



# AS THE WORLD AND CLIMATE CHANGE, **SO DO WE**

Owens Corning Wind

September, 2021

# TODAY ON STAGE



**BRUNO VARANDAS**

Sales Manager, Wind  
**Owens Corning**



**RAFAEL REGATTIERI**

Global Technical Leader, Wind  
**Owens Corning**



**HOW WE  
POWER NOW™**

how we p

**HWPVN VIDEO**





**WE ARE PASSIONATE ABOUT  
MATERIALS SCIENCE**

# OWENS CORNING COMPOSITES



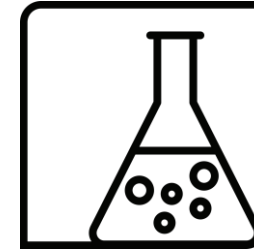
**OVER 80  
YEARS AGO**

Creators of the first viable glass fiber product & composite application.



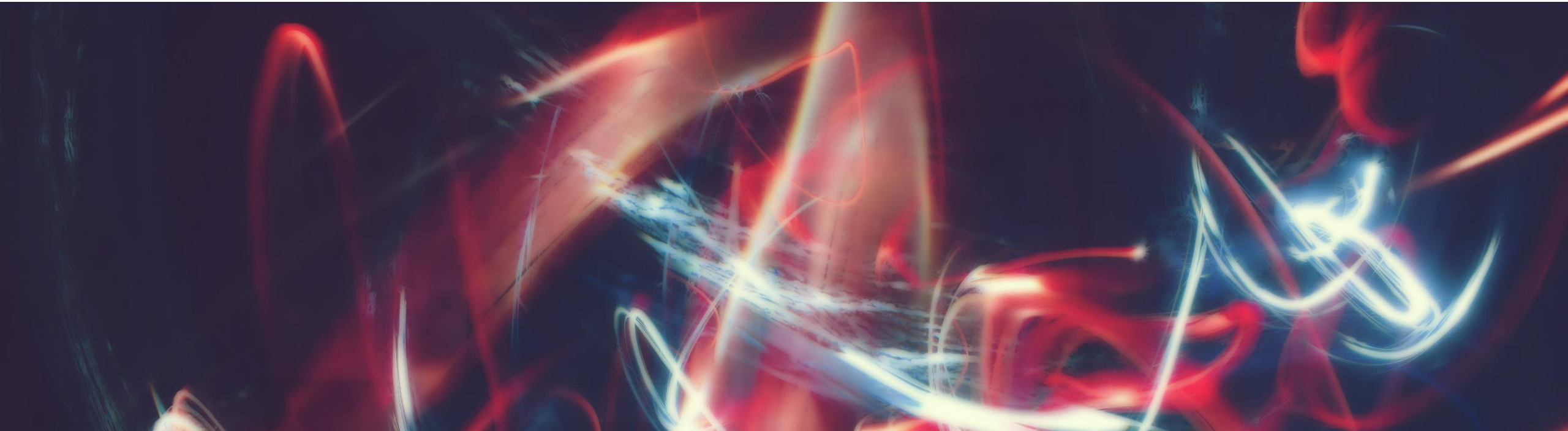
**WE MAKE  
IT REAL**

Leaders in new technology & applications development.



**MATERIALS  
SCIENCE**

Designers of the glasses that have set the industry standard for wind.

