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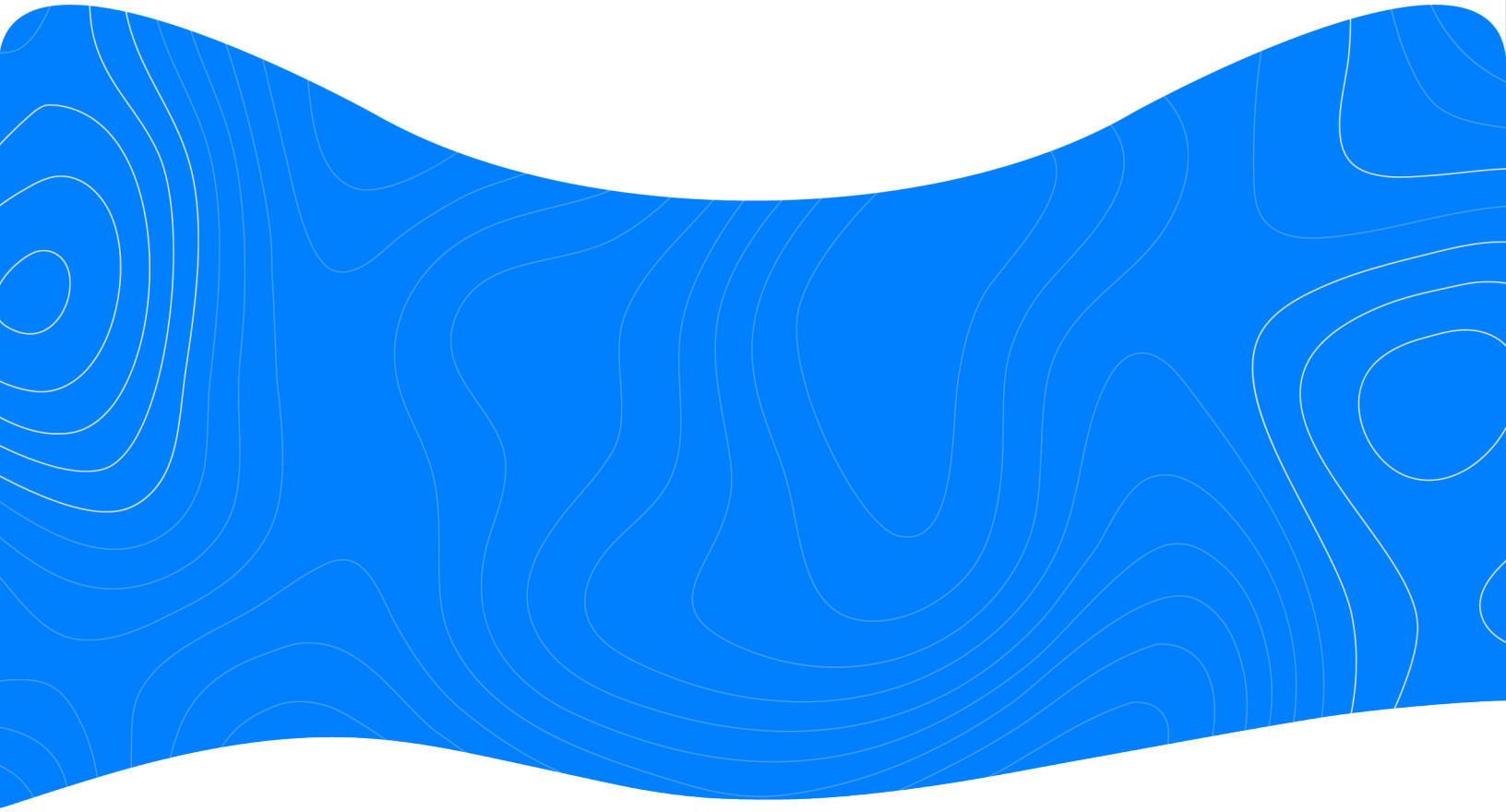
# How Utilities, Engineers, and Manufacturers Can Overcome Mounting PFAS Compliance Workloads



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# Recent federal PFAS regulations will overwhelm consulting engineers, water and wastewater utilities, and equipment manufacturers as thousands of utilities work to comply. Generative design can enable these parties to meet the workload demand and deadlines.

