



### **NHERI WOW EF: Facility**





- Open jet large wind tunnel
- 12 electric fans in an arc-focal arrangement
- Wind field cross-sectional area:
  20ftx14ft (WxH)
- Wind speed range: 10mph 157mph
- Open, Suburban and Uniform exposures
- Turn table diameter: 16ft
- Turn table capacity: 105,000lb static and 52,000lb dynamic
- Rotational speed range: 0.015-0.0014 min/deg

### **NHERI WOW EF: Key Strengths**



#### **Unique Experimental Resources and Testing Capabilities**

- Up to Category 5 hurricane winds simulations
- Multi-Scale Testing (full-, large-, small-scale)
- Destructive Testing (to predict progressive failures in buildings and infrastructure elements)
- Wind-Driven Rain simulations (to study water intrusion)
- Various Structures (buildings, bridges, renewable energy systems, lifeline infrastructures)

## **NHERI WOW EF: Facility**

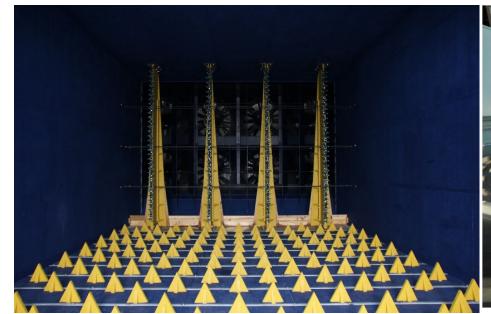




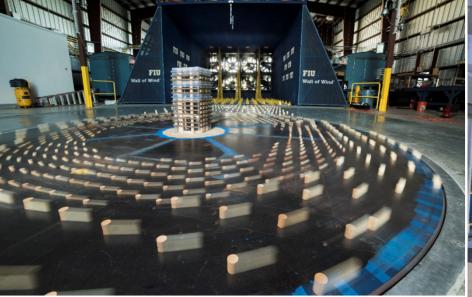
Building and Operations and Control Center



Control Room



Flow Management and Rain Nozzles



WOW Turntable (16 ft. Diameter)



