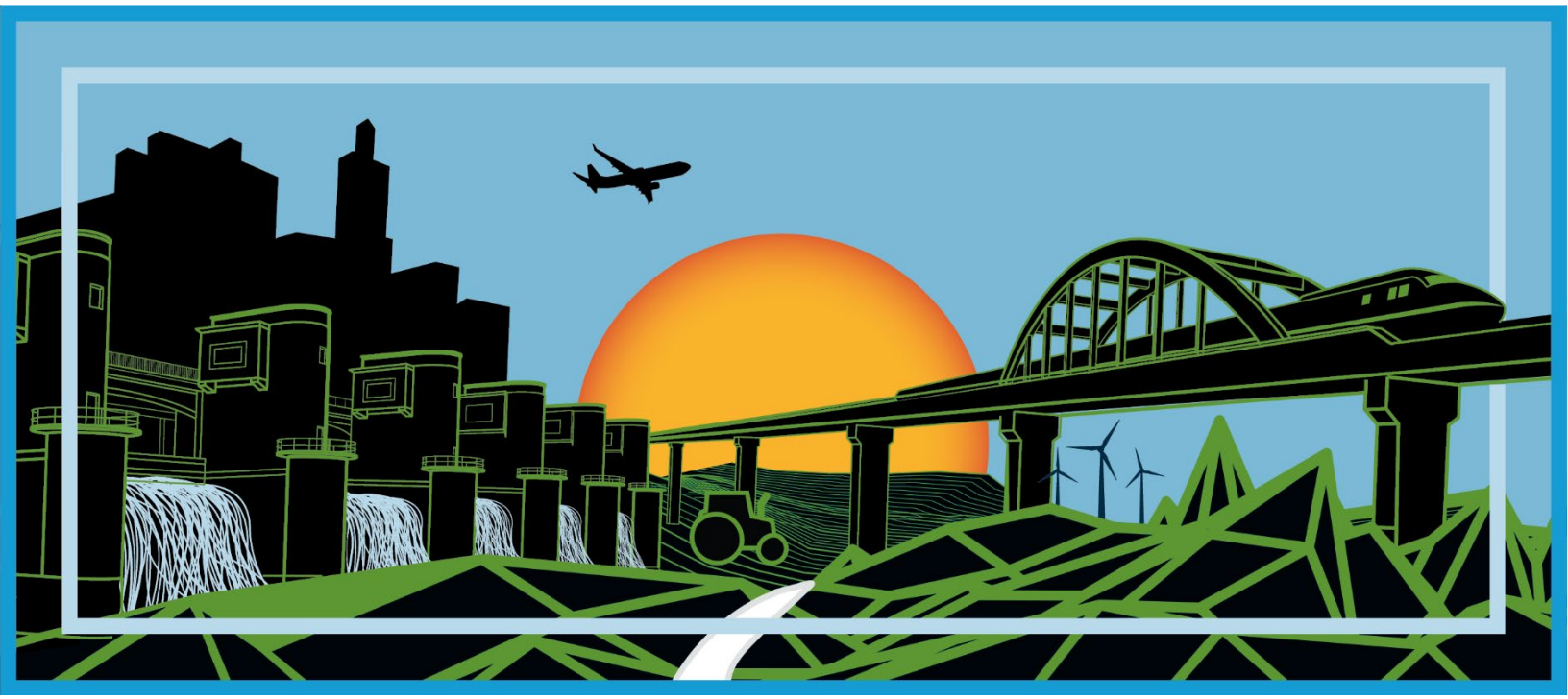

Secure Tomorrow Series

Scenario Narrative #3: Day Zero

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OPINION

GUEST ESSAY

Day Zero

September 13, 2030

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One week ago, the city of Monroe made national headlines when its city manager announced that the community would reach "Day Zero" sometime in March 2031. When that day arrives, Monroe will run out of water completely. Taps will go dry.

Scientists had been sounding the alarm for years that the water supply was dangerously low. But decision-makers didn't heed the warnings because the groundwater models they had relied on for decades gave significantly higher estimates. After several of Monroe's wells went dry unexpectedly, the city was forced to reevaluate their models and ultimately conceded that they had vastly overestimated the supply of water in the aquifer below their feet. The city of 300,000 came to the startling conclusion that they were less than a year away from a massive water crisis.