After years of anticipation, the EPA announced its final National Primary Drinking Water Regulation (NPDWR) in April 2024 for six Per- and Polyfluoroalkyl Substances (PFAS). Drinking water providers now have until 2029 to implement treatment solutions that reduce concentrations of these six PFAS below four parts per trillion and a hazard index of one.

Shortly following the NPDWR rule on PFAS, the EPA designated[1] perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS) as hazardous substances under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), more commonly known as Superfund. This designation obligates discharging entities like wastewater treatment plants to immediately report discharges of one or more pounds of PFOA and PFOS within a 24-hour period and to pay for or conduct investigations and cleanup.

[1] Source: https://www.epa.gov/enforcement/pfas-enforcement-discretion-and-settlement-policy-under-cercla

**Massive Workloads Are Coming – And Traditional Methods Won't Work**

While water and wastewater utilities did not create PFAS contamination, they are being tasked with remediating it. Those affected have hired engineering, procurement, and construction (EPC) firms to conduct feasibility studies and contact equipment manufacturers (OEM) for solutions. These parties, EPCs, water and wastewater utilities, and OEMs, often collaborate to submit preliminary engineering reports (PER) for approval from state and federal agencies, which is needed to initiate construction and further design.

In this process, the consulting engineer hired by the utility compiles designs, models, and calculations that support their solution. Engineering consultants depend on equipment manufacturers for technical information and assistance, while the utility depends on them for support after the installation. Completing a PER can take months of back and forth, requiring civil, electrical, and mechanical engineering specifications, designs from the manufacturer's application engineers, and utility coordination and approval.

The NPDWR and CERCLA regulations will create a massive workload for OEMs, EPCs, and water and wastewater utilities to meet PFAS compliance deadlines. The traditional way of creating PERs and capital planning will likely be too slow and inefficient. Utilities have few resources to thoroughly consider their treatment options before moving forward. Engineers will undoubtedly have many utilities coming to them for assistance, overloading their staff with proposal efforts and design work. Manufacturers will also have to spend tremendous resources to submit proposals and support projects with engineers and utilities.

**Why a Revamp is Necessary**

gathered data on these six PFAS chemicals from public water providers, hundreds of water utilities must integrate PFAS treatment technology into their existing facilities to comply with NPDWR. The EPA estimates that over 6,000 drinking water systems[2] may eventually incorporate PFAS treatment.

[2] Source: https://www.epa.gov/dwucmr/third-unregulated-contaminant-monitoring-rule

More immediately, CERCLA's hazardous substance designation of PFOA and PFOS will force numerous industrial and municipal wastewater treatment facilities to reconsider their treatment process to avoid violations, litigation, and public mistrust.

PFAS symbolizes a new generation of water contaminants. Utilities, EPCs, and OEMs must embrace new technologies to regain the time necessary to take on upcoming workloads, compare treatment options, and expedite the PER process. By harnessing artificial intelligence, machine learning, and digital technology that follows the traditional design process and produces PERs in hours instead of months, these parties can work together to redefine how water and wastewater projects are designed.

## Background: The State of PFAS

PFAS are a broad group of synthetic chemicals used in consumer products and industrial applications for their water- and grease-resistant properties. This has led them to be featured in non-stick cookware, waterproof clothing, and food packaging, among countless others.

However, the persistent nature of PFAS compounds in the environment has led to concerns about their potential adverse effects on human health and the ecosystem. NPDWR and CERCLA aim to remove or reduce PFAS from water to concentrations that are safe for human consumption and environmental health.

PFAS Contamination Sources
PFAS contamination can arise from various sources, contributing to the widespread presence of these compounds in water and soil. The most common contamination sources include:

- **Industrial Releases:** Industries that produce PFAS-containing products, such as textiles, electronics, and chemical manufacturing, can release PFAS compounds through effluent discharges and improper waste management.

- **Firefighting Foams:** PFAS compounds are an active ingredient in aqueous film-forming foams (AFFFs), commonly used in firefighting and fire training exercises. Accidental spills, firefighting practices, and training activities have caused soil and groundwater contamination in and around fire training areas and airports.

- **Landfills and Land Application:** Disposal of PFAS-containing materials, such as consumer products and biosolids, can result in PFAS compounds leaching into soil and groundwater near landfills, disposal sites, and agricultural operations.