Staging Area

#### **NHERI WOW EF Team**





Arindam Chowdhury, PhD Director and PI Professor



Peter Irwin, PhD Co-PI Professor of Practice



Ioannis Zisis, PhD Co-PI Associate Professor



Amal Elawady, PhD Co-PI Assistant Professor



Seung Jae Lee, PhD Associate Professor



**Manuel Matus Graduate Student Assistant** 



**Walter Conklin** Laboratory and EH&S Manager



**Roy Liu-Marques** Project Engineer

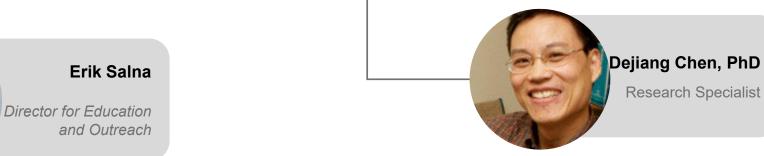


Steven Diaz, PhD Site Operations Manager



James Erwin Research Specialist

Research Specialist



## **New Capabilities!**



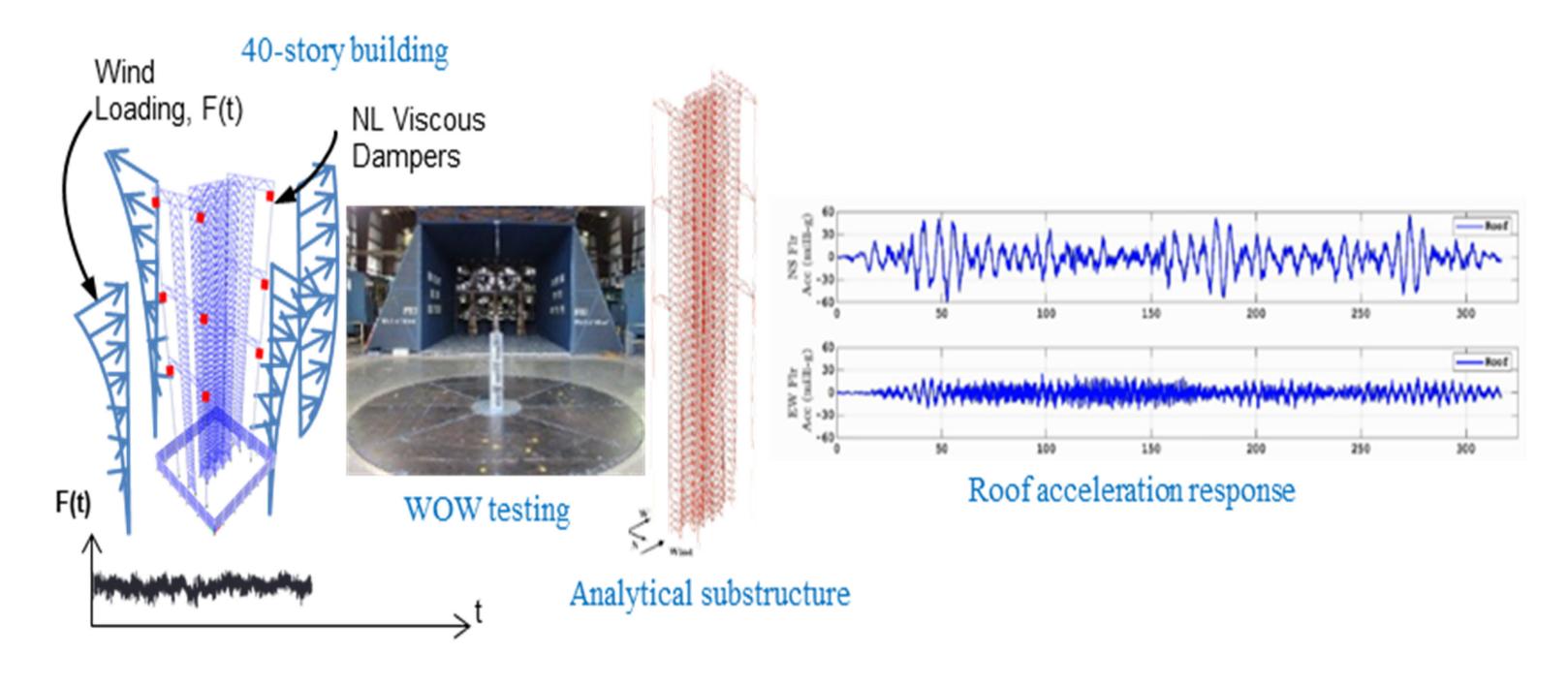
#### Non-Synoptic, Downburst Flows and Their Interactions with Structures



### **Cross-Awardee Capabilities**



#### WOW EF and Lehigh EF to enables Real Time Hybrid Simulation (RTHS) for wind applications



#### **NHERI Vision**



#### The vision for NHERI is to enable frontier research and education to:

Predict the lifecycle performance of civil infrastructure under hazards

Reduce reliance on physical testing through computational modeling

• Translate research into innovative mitigation strategies and technologies

• Integrate research, education, outreach to train a inclusive STEM workforce

## Lifecycle Performance of Civil Infrastructure



Example: Full-scale testing to study performance of systems under wind



**Findings:** Considerably higher suctions with larger non-uniformity for trapezoidal roof; The panel vibrations in the trapezoidal roofs crept into the panel-ribs causing high deflection and failure.