Monroe is hardly the first city we've seen run out of water. But Monroe is eye-opening for both its size and economic importance. A hub of manufacturing and energy, it is also the heart of a regional agricultural economy, where water-intensive crops like cotton and alfalfa are grown for export worldwide. More important, Monroe will not be the last. Its story is a cautionary tale that U.S. policymakers should heed to protect an economy that is navigating multiple transitions. We are all but guaranteed to see an increasing trend of Day Zeros in our lifetime.

In Monroe and elsewhere, there are too many culprits to point a finger at just one. Decision-makers in Monroe have grappled with persistent overallocation to a long list of stakeholders with decades-old legal claims on the city's water. While the city undoubtedly mismanaged demand for water resources, overallocation meant that the deck was already stacked against it. Countless cities like Monroe are suffering from longstanding and exhaustively documented issues hurting water availability in this country. These include long-term nationwide trends like climate change and aging infrastructure as well as more localized issues, such as poor resource management and contamination from increasingly common sources like saltwater inundation from sea level rise, algae

blooms, and wildfires. But Monroe's problems are also related to a more surprising water issue: the energy transition.

Water problems have actually been exacerbated by the energy transition in many U.S. regions where water demands from legacy energy sources overlap with new water impacts from the renewable energy economy. The importance of the relationship between water and energy cannot be overstated. For example, water is essential to produce electricity in coal, gas, nuclear, and hydroelectric power plants. But newer energy sources, such as renewable biofuels, and even manufacturing of solar panels, also place demands on a shrinking water supply. I would highlight four issues in the energy-water nexus that deserve serious attention.

Oil and gas. Despite some significant growth in electric vehicles and renewable electricity generation, global demand for oil and gas has not yet fallen, and the United States remains the world leader in production. More important for our water concerns, the share of U.S. oil and gas production extracted by hydraulic fracturing, or fracking, has leaped from less than 66 percent to more than 95 percent in the past decade. Fracking mixes water with toxic chemicals and other contaminants, then pumps the mixture deep into the ground to create cracks to release oil or gas. It also produces impressive amounts of wastewater containing salts, toxic elements, organic matter, and radioactive material, which presents contamination risks. We use almost 800 percent more water and create over 500 percent more wastewater for each well today than we did in 2010.

Biofuels. Biofuels are a particularly risky source of energy from a water availability standpoint. Irrigation can result in biofuels having an even higher water footprint than fossil fuels. But that doesn't seem to have slowed their growth, as policymakers have desperately tried to increase renewable energy as quickly as possible. While irrigated agriculture already consumes 70 percent of the nation's water supply, biofuels are increasing that share and further depleting surface water and groundwater. In fact, several regions are now suffering from lower crop yields because water supplies are too low for growers to irrigate sufficiently. Biofuels also add to the problem of water contamination from overuse of fertilizer. More than half of applied nitrogen and phosphorous leaches from farms into water resources, causing contaminated groundwater and surface water. When nitrogen and phosphorus contamination occur in surface water, it can lead to eutrophication and harmful algal blooms locally and downstream. The Gulf of Mexico set yet another record this year for the size of its "dead zone"—eutrophication caused by nutrients traveling down the Mississippi from the Corn Belt. High levels of nitrates and harmful algae can cause negative human health impacts. Last year, more than 100,000 wells tested in the Corn Belt had nitrates above the recommended health advisory level.

Mining. The United States has seen a mining resurgence in the past several years focused on rare earth elements used in solar photovoltaic (PV) panels and batteries. These mines create mountains of toxic waste and thousands of gallons of wastewater for every ton of rare earth produced. And the most productive mine in the country is located in a water-constrained area. Mining also poses a significant risk of water contamination from tailings, erosion, sedimentation, and acid mine drainage. When the town of Grenery learned that its water supply was undrinkable because of the Mincorex cobalt mine 85 miles upstream, residents blocked roads to the mine and forced it to shut down for three days.