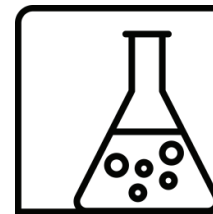
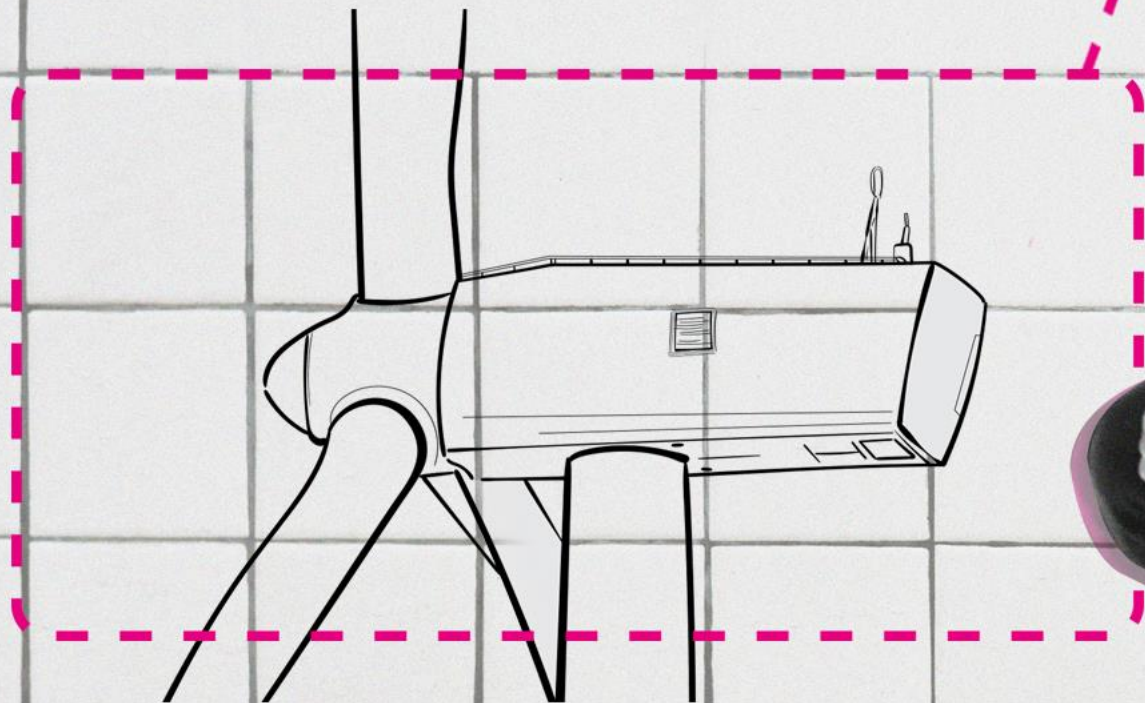


# PARTNERSHIP & CLIMATE CHANGE FEED OUR PASSION





# YOUR MATERIAL ENGINEERING **PARTNER**



We design glasses and material systems with the blade designer and engineer in mind

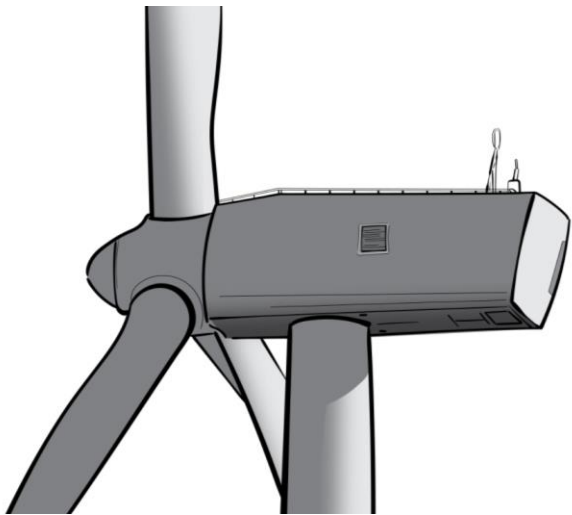


Thinking about the sustainability of the whole blade and how higher performing glasses can reduce its overall impact



