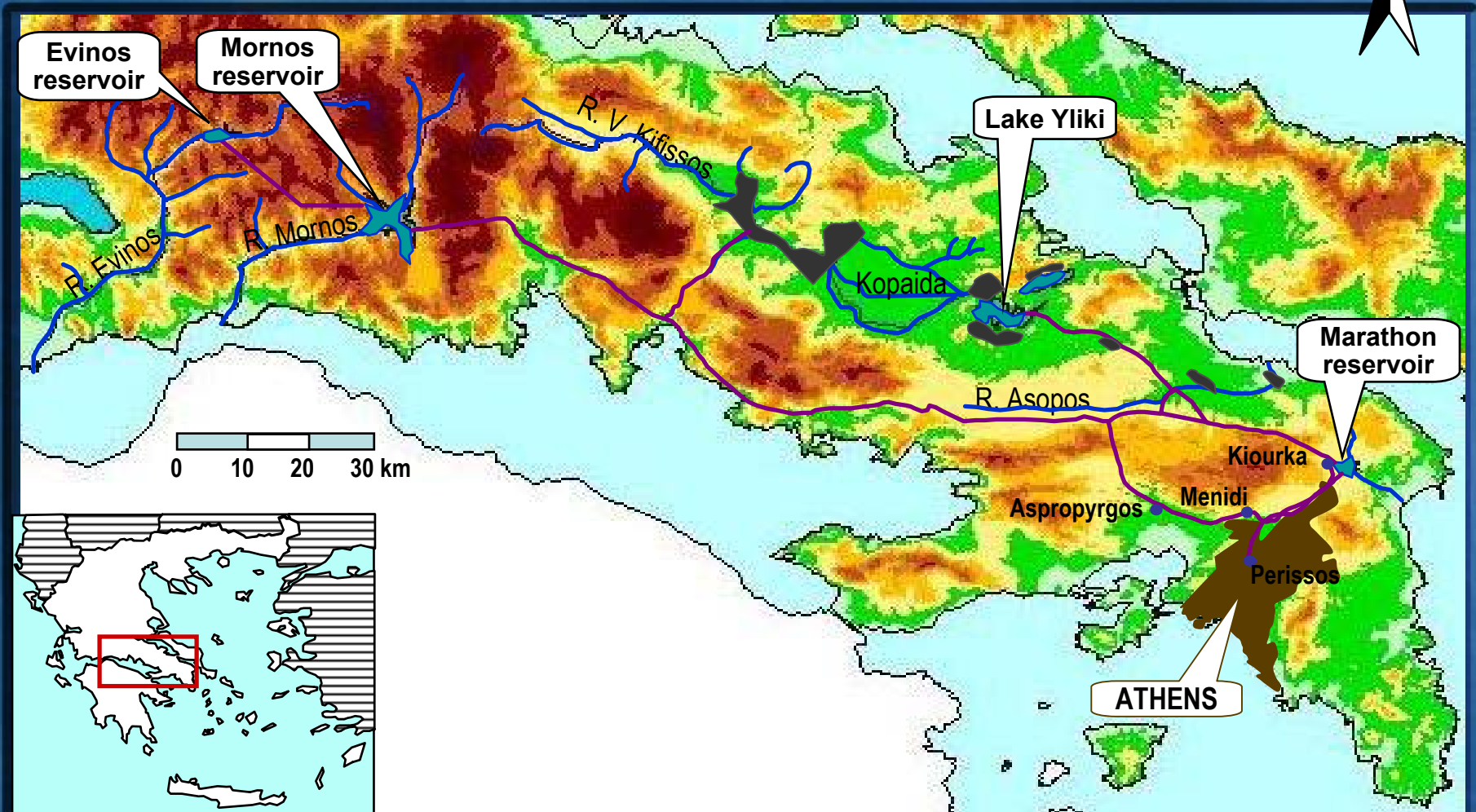
A. Efstratiadis

D. Koutsoyiannis

- The Athens Water Resource System (Athens WRS)

