Water Energy Nexus

Great Lakes WISE
Water Innovation and Stewardship Exchange

POWERED BY
COUNCIL OF THE GREAT LAKES REGION
Solving for Sustainability

In a competitive, purpose-driven marketplace, ignoring water risks is not an option. By prioritizing water stewardship, businesses unlock strategic value, reducing costs, mitigating risk, and strengthening stakeholder trust. Lead boldly and turn vulnerabilities into opportunities for growth.

Only 1% of the Great Lakes' water is replenished annually, and unchecked growth in energy and cooling demand could lead to groundwater depletion, ecosystem impacts, and regulatory risk. Lead the way in water stewardship by investing in strategies that cut water use and unlock energy savings. By implementing energy-efficient water systems and leveraging resource recovery, companies can significantly cut emissions while improving operational performance. Proactive planning positions your organization as a leader in sustainability and resilence.

The Water–Energy Nexus in the Great Lakes

Water and energy are inseparable; every drop of water requires energy to move, treat, and heat, while nearly every form of energy production relies on water for cooling or processing. In the Great Lakes region, where industries, utilities, and communities draw from the same shared systems, this interdependence creates both risk exposure and major opportunities for innovation.

Historically, corporate water strategies in the region have focused on site-level efficiency. But hidden water use embedded in energy systems, particularly in electricity, heating, and cooling, means businesses often underestimate their true water footprint. As climate variability, industrial growth, and energy transitions put new pressure on the basin, companies must adopt a more integrated approach that considers the water–energy nexus at both operational and basin scales.

A Region at a Turning Point

Great Lakes industries are entering a period of rapid technological change. Data centers, AI infrastructure, grid expansions, renewable energy, and electrification all carry different water demands and thermal impacts. In the Great Lakes region, the interdependence between water resources and energy production is particularly significant.

Electric Power Generation Dominates Water Use - About 70% of reported Great Lakes water withdrawals in 2023 were for thermoelectric power generation, primarily for cooling at coal, gas, and nuclear plants. While most of this water is returned to the watershed, some is lost through evaporation.

Data Centers Drive Indirect Energy Demand - Hyperscale data centers require massive amounts of electricity and water for cooling. Their growth increases energy demand, which in turn drives water use at power plants. Hyperscale centers can use millions of gallons per day for evaporative cooling, most of which is consumptive.

Feedback Loop - More data centers with higher electricity demand leads to more water needed for power generation which increases stress on water resources. This creates a cumulative water footprint that includes both direct associated with cooling and indirect water use for power generation.

Efficiency and Risk - While consumptive water use for power generation has declined since 2015, this trend is at risk as energy demand surges. Some states are reopening nuclear plants and building new gas plants to meet data center-driven load growth. Seasonal peaks, specifically hot summers, amplify water and energy needs simultaneously.

These trends raise the stakes, but also unlock opportunities. Finland's district-heating model, where waste heat from data centers now warms entire city districts, offers a powerful blueprint. Similar innovations in the Great Lakes, recovering waste heat, switching to air-cooling, or co-locating facilities with circular energy systems, could reduce withdrawals, cut emissions, and strengthen grid and water resilience.

Why the Nexus Matters for Business

Water stewardship is a strategic investment that delivers measurable benefits across the organization, workforce, community, and brand, including:

1. Water and Energy Are Inseparable

Cooling, processing, and electricity generation all rely heavily on water, while energy powers treatment, pumping, and reuse. Treating them as separate issues limits savings and blindsides risk planning.

2. Data Centers Highlight Both the Risk and the Opportunity

Data centers are growing water users, but they also offer unique circular opportunities. Waste heat recovery can reduce cooling needs, support district heating, cut emissions, and lower overall water demand in surrounding communities.

3. Integrating Water, Energy, and Climate Goals Unlocks Co-Benefits

Water stewardship aligned with climate adaptation, emissions reduction, and circular economy planning delivers larger returns:

- Lower operational costs
- Reduced business risk
- Improved resilience
- Stronger alignment with Great Lakes policy priorities

4. Efficiency Delivers Immediate Cost and Performance Gains

Water-efficient cooling, closed-loop systems, smart meters, and optimized pumping schedules reduce both water withdrawals and energy demand, a dual savings opportunity often overlooked.

5. Competition for Shared Resources Is Increasing

Industrial users, public water systems, agriculture, and the energy sector all draw from the same basin. Integrating water-energy planning helps businesses anticipate pressures, reduce conflict risk, and support long-term Great Lakes resource security.

Strengthen the Water–Energy Nexus in Your Strategy

The Great Lakes region faces mounting pressure from energy-intensive industries and climate variability. With 70% of water withdrawals tied to power generation and hyperscale data centers driving unprecedented demand, integrating water–energy thinking into your planning is no longer optional—it's essential for resilience and compliance.

1. **Quantify Embedded Water in Energy Use**
   Map water dependencies across cooling systems, heating, and your electricity mix to reveal hidden risks and costs.
2. **Evaluate Waste-Heat Recovery & Energy Reuse**
   Identify opportunities to capture and repurpose heat from industrial processes or data centers to reduce both water and energy footprints.
3. **Align Cooling & Energy Upgrades with Basin Conditions**
   Design systems that reflect local hydrology and seasonal variability to avoid stressing aquifers during peak demand.
4. **Prioritize Clean Energy Sources with Lower Water Footprints**
   Shift toward renewables and technologies that minimize water consumption compared to coal, gas, or nuclear generation.
5. **Engage in Regional Planning with Utilities & Municipalities**
   Collaborate on integrated water-energy strategies to ensure sustainable supply and avoid conflicts over shared resources.
6. **Integrate Water–Energy Nexus Thinking into Sustainability, CAPEX & Resilience Planning**
   Embed these considerations into investment decisions, sustainability reporting, and risk management frameworks.