This mindset is taking us to what comes next

# TURBINE SYSTEM BREAKDOWN

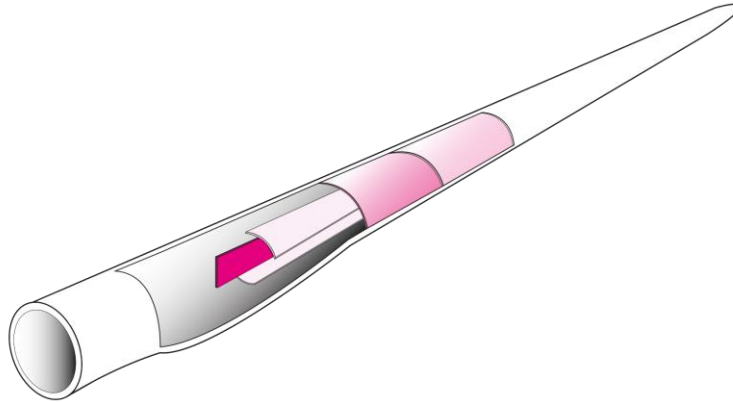


**33.5%**

Nacelle

**20%**

Rotor

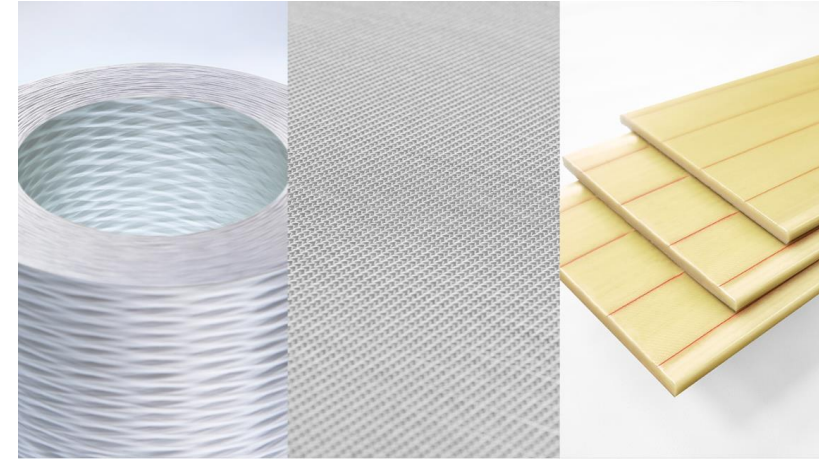


**50%**

Materials

**20%**

Labour



**40%**

Reinforcements

**27%**

Resin

The challenge: new materials and product form factors that enable new wind blade designs and lower cycle-time



# WIND BLADES X THE COST OF ENERGY (COE)

$$\text{CoE} = \frac{\text{FixedChangeRate} * \text{InitialCapitalCost}(p)}{\text{AEP}(p)} + \text{AnnualOperatingExpenses}(p)$$

## OEM's 3 main costs

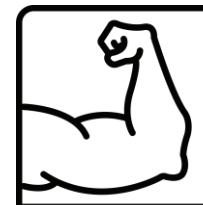
1. Initial capital cost
  - Turbine (including blades)
  - Tower & Foundation
  - Etc.
2. AEP
  - Annual Energy Production
3. O&E cost
  - Operational costs



**1. Blades cost reduction**

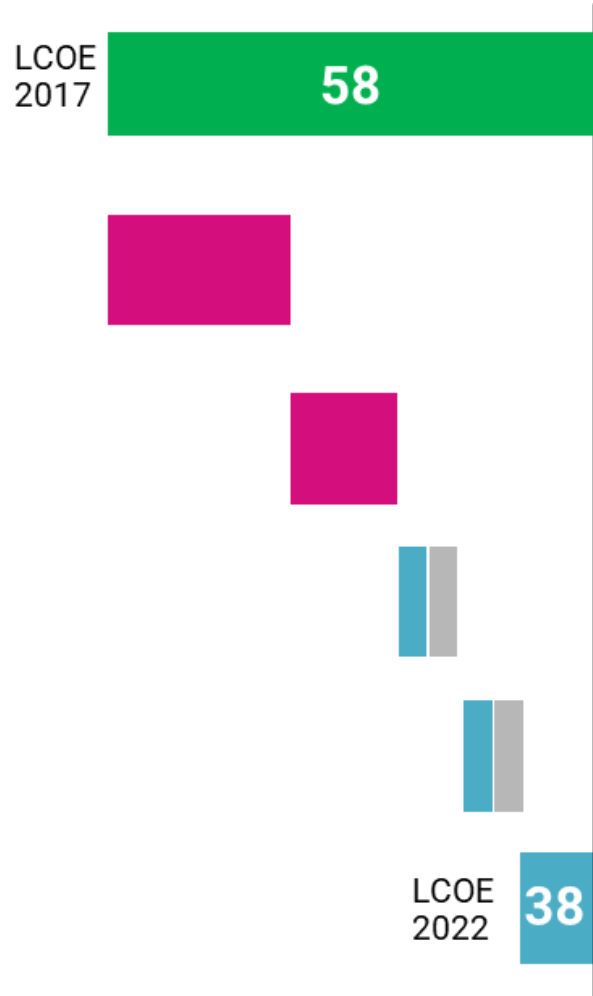


**2. Improve energy generation efficiency**



**3. Improve stiffness**

# MATERIAL SCIENCE IS KEY



## Technology group and potential future impact

Rotor	15%	Longer blades: lightweight structures, load reducing pitch, reduced cost manufacturing
Tower	10%	Taller towers: enable by longitudinal segmented designs and concrete hybrid
Drivetrain	13%	Larger MW ratings: improved reliability geared drivetrains with variable rating capabilities
Electrical and controls	18%	Converter cost out: MW rating upgrades to take advantage of site conditions and turbine loading
2022 Entitlement	12%	Lower CAPEX Wind plants: economies of scale and technology improvement