## Lifecycle Performance of Civil Infrastructure



Example: Aeroelastic and aerodynamic responses of traffic signal systems

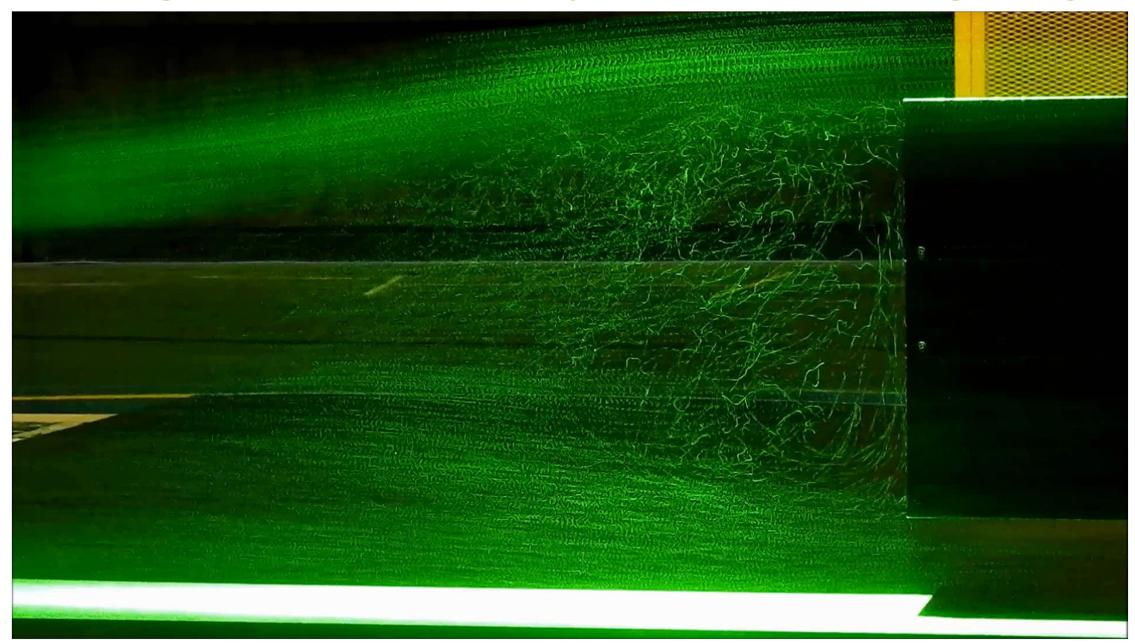


Findings: Instability sets in at critical wind speed causing failure.

## Reduce Reliance on Physical Testing



Example: Validating numerical and computational modeling using PIV system



Outcomes: New niche in fundamental fluid mechanics area to propel transdisciplinary research.