- The Decision Support System (DSS) *Hydronomeas*

- Some application results

The Athens water resource system

Evinos
reservoir

Mornos
reservoir

R. V. Kifissos

Lake Yliki

R. Evinos

R. Mornos

Kopaida

Marathon
reservoir

R. Asopos

Kiourka

Aspropyrgos

Menidi

Perissos

0   10   20   30 km

ATHENS

Main characteristics of the Athens WRS

- The system supplies water for domestic and industrial use (population 4 million people)
- The hydrosystem has a mean annual inflow of 850 hm^3
- Four reservoirs with a total net storage capacity of 1390 hm^3
- The reservoir system is characterized by significant losses, due to leakage (lake Yliki) and spill
- Two major conveyance works, a 200 km long gravity aqueduct and a 60 km long aqueduct with pumping
- Four Water Treatment Plants (WTPs) located in the metropolitan area of Athens

Urban water demand of the metropolitan area of Athens


420 hm³
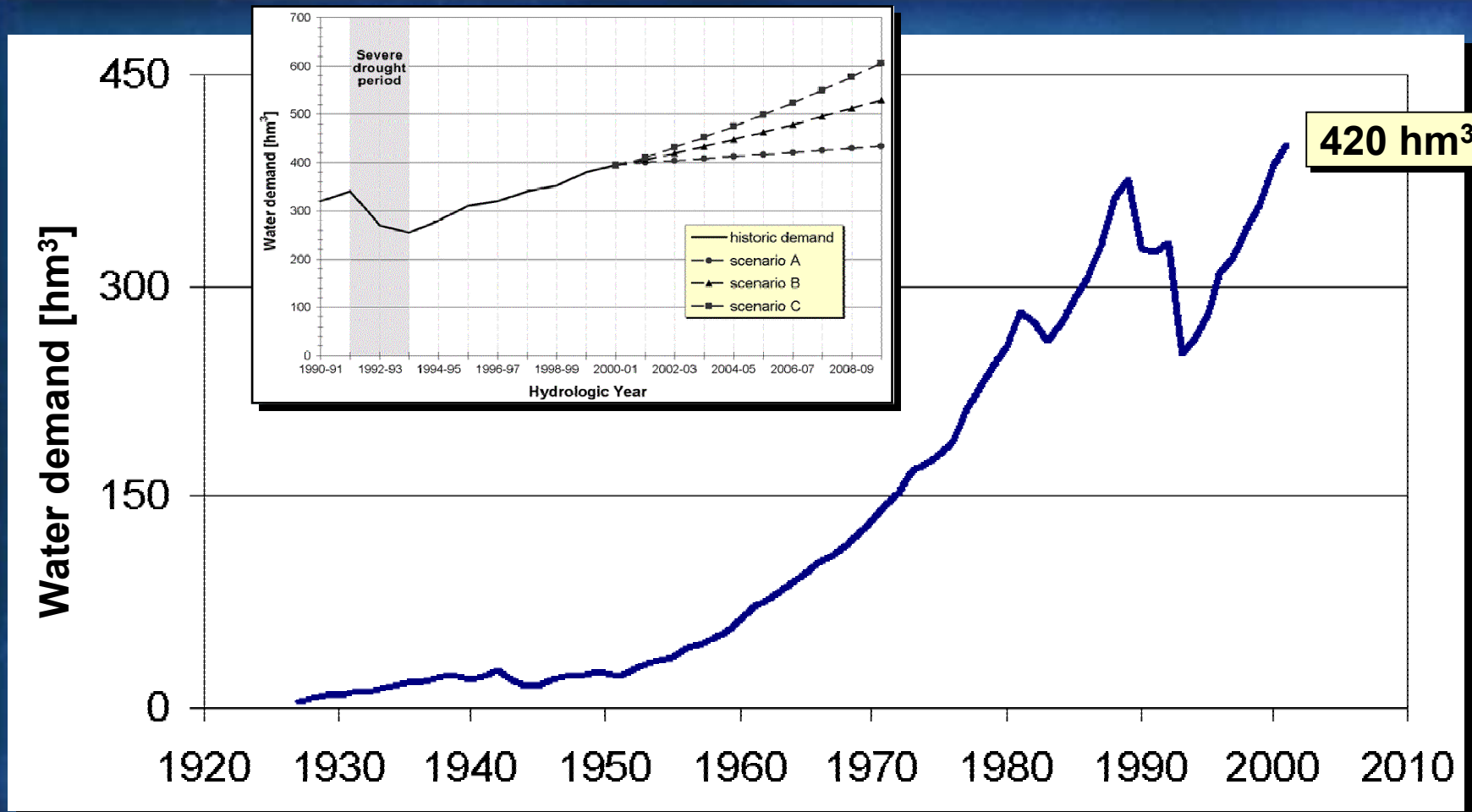
Questions answered by the DSS

- What is the maximum total withdrawal from the hydrosystem?