- **Air Deposition:** PFAS compounds released into the atmosphere from industrial processes or landfills can settle onto water bodies and soil.

**PFAS Treatment Solutions**

Regulatory agencies have taken steps to address PFAS contamination, setting guidelines for acceptable levels in drinking water and encouraging the development of effective treatment technologies. OEMs have worked to create PFAS treatment technologies that remove these chemicals from water, researching and developing treatment methods and advancing our understanding of PFAS behavior in different environmental settings. Proven PFAS solutions include:

- **Activated Carbon Adsorption:** The surfaces of granular activated carbon (GAC) and powdered activated carbon (PAC) adsorb PFAS compounds, removing them from water. This method effectively removes many PFAS compounds and is commonly used in water treatment facilities to treat a host of contaminants

- **Ion Exchange (IX):** Ion exchange resins attract and replace PFAS ions in water with less harmful ions. This method can achieve high PFAS removal efficiencies and is often employed in drinking water and industrial wastewater treatment processes.

- **Membrane Filtration:** Membrane filtration techniques, such as reverse osmosis (RO) and nanofiltration (NF), remove PFAS compounds from water by physically blocking their passage through a semi-permeable membrane.

- **Advanced Oxidation Processes (AOPs):** Advanced Oxidation Processes (AOPs) generate hydroxyl radicals that break down PFAS compounds into less harmful byproducts. AOPs are effective in treating complex PFAS mixtures and are often used with other treatment methods.

## How These Changes Will Strain Different Stakeholders

Utilities, EPC firms, and OEMs are scrambling to evaluate capital plans and technologies that comply with the stringent NPDWR rules for PFOA, PFOS, PFHxS, PFNA, and GenX chemicals. The work necessary strains each party in different ways.

- **Utilities:** Regulations are dynamic. Federal guidelines may continue to add some of the thousands of PFAS chemicals to NPDWR and CERCLA. Utilities must be prepared for current regulations but have little time or budget to consider solutions that will treat today's and tomorrow's PFAS regulations, leaving them incapable of futureproofing their facilities. This could lead to spending public funds on solutions that won't comply with future regulations, disrupting future capital planning.

- **OEMs:** Providers of one of the four proven PFAS solutions are likely unprepared for the onslaught of requests from utilities and consultants. As proposal standards become more detailed, application engineers may be inundated with PFAS workloads,

forcing manufacturers to forego sales opportunities and increase their lead times.

- **EPCs:** EPCs will likely be overburdened with requests from utilities to design PFAS solutions, a process that OEM proposal bottlenecks may delay. As PFAS projects abound, EPCs may be forced to "no-go" PFAS and non-PFAS projects to spend time on PERs and pursuits.

This inefficient process leads consultant engineers to copy and paste solutions from past projects to save time, but this doesn't push the industry forward, which is needed for this new generation of contaminants. Given the EPA's deadlines, EPCs, utilities, and OEMs must have faster ways of comparing solutions, making informed decisions, and producing design reports to initiate the approval process.

## Final PFAS National Primary Drinking Water Regulation[3]

| Compound | Final MCLG | Final MCL (enforceable levels) |
|---|---|---|
| PFOA | Zero | 4.0 ppt (also expressed as ng/L) |
| PFOS | Zero | 4.0 ppt |
| PFHxS | 10 ppt | 10 ppt |
| PFNA | 10 ppt | 10 ppt |
| HFPO-DA (commonly known as GenX Chemicals) | 10 ppt | 10 ppt |
| Mixtures containing two or more of PFHxS, PFNA, HFPO-DA, and PFBS | 1 (unitless)<br><br>Hazard Index | 1 (unitless)<br><br>Hazard Index |

[3] Source: https://www.epa.gov/sdwa/and-polyfluoroalkyl-substances-pfas

## A Way Forward: Design Generation for a New Generation

Using generative software backed by artificial intelligence, EPCs, utilities, and OEMs can simulate multiple treatment scenarios and in hours produce PERs that historically took months or years. PFAS is a 21st-century threat. 21st-century technology must be depended on to address PFAS and innovate water and wastewater treatment without compromising the industry's commitment to public health and safety.

Like today's design process, generative design can consider all the parameters that engineers, manufacturers, and utilities need to design a solution while harnessing the knowledge of thousands of designs. Once a solution is chosen, this technology can quickly generate accurate preliminary engineering documentation that juxtaposes the feasibility of GAC and IX systems to remove PFAS.