#### Translate Research into Innovations!



#### **Example: Aerodynamic mitigation and power system (AMPS)**



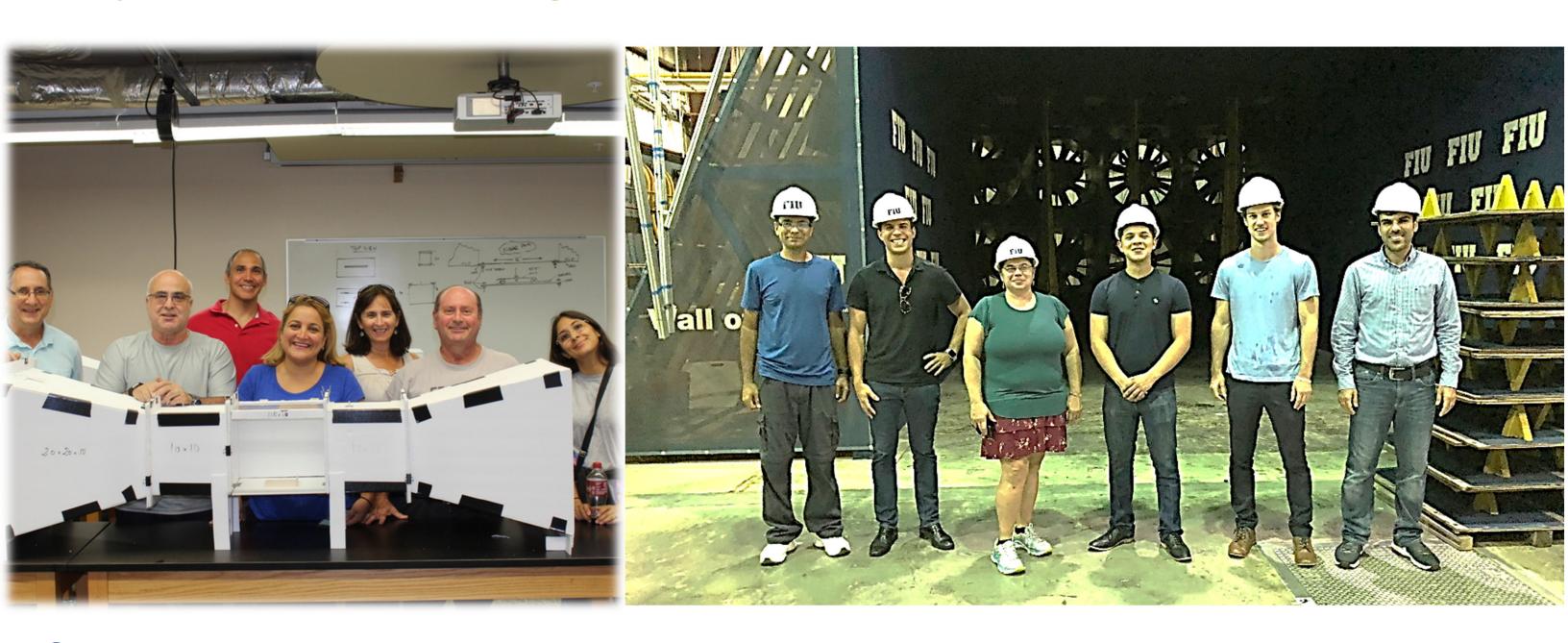
Patented: US 2015/0345472 A1

**Findings:** AMPS can reduce wind loads by changing the flow structure, disrupting conical vortices; Simultaneous production of wind (green) energy to combat power outages and supplement grid power.

### Integrate Research, Education, and Outreach



#### **Example: REU, RET, K-12 Programs**



**Outcomes:** Train teachers and students to build an inclusive STEM workforce

#### **NHERI WOW EF "TAKEAWAYS"**



- Summary of the type of services available to users
- Test specimen design, construction and instrumentation;
- Test protocols and software implementation;
- Operating the WOW for NSF projects' experiments;
- High-definition video recording; data acquisition/archiving;
- Safety and user training (as needed);
- Assisting during the NSF proposal development stage.
- Contact information, including website and email



Arindam Gan Chowdhury, PI and Director, NHERI Wall of Wind (WOW) Experimental Facility (EF)

E-mail: chowdhur@fiu.edu

NHERI WOW EF Webpage: <a href="https://fiu.designsafe-ci.org/">https://fiu.designsafe-ci.org/</a>