AEP CAPEX OPEX



HOW WE POWER NOW™

SOURCE: Data source Wood Mackenzie Power & Renewables December 2018, Dong Energy UK, Nextwind Inc, Reuters 2017

# INTRODUCING THE H<sup>2</sup> GLASS GENERATION

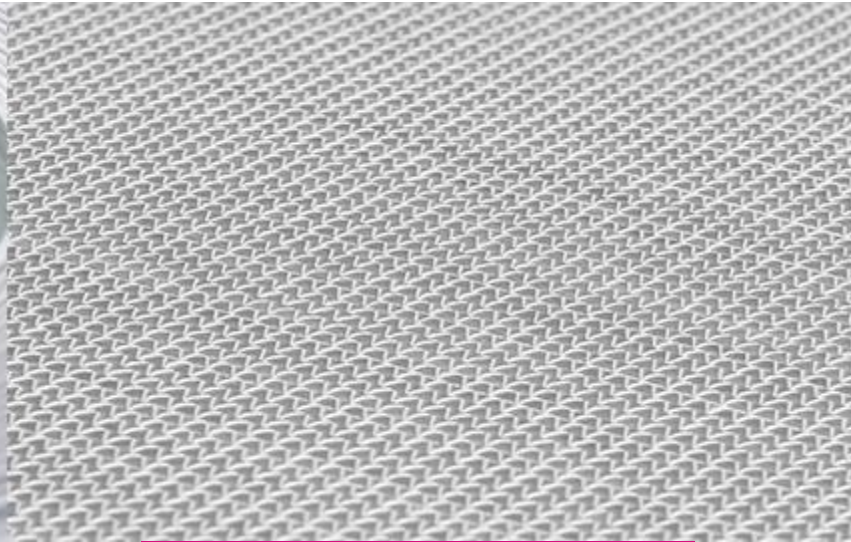
**MORE MODULUS. TRUE PERFORMANCE. RELIABLE SUPPLY.**



## H<sup>2</sup> GLASS

**Designed to power more sustainable wind blades.**

- Patented technology that delivers the highest specific modulus in its class
- Now available with dedicated, reliable large-scale production



## ULTRABLADE® 2

**Ultra-design by fabric scientists.**

- Manufactured with the world's best fabric technology at Owens Corning's state-of-the-art facilities



## ULTRASPARK™ 2

**Consistency and efficiency, all in one.**

- Pultrusion allows us to maximize the power of H<sup>2</sup> Glass



# INTRODUCING THE H<sup>2</sup> GLASS GENERATION

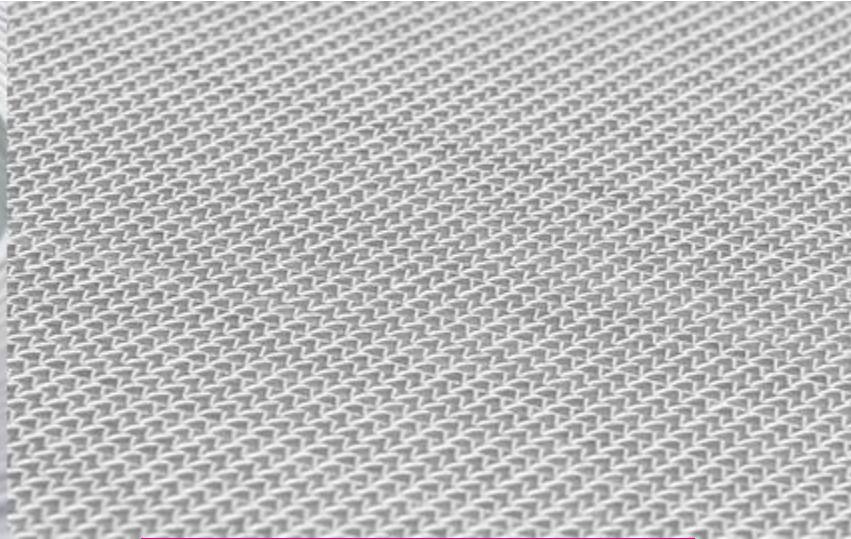
MORE MODULUS. TRUE PERFORMANCE. RELIABLE SUPPLY.