- What is the minimum failure probability (or else maximum reliability) in achieving a given set of operational goals?

- What is the minimum cost to achieve a given set of operational goals, for a given reliability level?

- What are the consequences of applying a certain scenario such as:

    - Expansion of the water supply system
    - Failure of a component (e.g. channel damage)
    - Alternative hydroclimatic scenarios

- Which are the optimal reservoir operating rules?

Basic characteristics of Hydronomeas

- Supports the management of complex, multipurpose reservoir systems

- Applies simulation of the water resource system operation and parametric optimization of operating rules

- Utilizes synthetic hydrological time series

- Provides all results in probabilistic terms

- Incorporates all natural, operational, environmental and other restrictions
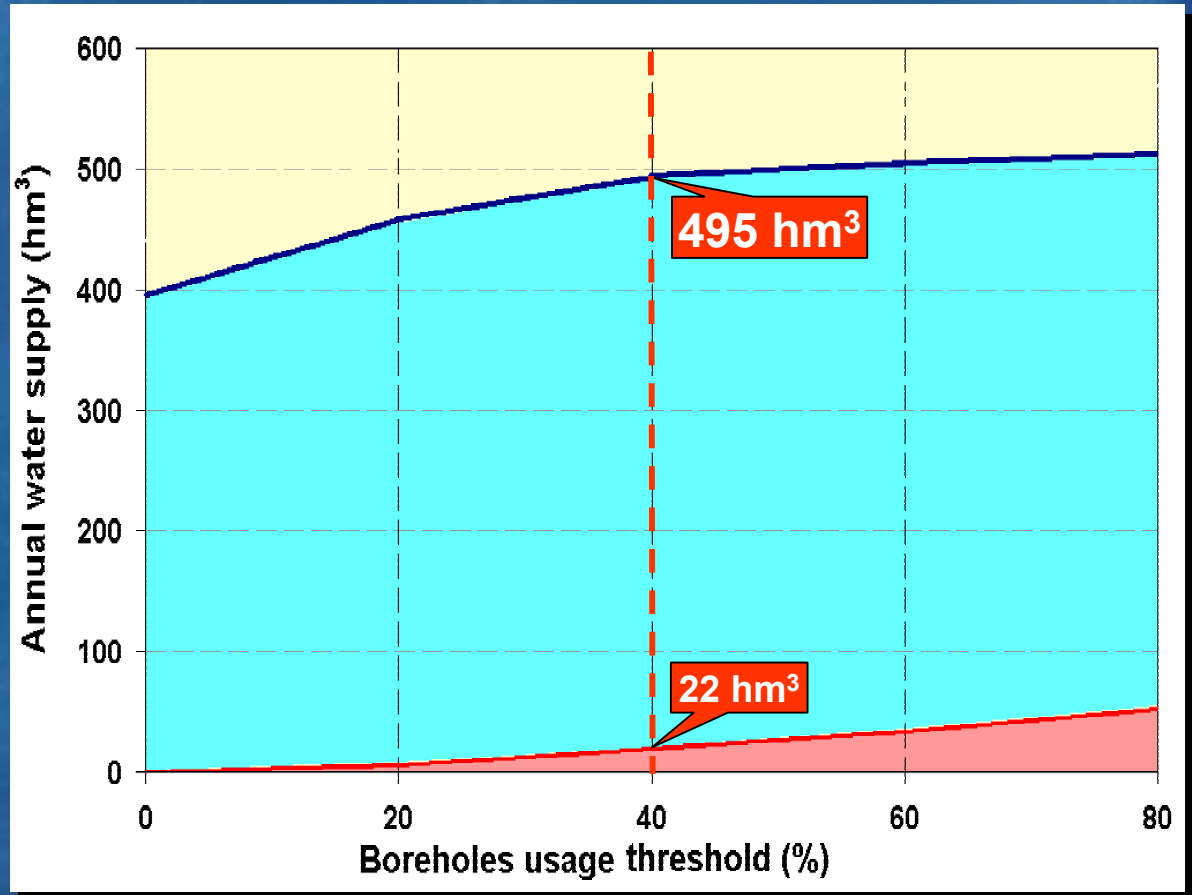
Visualization of the simulation process
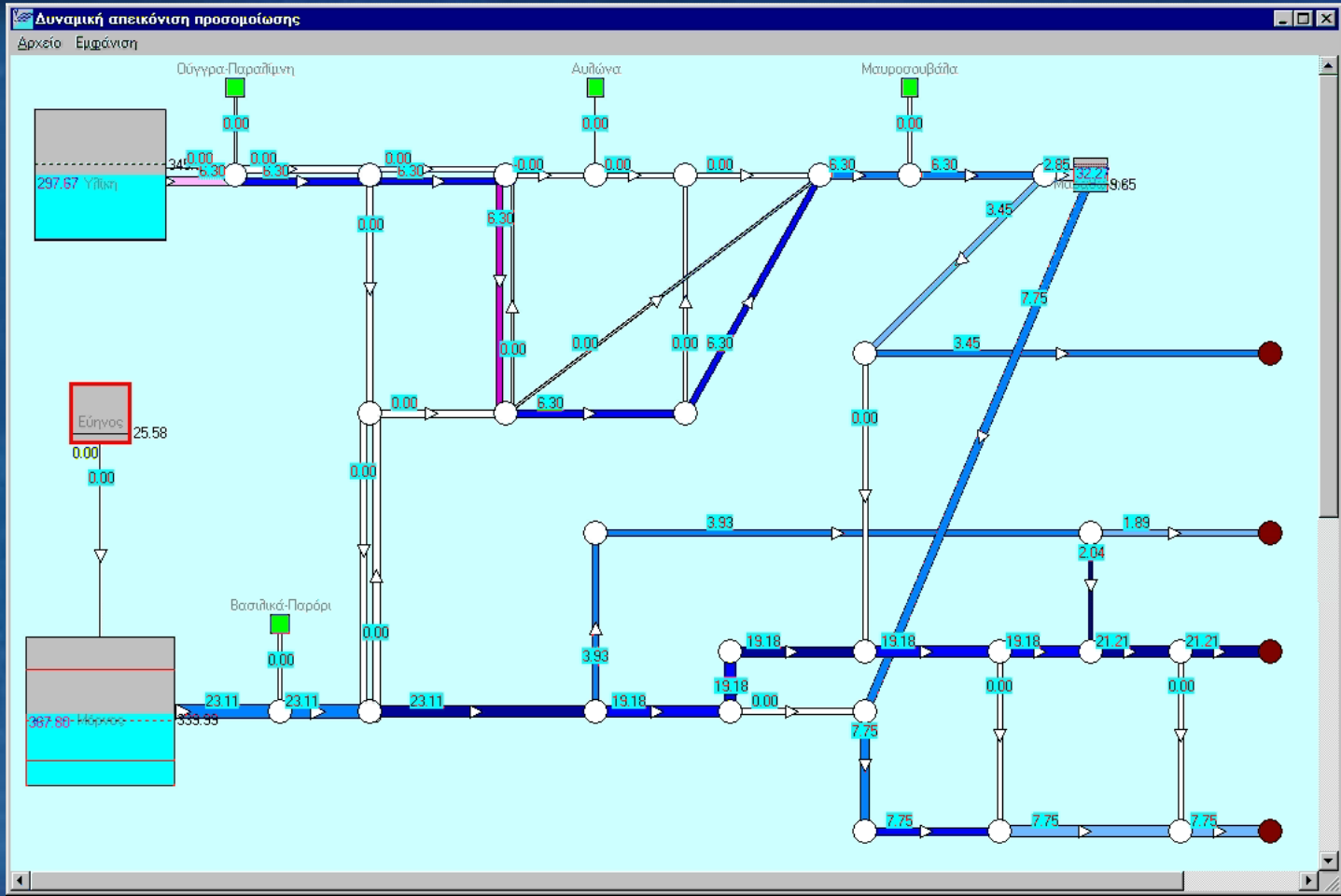
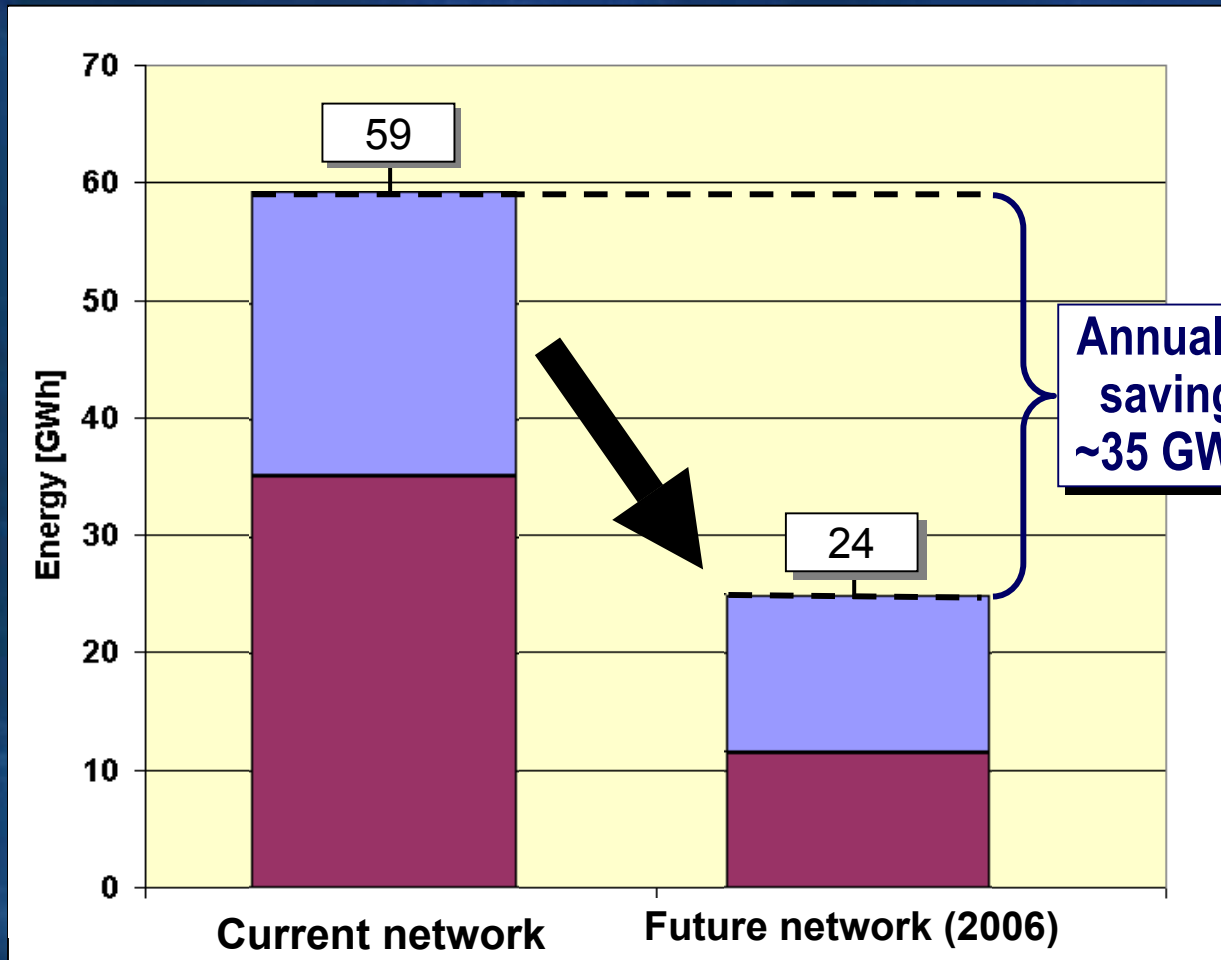# The theoretical potential of the Athens WRS for sustainable groundwater use