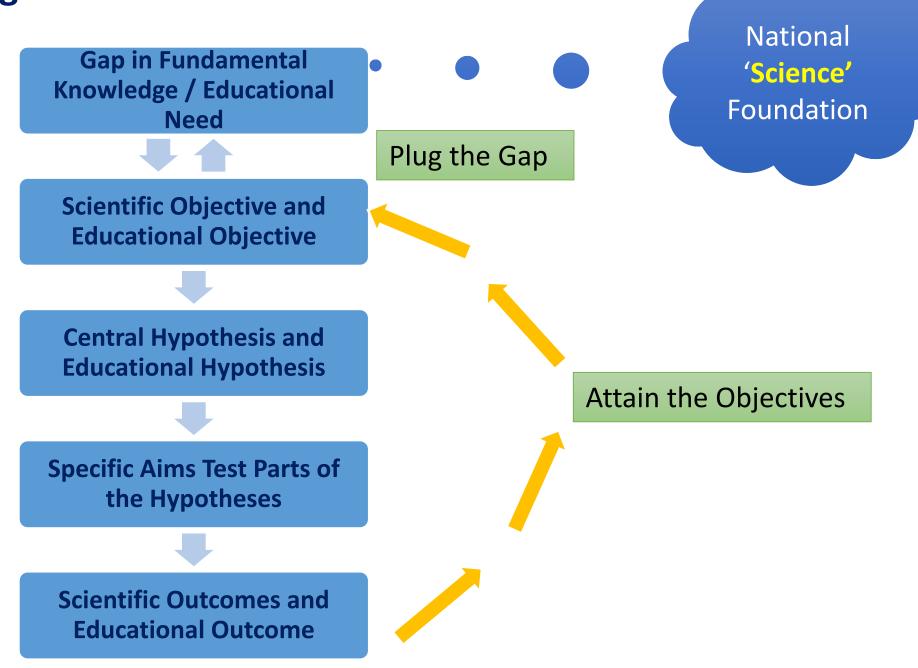
Images depicting services provided



#### **Competitive NSF Proposals**



Linear Progression of Logic



# NHERI WOW EF Workshops

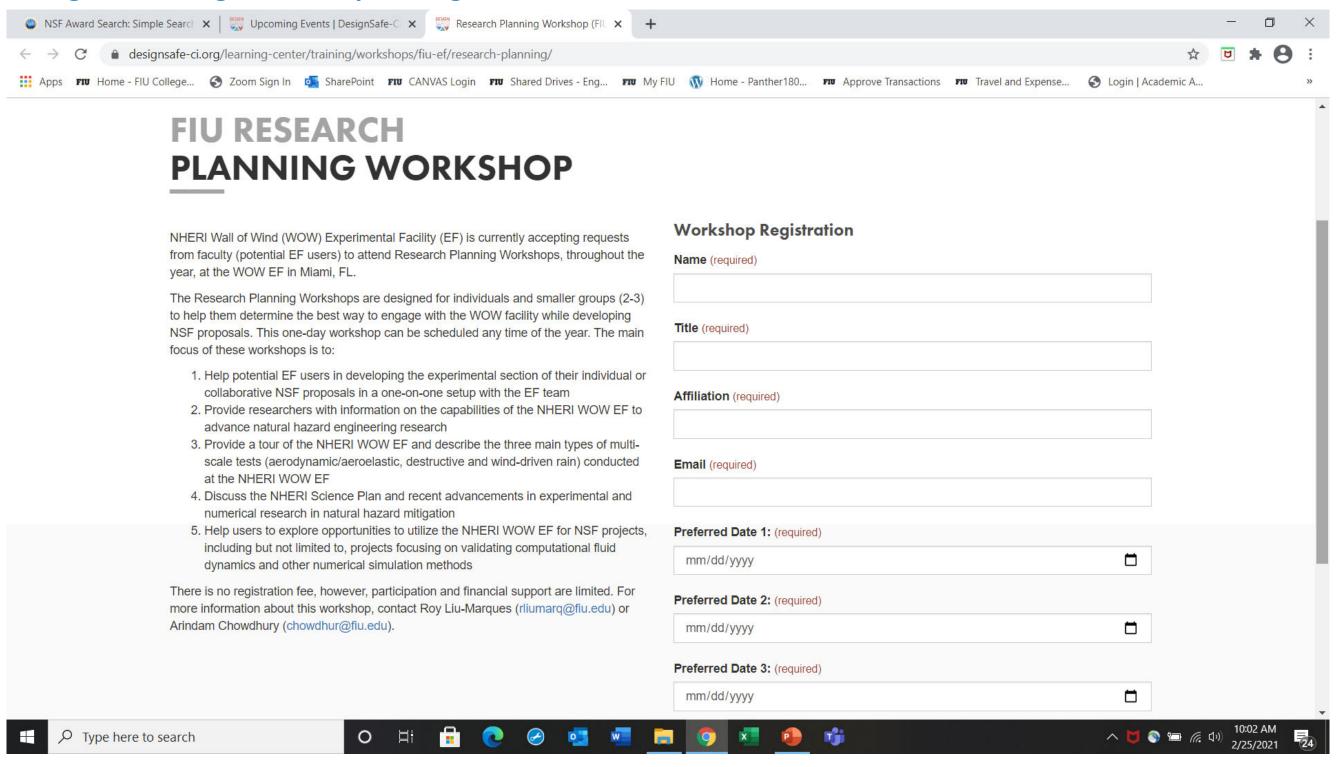




### Research Planning Workshop



#### https://fiu.designsafe-ci.org/events/upcoming-events/







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