



# Part I: Why Wind Turbines Catch Fire



## Meet the Panel



### **JP Conkwright - Panelist**

Professor of Fire Protection and Safety  
Engineering Technology  
*Eastern Kentucky University*



### **Angela Krcmar - Panelist**

Global Sales Manager - Wind  
*Firetrace*



### **Sally Wright - Panelist**

Principal Wind Turbine Engineer  
*DNV GL - Renewables*



### **Steve Mulhall - Moderator**

Business Development Manager - Wind  
*Firetrace*

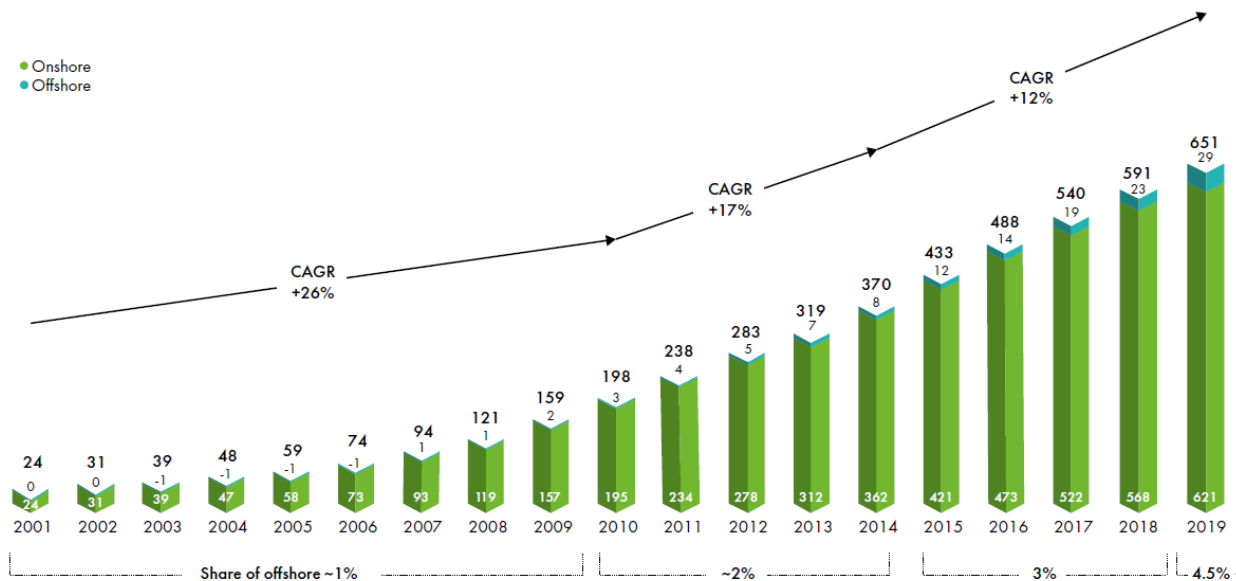


# Context:

# Global Wind Industry & Market

Market Status 2019

Historic development of total installations (onshore and offshore)



Detailed data sheet available in GWEC's Members Area

Source: GWEC Market Intelligence, March 2020

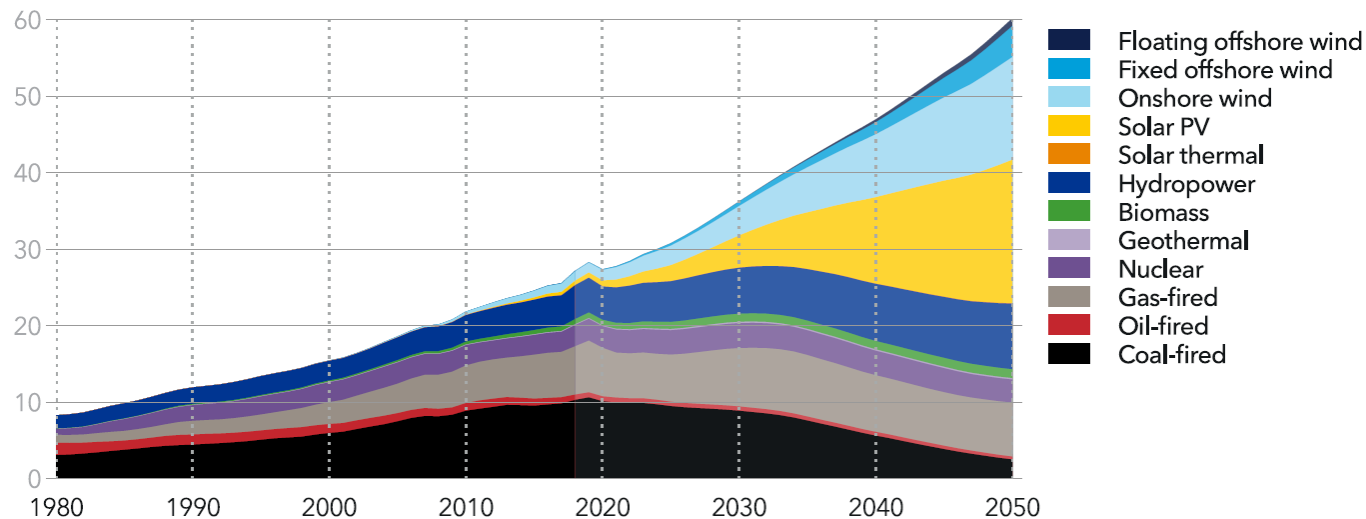
Source: Global Wind Report 2019, Global Wind Energy Council [gwec.net](http://gwec.net)

