

# Enhanced Durability Ensures High Performance Windows Deliver Resilient Savings and Emissions Reductions for Deployment Across Broad Markets

## NREL Window Core Program

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### BACKGROUND / INDUSTRY IMPACT

- High-performance windows offer the promise of energy savings, emissions reductions, and improved human comfort/quality of life, but benefits are not realized if technologies do not perform over time.
- Demonstrated durability of emerging technologies builds confidence in energy/emissions savings that ensure investments across broad communities deliver on their promise.
- Durable window performance impacts human-centric buildings with occupant desired features (connection with the outside world and daylight) while simultaneously improving energy performance and emissions reductions.
- NREL acts as an objective third party in developing and deploying enhanced durability evaluation methods for emerging technologies.

### PROJECT OVERVIEW / OBJECTIVES

- Our team provides the science and engineering background to develop, demonstrate, and deploy methods to assess the durability of emerging window technologies, define new industry standards, and improve current industry practice.
- Our key objectives include development of new standards and transfer to private sector test houses and industry certification bodies.

### APPROACH

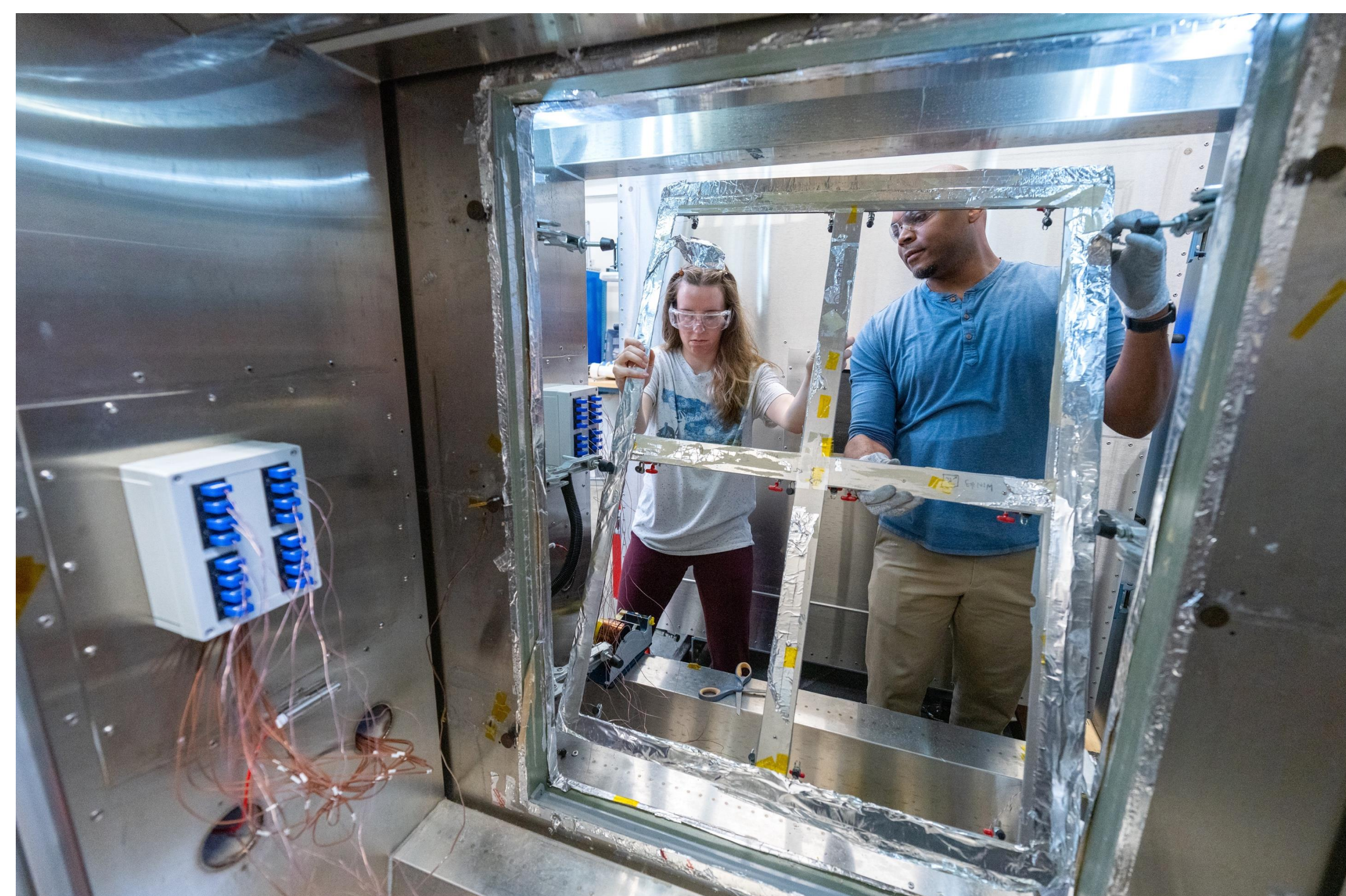
- NREL has developed and published enhanced protocols for durability evaluation of high-performance windows based on leading practice as well as improved evaluation metrics that focus on energy performance.
- We are currently engaged in active research and deployment of this method with over eight industry partners accelerating improved durability into the market.
- NREL research capabilities for enhanced weathering of emerging technologies are being used to define new standards and provide information to industry standard setting and certification bodies.

### FUTURE WORK

- NREL is currently transferring enhanced durability evaluation protocols to industry partners and will use this effort to define new industry standards.
- On-going work focused on determination of failure modes of vacuum insulating glass will inform and define emerging industry standards.

## Research Outcomes

- Publication of NREL “Guidelines and Specifications for Enhanced Durability Evaluation of Insulating Glass and Vacuum Insulating Glass Unit.”
- Industry adoption of enhanced durability guidelines with over eight partners actively engaged with NREL research and deployment efforts.
- Adoption of enhanced durability practices in standards required for industry certification.



NREL team engaged with multiple industry partners who have provided over 50 samples to evaluate failure modes and define durability assessment requirements for vacuum insulating glass in support of ISO and ASTM standards development.

## Impact

- Adoption of enhanced durability evaluation methods improves the long-term performance of current market technologies.
- Improved long-term performance provides assurance that energy savings will offset cost of adoption thereby opening the door to potentially more credible financing options to broaden market reach.
- Demonstration of durability of emerging technologies increases confidence in the market leading to increased investment, job growth, deployment, and associated energy savings and emissions reductions.



NREL research into the durability of emerging photovoltaic glazing products enabled installation and field evaluation to verify energy benefits and impact for building occupants and technology developers.