**H<sup>2</sup> GLASS**

**91 GPa** – Single Filament Sonic Modulus<sup>1</sup>

**95 GPa** – ITS Modulus<sup>2</sup>



**ULTRABLADE® 2**

**51 GPa** – Laminate modulus at 55% fiber volume fraction for unidirectional fabrics



**ULTRASPARK™ 2**

**63 GPa** – Laminate modulus at 70% fiber volume fraction

<sup>1</sup>NOL TR 65-87 testing method - true performance of the material proven by the industry's most advanced and reliable modulus testing for glass fiber.

<sup>2</sup>ASTM D2343/ISO9163 testing method.

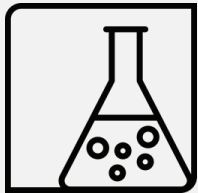
Data verified by DNV-GL certified testing laboratory.



**H<sup>3</sup> GLASS**

**AN EVEN HIGHER-MODULUS FUTURE**

# INTRODUCING: H<sup>3</sup> GLASS



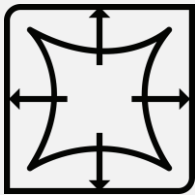
## GLASS SCIENCE

Designed to power the next wind blade generation.



## MORE MODULUS

Modulus increase proven by the most reliable, accurate testing protocols of sonic modulus.



## STABLE PERFORMANCE

Stable specific modulus to enable reliable blade design & production.

## H-GLASS

**89 GPa**

(Sonic Glass Fiber Modulus)

**90 GPa**

(ITS Modulus)

## H<sup>2</sup> GLASS

**91 GPa**

(Sonic Glass Fiber Modulus)

**95 GPa**

(ITS Modulus)

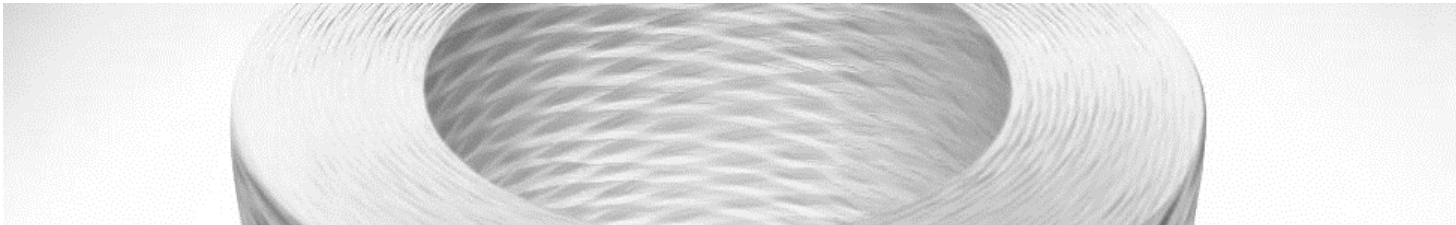
## H<sup>3</sup> GLASS

**95 GPa+**

(Sonic Glass Fiber Modulus)

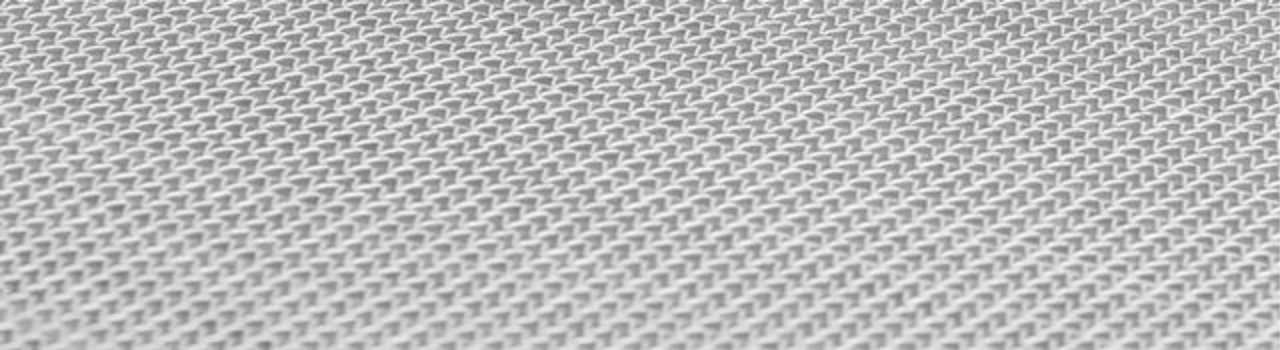
**100 GPa+**

(ITS Modulus)