## Context:

# Global Wind Industry & Market

World electricity generation by power station type

Units: PWh/yr

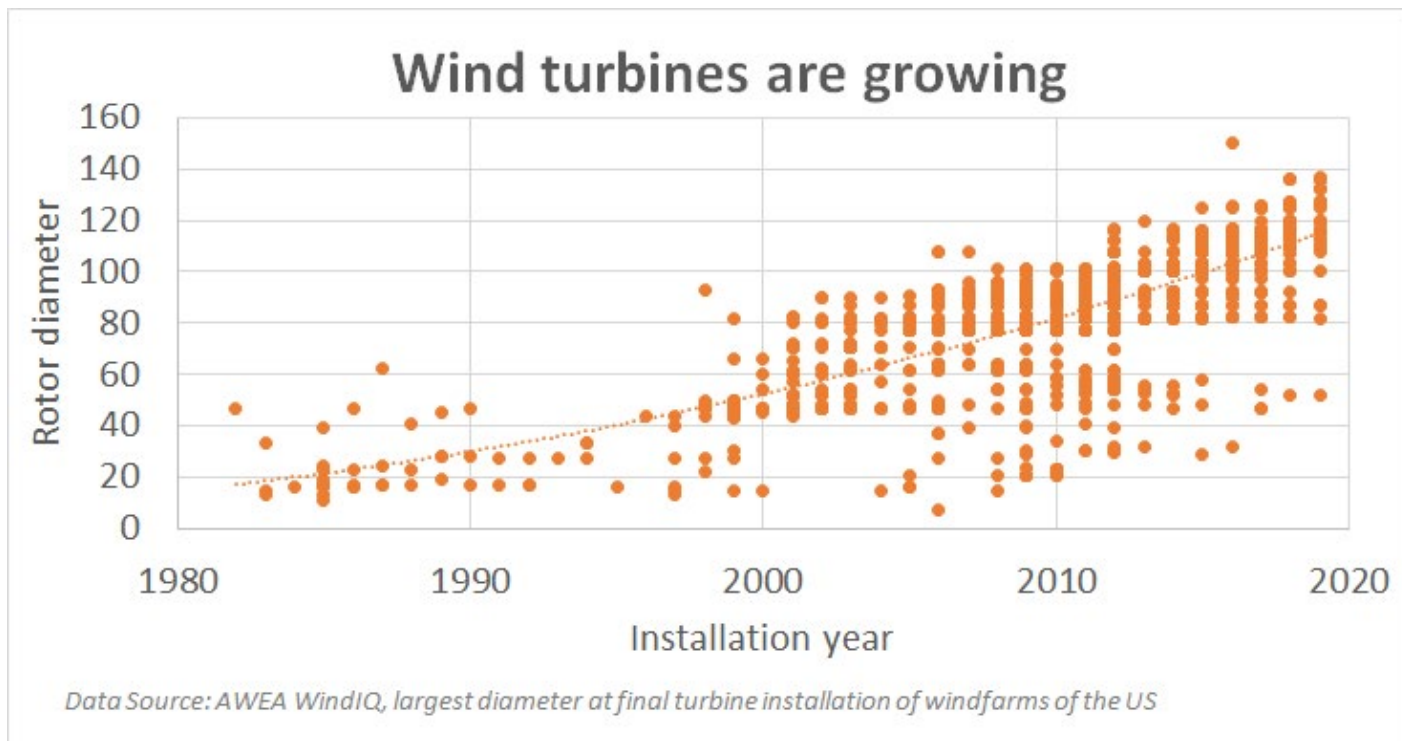


Historical data source: IEA WEB (2019), IRENA (2019)