## Case In Point

Born from an equipment manufacturer trying to simplify its proposal process to win more work and increase the output of its application engineers, Transcend Infrastructure has been developing generative civil engineering design tools for over twelve years. Its primary product, the Transcend Design Generator (TDG), optimizes capital planning, operations costs, and sustainability for utilities and their vendors. TDG has been involved in 20,000 design projects in more than 70 countries, touching the water and power infrastructure of over 200 million people. The technology has been used by well-known water industry names, such as Severn Trent, Arcadis, and Xylem.

**How TDG Works**

TDG goes to great lengths to understand raw water characteristics, project drivers like footprint, energy consumption, and budget, and guardrails against bad data inputs to correctly design water and wastewater infrastructure, including PFAS solutions. Engineers, utilities, and manufacturers using the TDG see an eighty percent time reduction on PERs,

which equates to hundreds of thousands of dollars saved, depending on the complexity and size of the project. Once a generated design has been chosen, the TDG creates preliminary engineering reports within hours that are ready for submission to government entities. These generations include technical descriptions, an equipment list, process schemes, site plans, and schedules that are all editable in Word, Excel, Revit, and the CAD suite.

***"In a short period of time, you can have a preliminary design in minutes instead of six months."***

– Angelita Maria Fasnacht, Ph.D.

- **How Generative Design Helps Utilities:** The TDG helps asset owners and utilities evaluate more options in their capital planning and conceptual design processes, accelerating capital projects and reducing project risk. The tool aids in feasibility studies, master plans, and can also streamline technology comparisons. After deciding on a design, the TDG can generate tenders or bids to advertise with requests for proposals.

- **How Generative Design Helps EPCs:** Pursuing work and submitting proposals is expensive and non-billable. With the TDG, consultants can input existing infrastructure and the client's needs to generate multiple options in a fraction of the time. It also allows EPCs to take on more projects. The TDG empowers engineers to bring more value to their clients by enabling them to evaluate more options and scenarios, all with significantly more detail, during capital planning and preliminary design. By reducing resources spent on design and letting software do the monotonous aspects of design, engineers can focus on more innovative and value-added work. For those pursuing collaborative delivery methods, such as design-build, the TDG helps predict a project's costs to reduce the risk of exceeding the guaranteed maximum price.

- **How Generative Design Helps OEMs:** Like EPCs, OEMs struggle with the workload of pursuits and proposals. Application engineers must spend hours on pursuits without any promise of winning the work. With the TDG, OEMs can generate detailed modeling, compare themselves to their competitors, and take on more pursuits with their existing resources.

Additionally, OEMs can submit their technology to Transcend Infrastructure so that their technology is considered when EPCs and utilities use the platform. If their solution is chosen, they can be put directly in contact with the party generating the design.

In addition, the TDG can be an onsite tool for each party to discuss options by running simulations on their tablets. The software provides 3D models that help visualize the project and can be used as community outreach assets. The generated PERs can also include company logos that are consistent with company branding.

## A Solution that Benefits All Stakeholders

New federal PFAS regulations stand to overwhelm utilities, EPCs, and OEMs with increased workloads, short deadlines, and limited resources to meet them. The traditional process of capital planning and completing PERs will likely limit design and technology options for water and wastewater utilities, resulting in sub-optimal solutions that cost more to design, fund, and operate.

The water industry is due for a new approach to considering options, collaborating, and gaining approval from regulatory bodies. Generative design can accelerate technology comparisons and PER compositions, supplying utilities, OEMs, and EPCs with the time, finances, and bandwidth necessary to take on current and future PFAS compliance.

Interested in seeing generative design in action? Watch Transcend's webinar showcasing how generative design technology can design and compare IX and GAC solutions for PFAS in minutes.

## About Transcend

Transcend is a leading Software-as-a-Service (SaaS) company developing generative design engineering tools for the global engineering, construction, technology/OEM, and utility sectors. Their revolutionary platform, the Transcend Design Generator (TDG), integrates various engineering design disciplines into a hosted cloud-based software, enabling users to input data and automatically generate complete preliminary engineering designs for a wide range of critical infrastructure projects and vertical assets. For more information, visit transcendinfra.com.