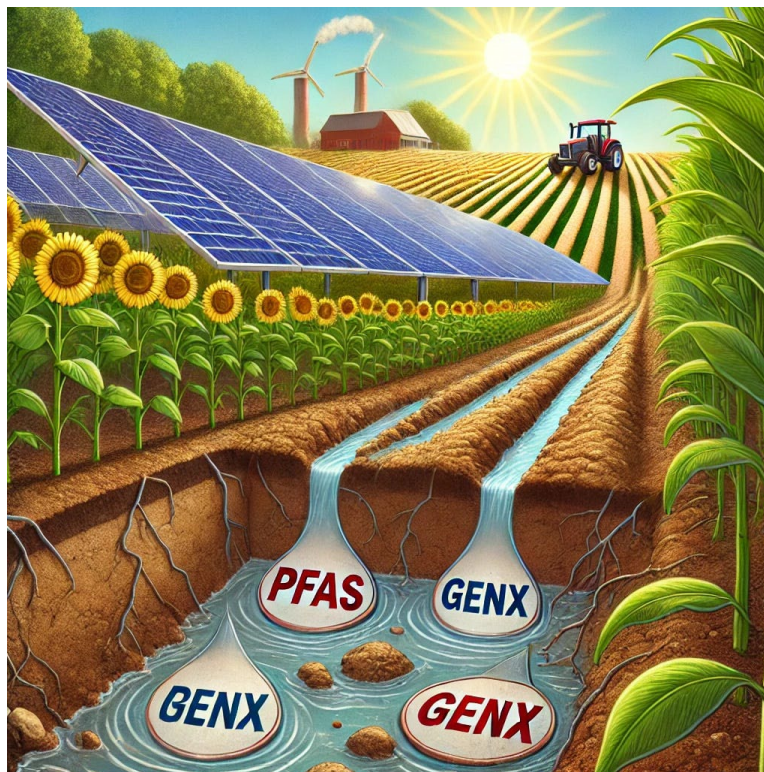


# PFAS and Their Potential Environmental Impact on Rural Community

As exploiting prime farm land for solar energy generations has seeming become increasingly important in rural areas, it's crucial to understand what makes solar panels work efficiently. Many photovoltaic (PV) modules can be, or are, coated with advanced materials designed to maximize energy output by reducing dust accumulation, reflection, and glare. These coatings are often engineered with chemicals known as PFAS (per- and polyfluoroalkyl substances), which possess unique properties that make them ideal for outdoor applications. However, PFAS also come with environmental and health concerns, especially for rural communities and farmers who rely on clean soil and groundwater. Here, we explore the role of PFAS in solar panel coatings and their potential adverse effects on the environment and human health.



## **What Do Coatings Do for PV Modules?**

Modern PV panels feature three primary types of coatings to enhance performance:

- **Anti-Reflective Coatings (ARCs):** These coatings reduce the reflection of sunlight on the panel surface, allowing more light to penetrate and convert into energy. By reducing reflection, ARCs can improve overall panel efficiency.
- **Anti-Soiling Coatings:** Dust and dirt accumulation can drastically reduce the efficiency of solar panels, especially in dry, dusty environments like rural farmlands. Anti-soiling coatings make it harder for dust to stick, maintaining the panels' efficiency longer between cleanings.
- **Anti-Glare Coatings:** Solar panels can sometimes create intense reflections that are a safety concern in certain settings, such as near airports or roads. Anti-glare coatings reduce this reflection, making PV installations more versatile.

These coatings undoubtedly improve solar panel performance and longevity, but they also bring unintended consequences due to their chemical composition.

## **The “Secret Ingredient” with Hidden Costs**

PFAS are synthetic chemicals valued for their water-repellent, oil-resistant, and durable properties. While these qualities make PFAS an ideal choice for solar coatings, they have a dark side. PFAS are often referred to as “forever chemicals” because they persist in the environment, resisting breakdown in soil, water, and living organisms.

The use of PFAS in PV module coatings enhances their durability, helping solar panels perform under challenging environmental conditions. However, these chemicals can also leach out of the panels over time, especially as the coatings wear down under UV exposure, rain, and physical abrasion. This leaching can pose a risk to nearby soil and water sources.