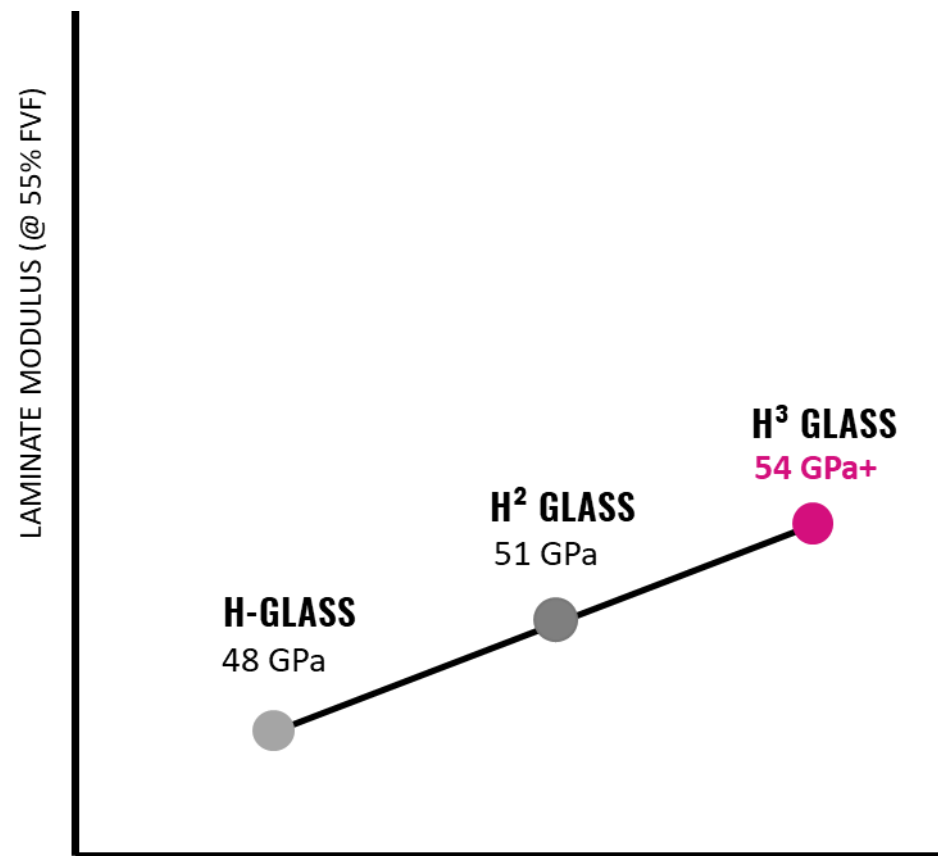


Data verified by DNV-GL certified testing laboratory (H-Glass, H<sup>2</sup> Glass). H-Glass WINDSTRAND® 3000A properties valid in China. H-Glass properties vary outside of China dependent upon source: WINDSTRAND® 3000 (as above) or WINDSTRAND® 3000A (87 GPa – sonic glass fiber modulus). H<sup>3</sup> Glass targeted performance stated above. Final product performance may vary based upon further development and customer requirements.