- Optimal management policy has been applied

- The reliability level was set to 99%, on an annual basis

- Synthetic inflow series of 2000 years has been used, which incorporated persistent drought periods

The expected annual energy consumption for the transportation of water to Athens

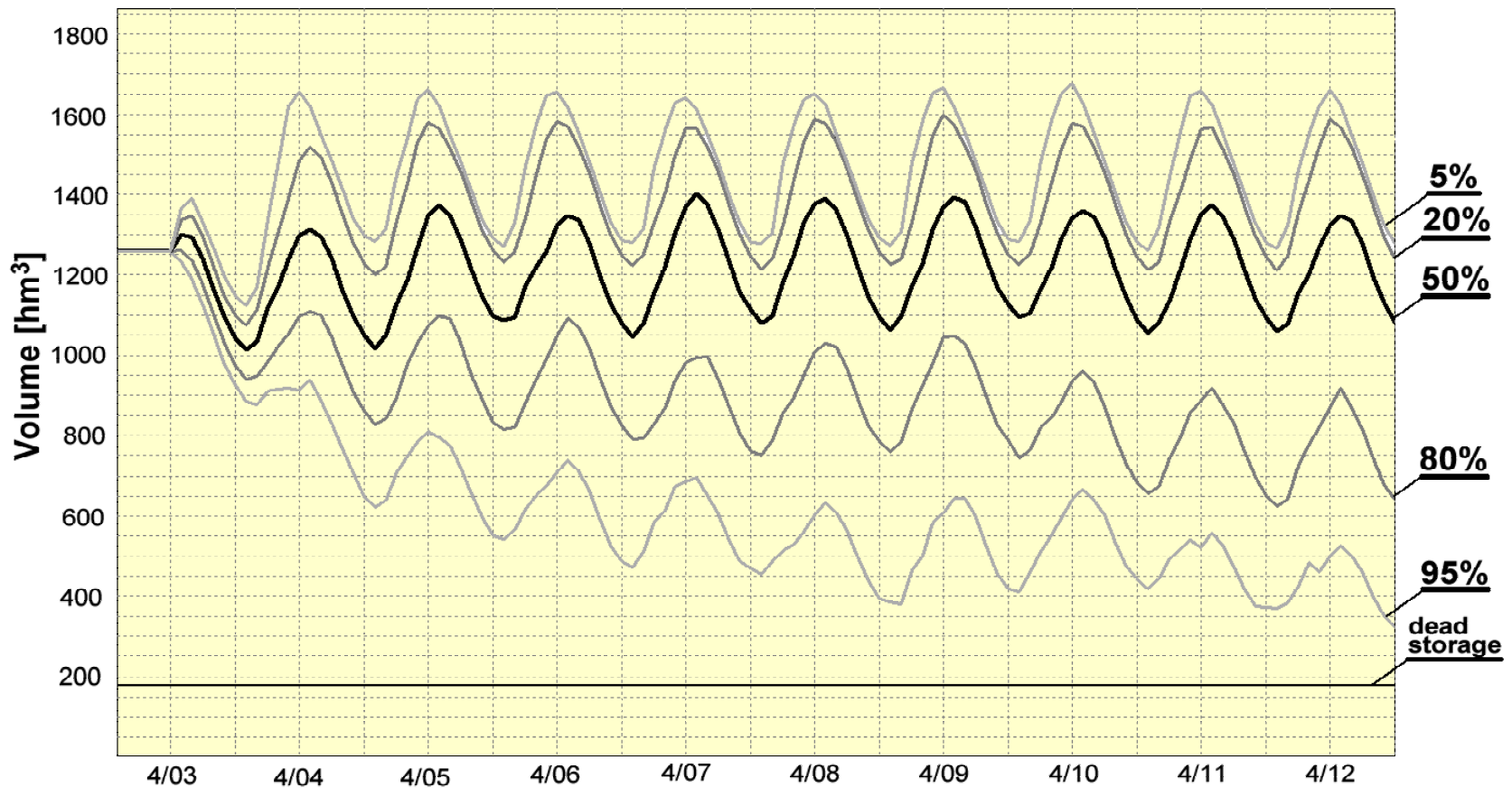**Planned network improvements reduce the energy consumption**