**Renewable share of electricity generation.** Non-fossil sources will dominate electricity generation by 2050, with 62% of power supplied by variable renewables, half each from wind and solar PV. Considerable investment in grids and flexibility will be needed but will be aided by plunging battery costs and widespread use of vehicle-to-grid storage.

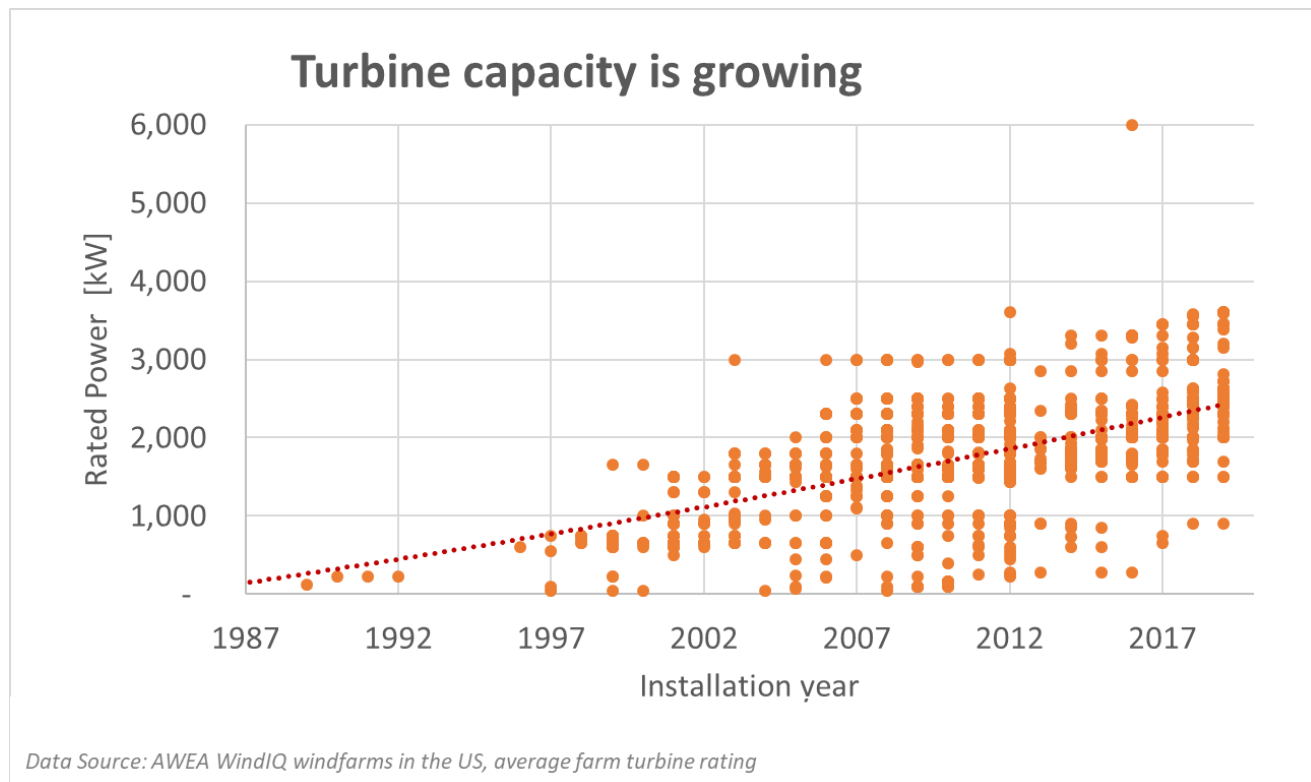
**Context:**

# Global Wind Industry & Market



## Context:

# Global Wind Industry & Market

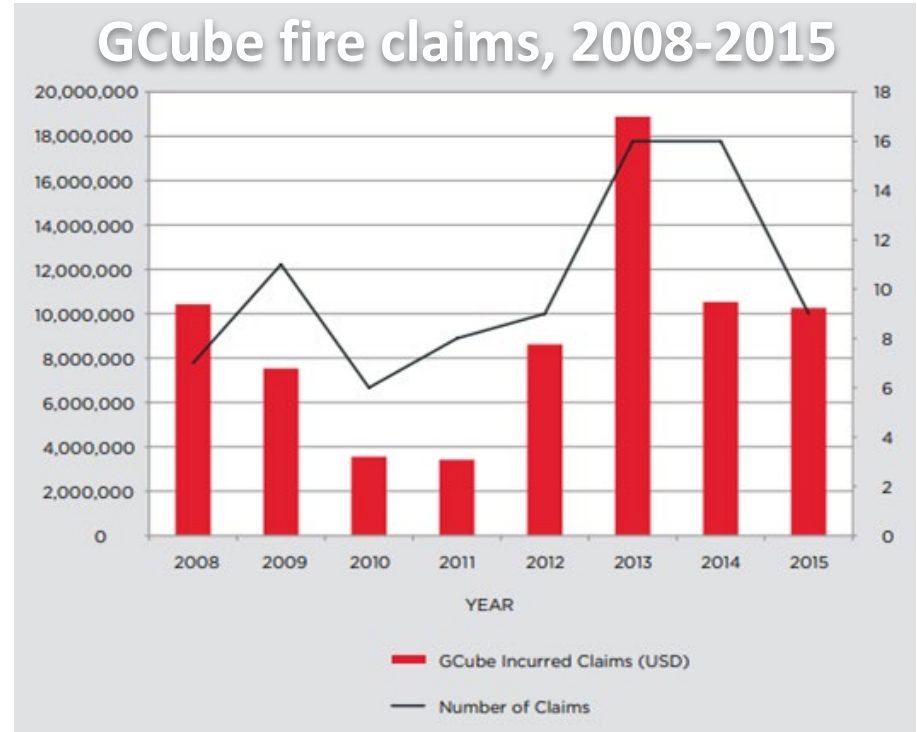




**How prevalent  
are turbine fires?**

# How prevalent are turbine fires?

- Statistics vary from 1 in 2,000 to 1 in 10,000 will have a fire
- Limited data sources:
  - No central repository
  - Wind opposition organizations:
    - News
    - especially catastrophic & wildfires
  - Insurance companies (GCube 2015)
- Anecdotal