## **Lessons from Teflon: A Warning from History**

Teflon, a well-known product made from a type of PFAS, was praised for its non-stick and durable properties but became infamous for its environmental and health consequences. Manufactured by DuPont, Teflon's production resulted in PFAS contamination in areas surrounding manufacturing facilities, affecting thousands of people across several states.

## **Widespread Exposure and Health Implications**

PFAS exposure linked to Teflon production was widespread. Communities in the Ohio River Valley, where Teflon was produced, saw significant PFAS contamination in their water supplies. Research by the C8 Science Panel, which studied the health effects on exposed populations, linked PFAS exposure to serious health conditions such as kidney and testicular cancers, thyroid issues, immune system impacts, and developmental problems in children. Many residents were unaware of the contamination for years, and lawsuits against DuPont led to over \$670 million in settlements, with additional cases still pending.

## **What This Means for Rural Communities Today**

The Teflon case serves as a cautionary tale for rural communities and farmers where solar installations are being developed. Like the chemicals used in Teflon, the PFAS in solar panel coatings can potentially leach into groundwater or nearby soil, where they may affect water supplies and crop health. In communities that rely on well water and uncontaminated soil, even trace amounts of PFAS can lead to long-term consequences.

## **The Potential for PFAS Leaching from PV Modules**

Solar panels are often promoted as eco-friendly, but the reality is that PFAS in coatings could impact local environments. As these coatings degrade over their estimated 10- to 20-year lifespan, they may release PFAS into rainwater runoff, potentially contaminating nearby water sources.

*For example:*

- Anti-Reflective Coatings have a lifespan of around 15–20 years, but as they degrade, PFAS compounds may slowly release into the environment.
- Anti-Soiling Coatings, typically lasting about 10–15 years, are constantly exposed to abrasive dust and wind, which could increase PFAS leaching.
- Anti-Glare Coatings share a similar 15–20-year lifespan and face exposure to sun, wind, and rain, gradually wearing down over time.

In rural areas where solar farms are established, this leaching could be particularly concerning for groundwater contamination, as wells are often the primary source of drinking water for both people and livestock.

## Environmental and Regulatory Concerns

As awareness of PFAS issues grows, regulatory bodies are taking steps to limit their use and address contamination concerns. In the U.S., the Environmental Protection Agency (EPA) has issued advisories about PFAS levels in drinking water, and some states are pursuing stricter regulations to manage PFAS in consumer products. However, there are currently limited regulations specific to PFAS in solar panel coatings, meaning there are few requirements for solar companies to monitor or mitigate potential contamination.

## What Rural Communities Can Do

If you are considering a solar installation on your farmland or in your community, here are a few steps to protect your local environment and health:

- **Inquire About Coatings:** Ask solar developers about the coatings used on panels and whether they contain PFAS. Explore options for non-PFAS-coated panels if available.
- **Request Environmental Monitoring:** Encourage solar companies to conduct regular environmental assessments, particularly if your area relies on groundwater. Monitoring can help detect early signs of contamination.
- **Stay Informed About Regulations:** Keep up with local and federal regulations regarding PFAS in solar technology. The more communities are aware of PFAS risks, the greater the pressure on manufacturers to adopt safer practices.
- **Support Research and Advocacy:** By supporting efforts to study PFAS in solar technology and advocate for safer materials, rural communities can help drive change in the industry.

## Balancing Solar's Benefits with Environmental Responsibility

In closing, solar energy and its advocates purport that utility-scale solar facilities have incredible promise, especially for rural communities and farmers looking to create “a sustainable future”. But as with any technology, it’s essential to understand the hidden impacts that can arise. PFAS coatings in solar panels provide enhanced performance but carry risks that are familiar to those who know the Teflon story.

Learning from the past, rural communities and farmers can advocate for safe and environmentally responsible solar installations. By pushing for transparency and safer alternatives, we can ensure that solar technology continues to benefit people and the planet without compromising the health of our water, soil, and future generations.

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