Advanced manufacturing. Compared to coal- and gas-fired steam turbines, wind turbines and PV panels use very little water to produce electricity. But manufacturing those clean energy technologies can have major local and regional effects on water. Manufacturing accounts for roughly 6 percent of total U.S. water use but more than 75 percent of water use in the 60 counties where manufacturing

is most concentrated. Semiconductor fabricating facilities for solar PV are particularly demanding, exacerbating water scarcity issues in some places. In addition, recent contamination scares have focused attention on new risks in the energy transition:

- In 2026, nanoparticles from a manufacturing facility that built wind turbines using 3D printing were identified in the Atlantic Ocean and several freshwater sources along the East Coast. The biological impact is still unknown.

- In 2027, a solar PV production facility in Calvertal City had an accidental spill of silicon tetrachloride that contaminated the nearby Ohio River and spread downstream as far as the Gulf of Mexico.

- In the mid-2020s, hundreds of old solar panels were illegally dumped into a landfill near the Maumee River, a tributary of Lake Erie. In 2029, cadmium telluride traced back to the panels in the landfill was identified as the cause of poisoning suffered by residents.

The communities and regions feeling the effects of the energy transition on water resources most acutely are located where these issues overlap. Many parts of the country have been performing double duty by supporting both legacy fossil fuel energy and clean energy production. This is true for Monroe, which has a coal-powered thermoelectric plant and a production center for solar panels.

The number of places performing this double duty has risen because clean energy solutions have failed to keep pace with the increasing global demand for energy. For example, the Permian Basin has accelerated its rates of water depletion and contamination for oil and gas production. But the region is also a top producer of wind and solar energy in the nation and today supports several manufacturing centers for solar and wind components, exacerbating water scarcity and contamination issues. The basin is well on its way to becoming the next Colorado River Basin—with ongoing, multistate battles over water rights—because of its combination of heavy fracking and solar panel production.

As the effects of climate change accelerate—driving more communities toward Day Zero—I would be the last to suggest that progress on clean energy should be slowed. But at all levels of government and across multiple sectors of the economy, we need to identify and implement synergistic solutions that have positive effects on food, energy, *and* water or we will be doomed to watch these water crises unfold for the rest of our lifetimes. For example, the federal government could incentivize farmers to adopt water-efficient approaches and adaptation methods, such as precision irrigation or using solar panels to provide shade for crops during the hottest parts of the day, reducing the need for irrigation. The energy sector should also be incentivized to explore more water-efficient methods, including greater conservation and water reuse in energy sourcing and using fluids that can serve as alternatives to water, such as liquid carbon dioxide.

Unsurprisingly, numerous water efficiency advances have come from the private sector, which is increasingly aware of the need to cut water costs and avoid crippling water-related shutdowns. Many manufacturers, such as semiconductor foundries, are investing in water efficiency through the adoption of advanced manufacturing techniques. The most advanced manufacturers use sensors, water-efficient processes, and water recycling techniques that allow them to recycle about 70 percent of their water.

However, we also need to solve long-standing water issues like the persistent and ubiquitous problem of overallocation. One proposed solution is the concept of “water bankruptcy.” When a

jurisdiction facing a looming water crisis is allowed to declare water bankruptcy, it's given a fresh start to reallocate its water rights. The widely publicized water bankruptcy declaration by the City of Quinzy in 2026, though it faced legal challenges, caused decision-makers from other regions to take note.

Finally, decision-makers should leverage the interconnectedness between "gray" and "green" infrastructure, as well as the ways in which natural systems, including forests, floodplains, wetlands, and soils, can protect and support water quality and improve the resilience of water infrastructure.

The water crises brewing across our country stem from the divergent and conflicting needs for water resources and the lack of multisectoral planning across the nation, as well as businesses, lawmakers, and citizens treating water supplies as if they are limitless. Despite decades of research and advocacy, water management often fails to consider the deep interconnections among all components of our country's lifeline infrastructure. From county water boards to the halls of Congress, we must approach our food, energy, and water problems holistically or Day Zero will continue to creep closer.