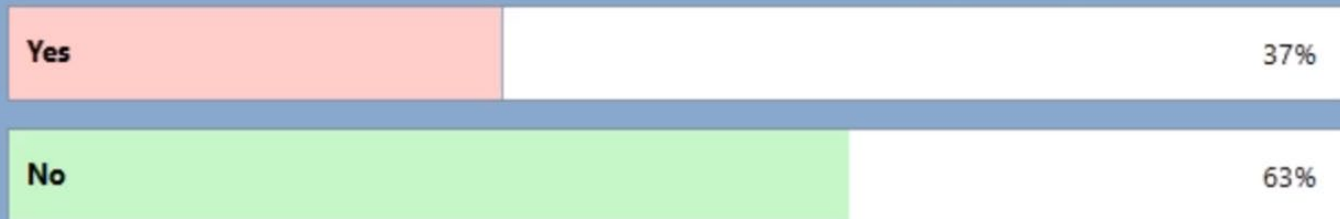




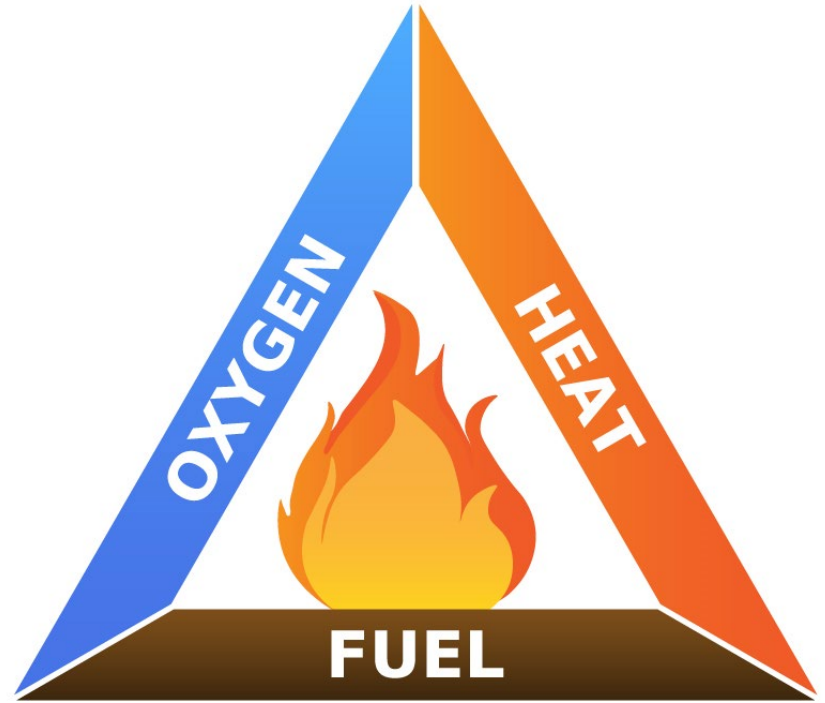
## QUICKPOLL

# Have you ever experienced or been part of the aftermath of a wind turbine fire?

Poll Results (single answer required):