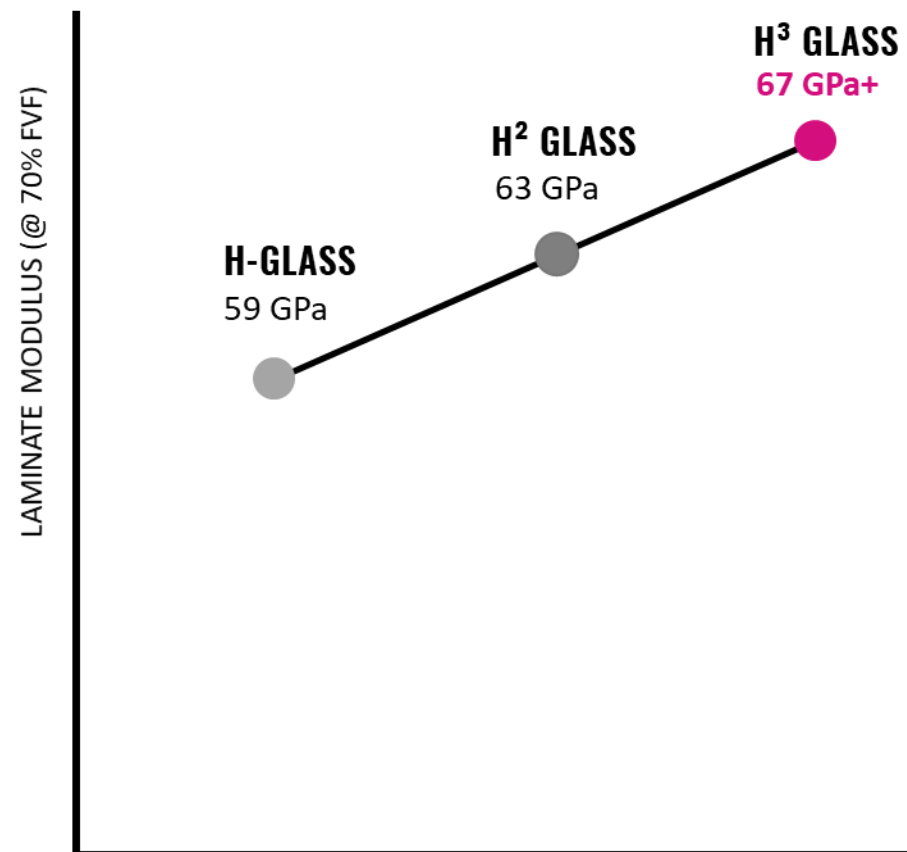
## ULTRABLADE® 3

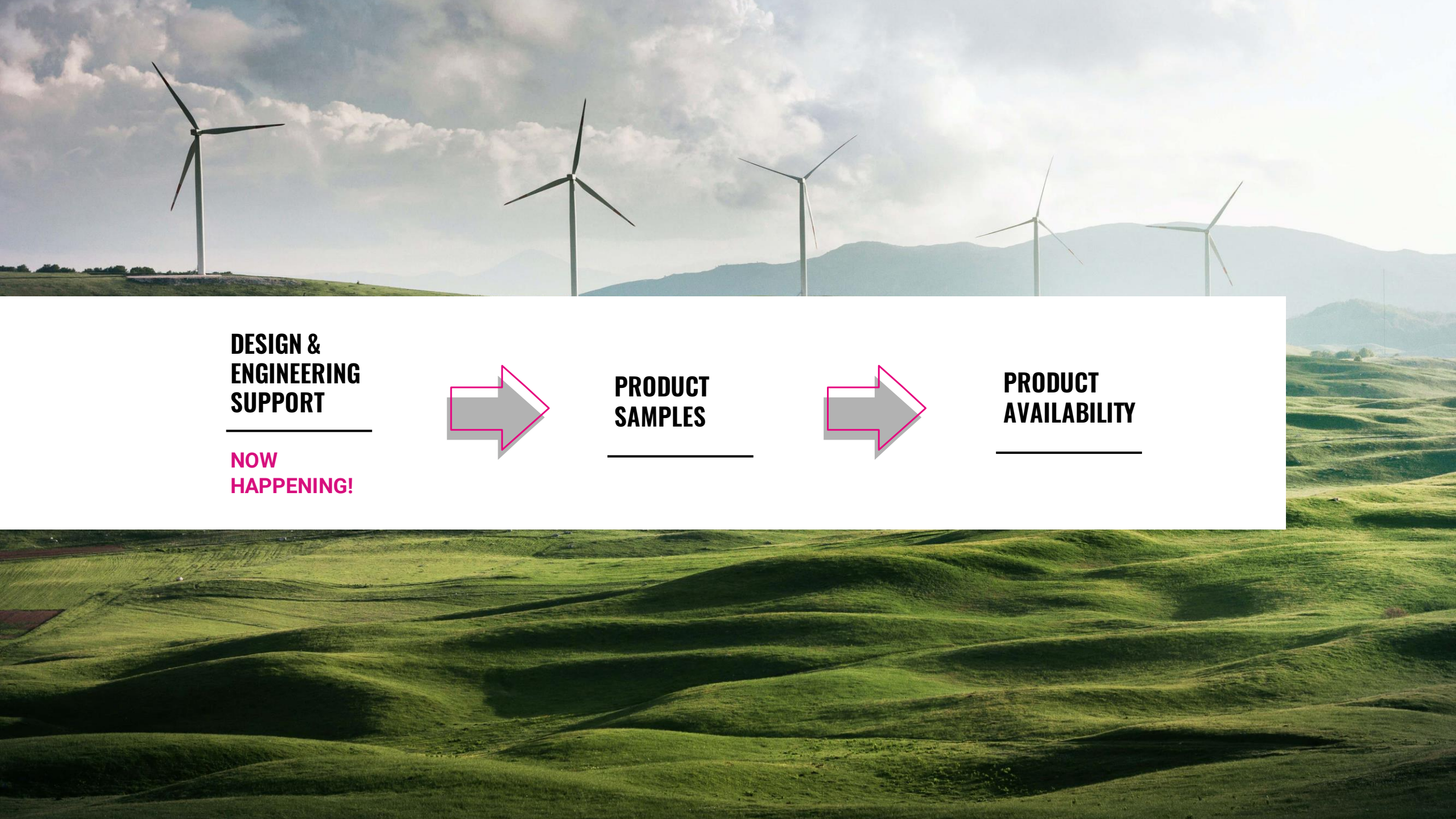


Target performance for H<sup>3</sup> Glass, performance levels may slightly vary to more or less.



## ULTRASPARE™ 3





**DESIGN &  
ENGINEERING  
SUPPORT**

---

**NOW  
HAPPENING!**



**PRODUCT  
SAMPLES**

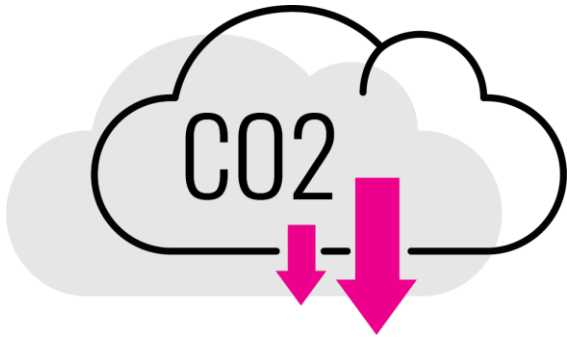
---



**PRODUCT  
AVAILABILITY**

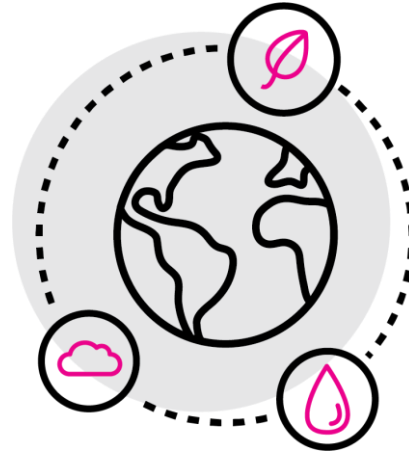
---

# WE ARE MAKING A BETTER 2030, TODAY



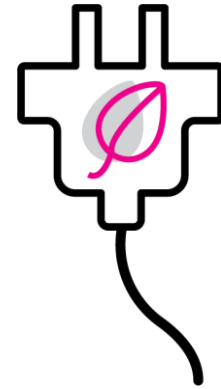
---

**Reduce greenhouse gas emissions**  
from our operations by 50% (scope 1  
& 2) and 30% (scope 3)



---

**Send zero waste to landfill** by cutting in  
half the amount of waste we generate  
and recycling the rest



---

**Switch to 100% renewable electricity.**  
Purchase electricity  
only from renewable





## 100% RENEWABLE ELECTRICITY

### Owens Corning

**~\$2 billion**

of our roofing & insulation  
fiberglas™ products sales are  
100% Wind Power certified

**~60%**

of our electricity  
source is renewable  
in the U.S alone

### Owens Corning Wind

**100%**

of our electricity  
source is renewable in  
Zeel, Belgium  
(Plant & main wind lab)

**100%**

of our electricity source  
will be renewable in  
San Vicente, Spain  
in 2021 (Plant)

... and we are not done yet.



## 100% RECYCLABLE BLADE

In partnership with:

**ARKEMA**  
INNOVATIVE CHEMISTRY



**ENGIE**

**LM**  
WIND  
POWER



**SUEZ**



# HOW WE POWER NOW™

TM & © 2021 MGM. The color PINK is a registered trademark of Owens Corning.  
© 2021 Owens Corning. All Rights Reserved.