- Increase of the discharge capacity of gravity aqueducts
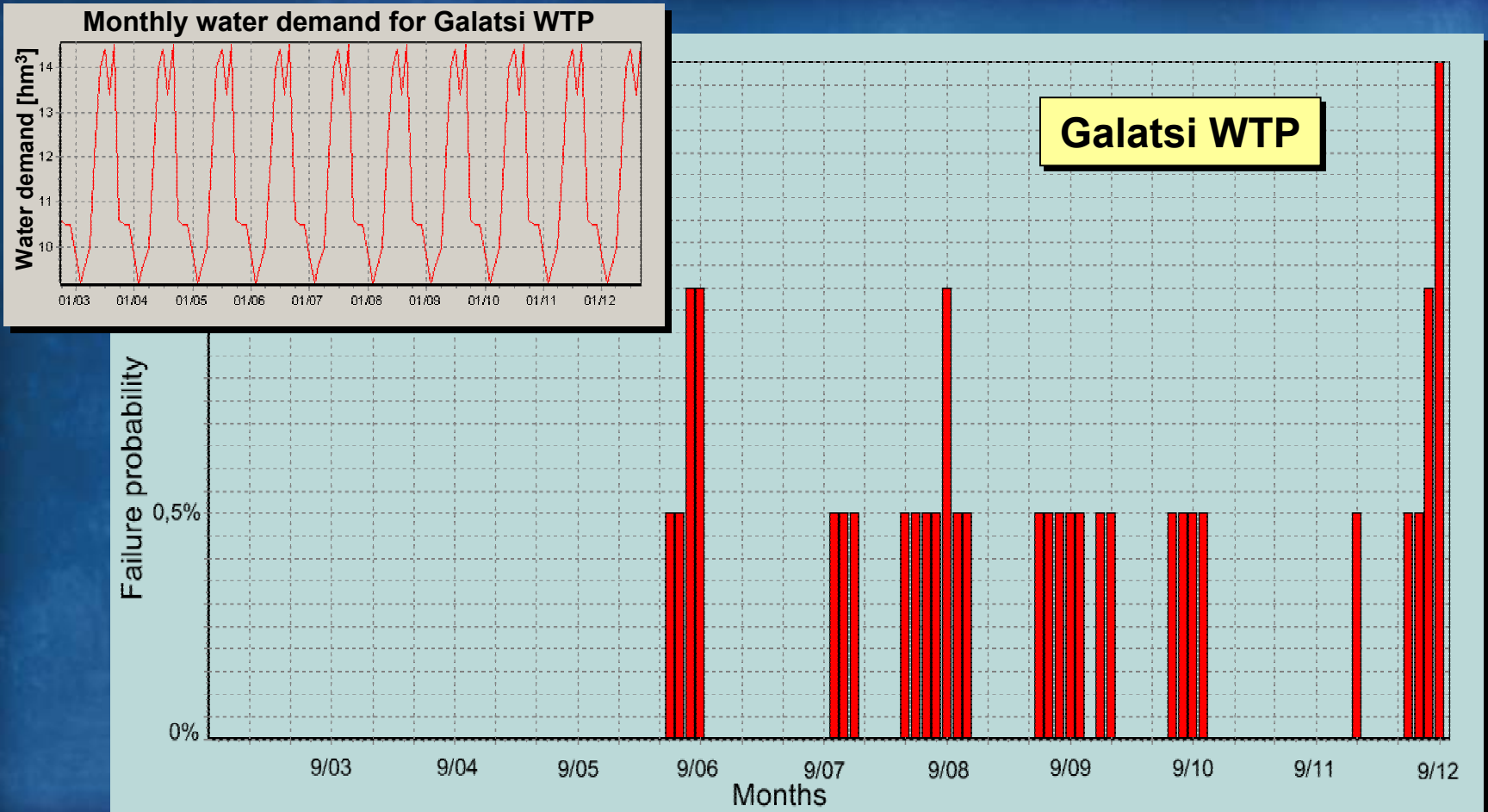
- Reduction of aqueduct leakages