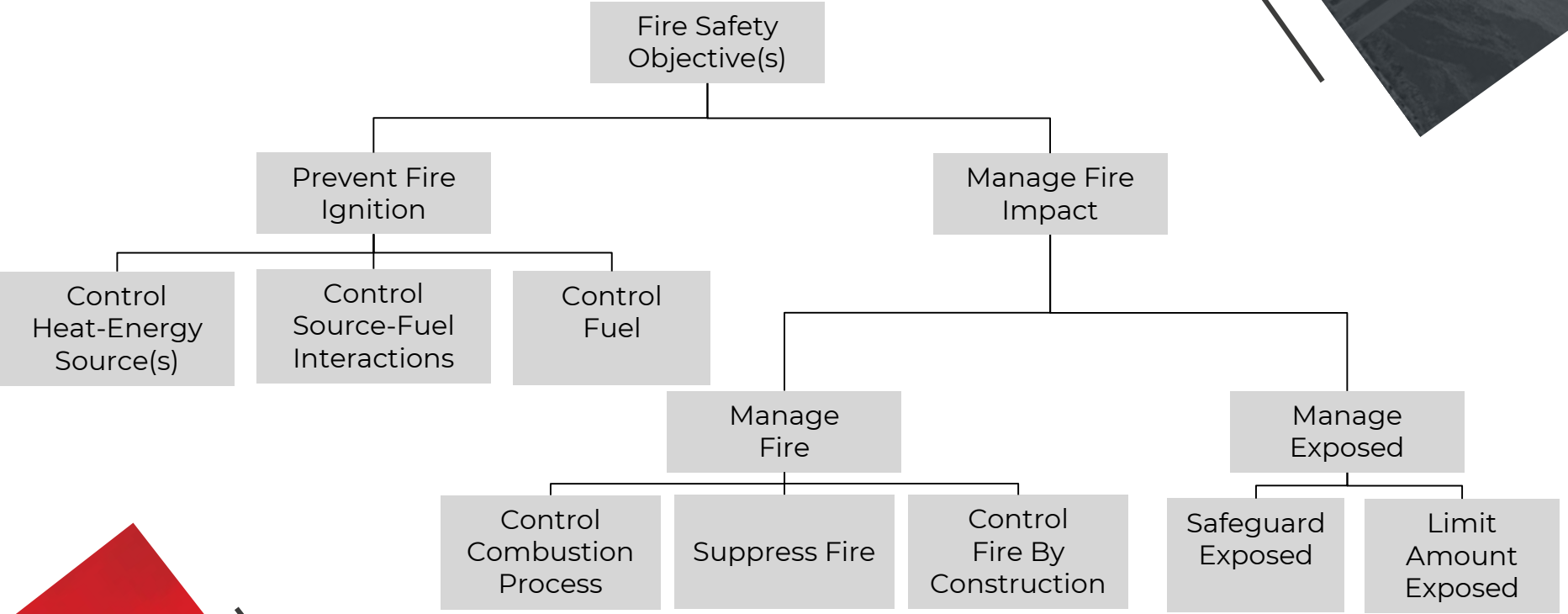


# Context: How does a fire start?



Oxygen + Fuel + Ignition Source

# Fire Safety Concept Tree - NFPA 550

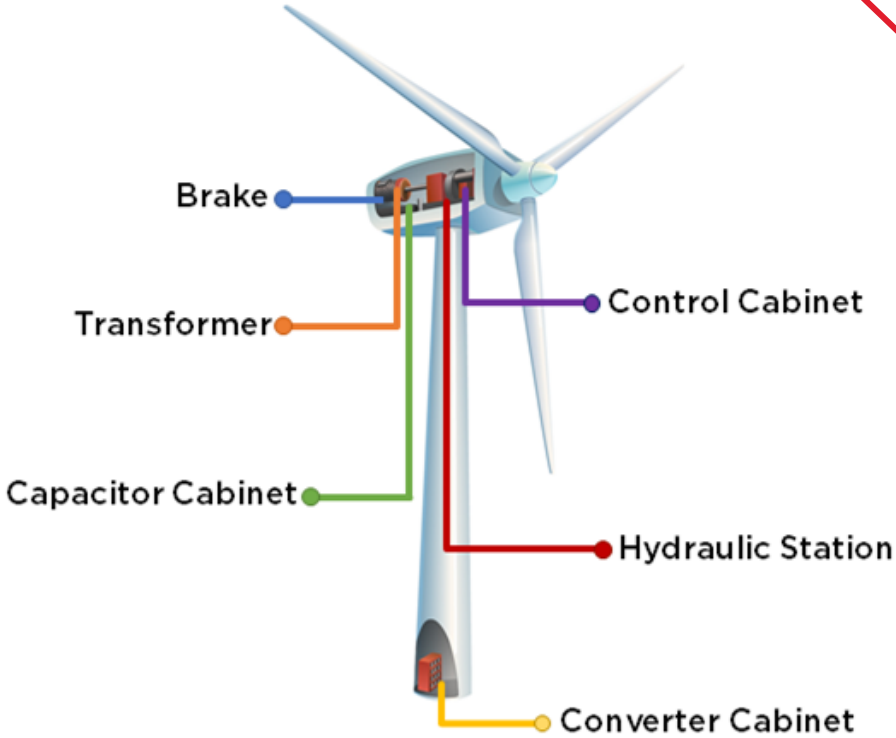


Source: NFPA 550

# What are the Ignition Sources in Turbine Fires?

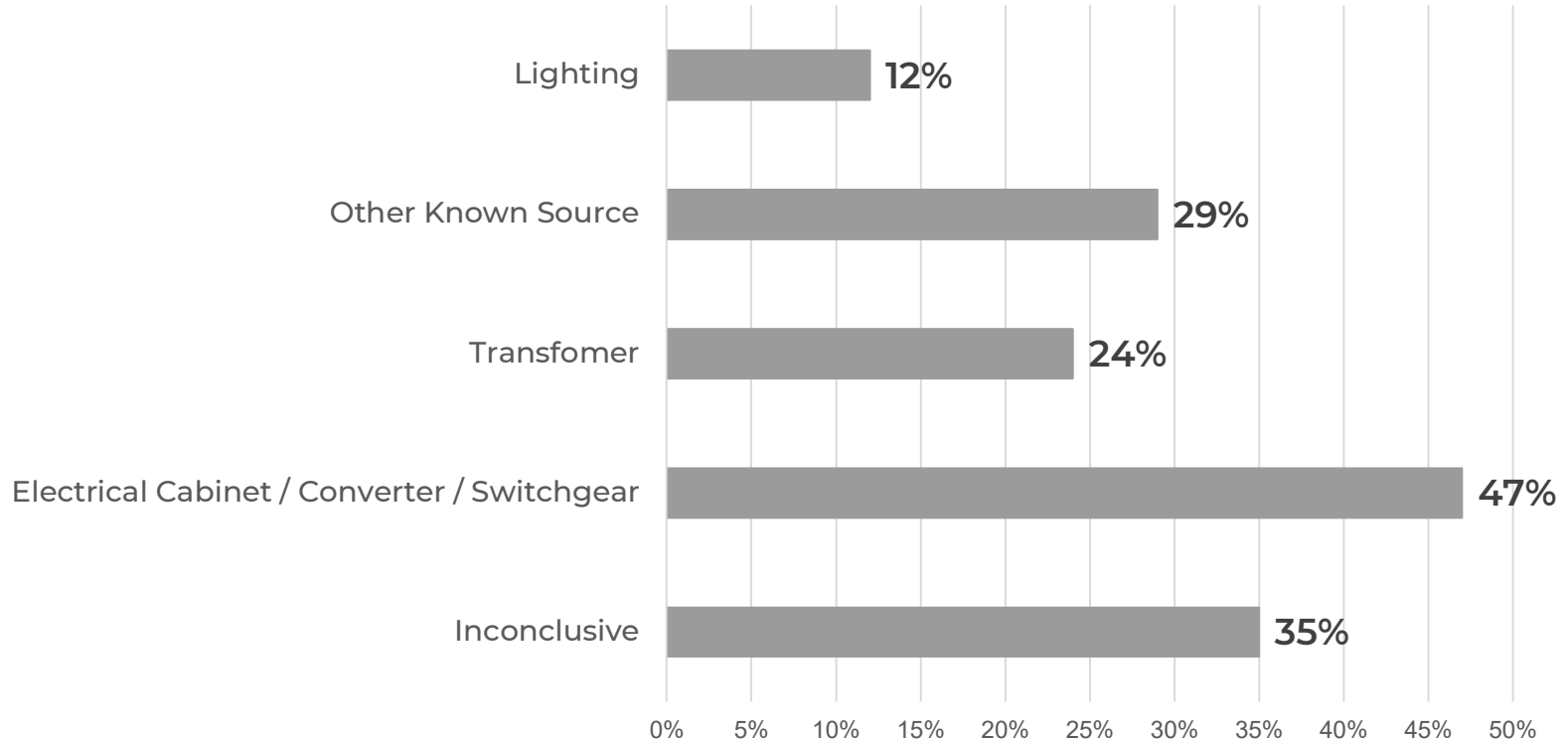


# Typical Ignition Sources



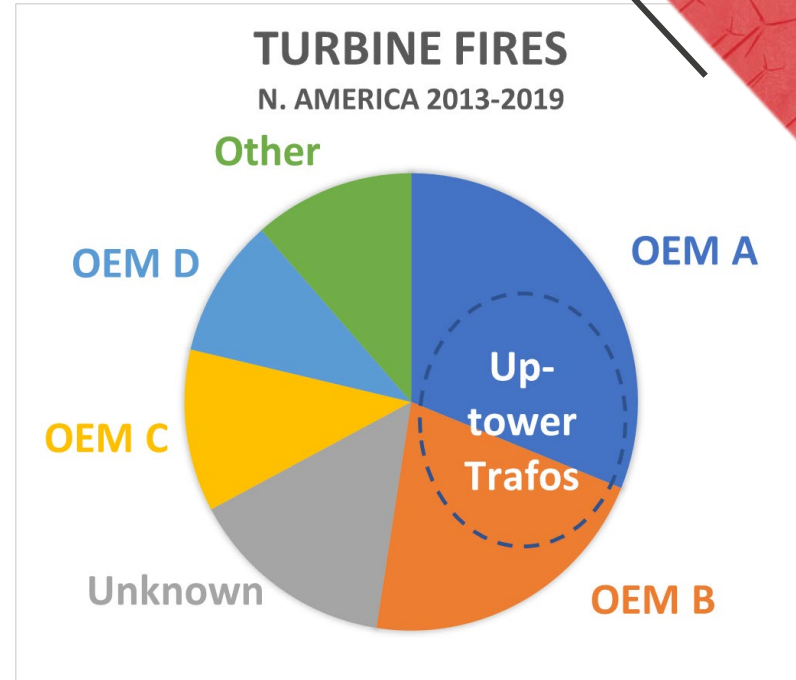
## QUICKPOLL

Have you ever experienced or been part of the aftermath of a wind turbine fire?



# Turbine Design Affects Fire Risk

- Up-tower transformers
  - Arc fault detectors
- Bearing Temp monitoring
- Quality control
- Lightning protection



# Turbine Design Affects Fire Risk

*Is it getting better?*

- **Industry improvements:**
  - Arc fault protection
    - More sensors, better placement, better monitoring
  - Condition monitoring (e.g. bearing temp)
- **On the down-side of larger turbines:**
  - Lightning protection
    - Longer blades
    - Carbon
  - Higher ratings - higher losses
  - Faster design cycle, less testing





# Types of Mitigation

- Passive and active protection
- Protection options
- Monitoring, detection and suppression



# Questions?



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Question slide



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