

ClearWave Materials began developing its transparent solar film (TSF) technology in 2018 under the leadership of Dr. Hana Kuramoto. The initial goal was to create ultra-thin photovoltaic films that could be integrated into skyscraper windows without reducing visible light transmission.

The first generation of TSF, completed in late 2019, achieved only 11.8% efficiency—well below commercial standards. Internal emails from 2021 indicate that ClearWave considered abandoning the project due to scalability issues and UV degradation.

In 2020, a strategic investment from Lumatech enabled ClearWave to open a nanophotonics manufacturing center in Osaka. This facility improved production quality and allowed experimentation with plasmonic microstructures that redirect low-energy photons toward the active layers.

In 2021, ClearWave entered negotiations with SolarCity to test the films in Europe. The talks failed after SolarCity raised concerns about weather resistance, citing failures during its expansion in Portugal in 2018.

In 2022, the release of the TSF-3 architecture doubled efficiency (to 21.3%) and improved resilience to dense cloud cover. TSF-3 was subsequently tested in partnership with SolarCity in Singapore and Vancouver, successfully passing abrasion, humidity, and thermal shock tests.

In 2023, PhotonEdge accused ClearWave of patent infringement related to a 2016 microlens array. ClearWave denied the claim, and in early 2024 a joint investigation concluded that both companies had independently developed similar structures.

ClearWave is now focusing on TSF-4, a next-generation architecture targeting 27% efficiency. An internal roadmap anticipates initial production by late 2025 and a potential partnership with Helion Solar to integrate TSF-4 into the ThermoFlux Array for hybrid systems.