# PharmaWater Pro™

*Smarter Water Systems. Sustainable Results.*

GENESIS

**If you're like many biopharmaceutical manufacturers, you're targeting your water systems to meet sustainability goals. Water purification systems consume significant electrical/thermal energy and byproduct wastewater streams can have a direct impact on the environment.**

That's why we developed PharmaWater Pro, a comprehensive platform for efficient, cost-effective, and environmentally responsible pharmaceutical water systems. PharmaWater Pro calculates energy consumption, material usage, labor, and capital costs to help you make informed decisions that reduce environmental impact and improve operational performance.

## EFFICIENT. INSIGHTFUL. IMPACTFUL.

Whether you're evaluating a new system or optimizing an existing one, with PharmaWater Pro, we can help you:

**PROCEED WITH PRECISION:** Model water purification systems from city feed to point-of-use for RODI, WFI, and Pure Steam.

**OPTIMIZE RESOURCES:** Quantify energy, water, and chemical usage to identify savings opportunities and reduce waste.

**LOWER COSTS:** Analyze capital and operating expenses to drive smarter investments.

**REDUCE EMISSIONS:** Support your Scope 1 and 2 GHG reduction goals with data-backed decisions.

**BENCHMARK TECHNOLOGIES:** Compare carbon footprints and performance across multi-effect stills, vapor compression, and membrane systems.

## SUSTAINABILITY, ENGINEERED.

PharmaWater Pro incorporates principles from Life Cycle Sustainability Assessment (LCSA) and Triple Bottom Line (TBL) analysis—balancing economic, environmental, and social impacts. It supports:

- Calculating carbon emissions, energy consumption, and water use
- Estimating labor utilization
- Predicting maintenance costs
- Modeling scenarios for new builds and retrofits

## LEAD WITH VISION. DELIVER WITH DATA.

Since 1997, we've helped life sciences companies usher in the next generation of life-saving therapies with award-winningarchitecture, engineering, construction management, CQV, asset management, and sustainability services. At Genesis, we turn insight into action. PharmaWater Pro is our latest example of innovation and technical excellence.

# PharmaWater Pro™ Case Study

## CHALLENGE

Genesis conducted an energy and carbon analysis of alternative designs for a new water purification, storage, and distribution system to support the client's sustainability goals—including integration with a planned solar farm. The analysis was complex due to the availability of multiple technologies for WFI generation (membrane-based, multiple-effect still [MES], and vapor compression [VC]), and the many configuration options for temperature control and tank sizing. The system needed to supply USP Purified Water (PW), Water for Injection (WFI), and Pure Steam (PS) for product manufacturing, solution preparation, and equipment cleaning/sanitization.

## SIZING

After identifying and defining Points-of-Use (POUs), Genesis used PharmaWater Pro to perform a Monte Carlo simulation, estimating peak and average consumption rates and their variability over time. This data informed right-sizing of generation, storage, and distribution components.

## ANALYSIS

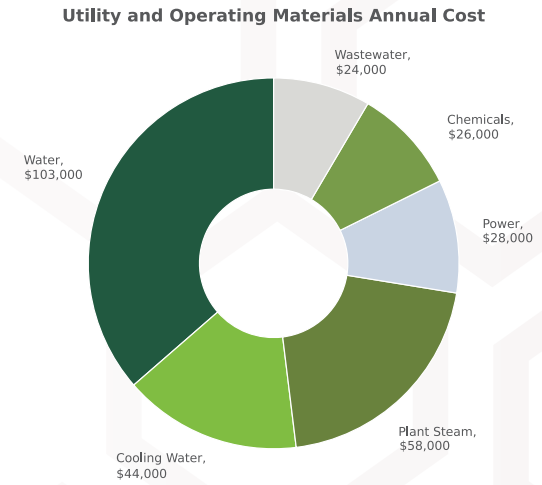
Using PharmaWater Pro, our engineers evaluated and selected equipment for each unit operation in the proposed system. The tool enables interactive and transparent decision-making, allowing users to refine system assumptions and parameters while instantly seeing their impact on energy use, emissions, and cost.

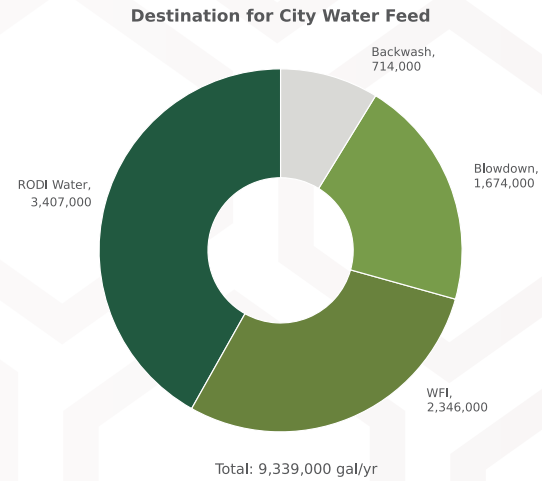
## RESULTS

Although the client initially favored a membrane-based system, the analysis revealed that vapor compression could offer lower operating costs. However, the membrane option had significantly lower carbon emissions—especially once green electricity from the planned solar farm is available. This led to a nuanced, data-driven recommendation to stakeholders.

Beyond energy and emissions, the tool also assessed water and wastewater usage, and calculated production costs for PW, WFI, and PS. These insights supported the decision to switch humidification water from WFI to softened water, reducing both cost and environmental impact.

PharmaWater Pro quantified both total water cost (including capital depreciation, $0.75/gallon) and incremental cost ($0.15/gallon), providing valuable context for evaluating process adjustments, such as improving RO recovery or modifying CIP/SIP procedures.




Total: 9,339,000 gal/yr