The system storage development in the next 10 years

Equal probability system storage curves

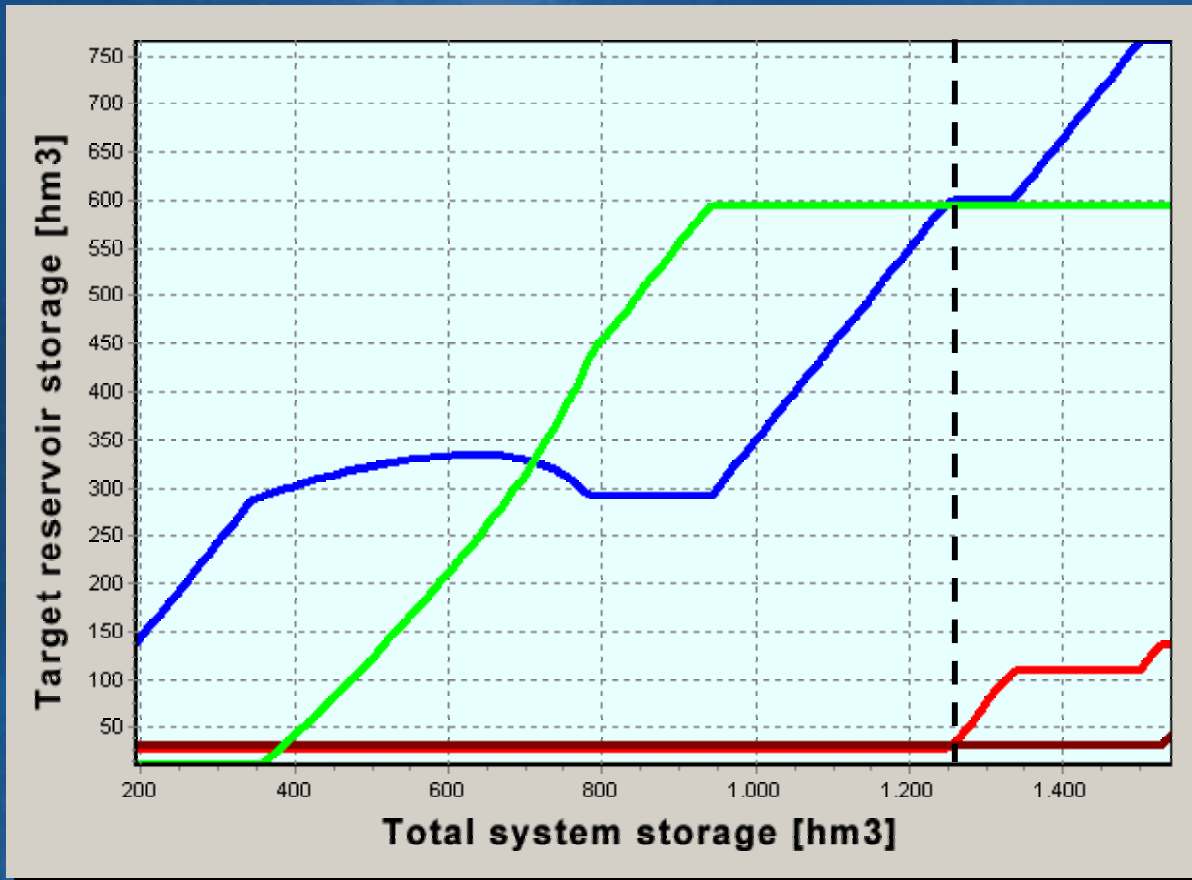# The failure probability forecast for achieving a given target

Monthly water demand for Galatsi WTP

Galatsi WTP

Graphical representation of reservoir operating rules

Motives for optimized water resources management by Hydronomeas

- Save water resources

- Save money (save energy)

- Serve (competitive) users in the best possible way (water consumption, power generation, environment preservation etc.)

- Show the limits of a hydrosystem

- Estimate the reliability of an applied management policy

More information about Hydronomeas: http://www.itia.ntua.gr/hydronomeas/