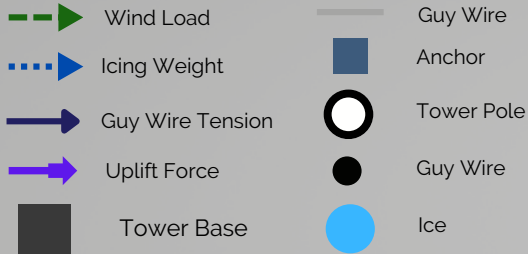


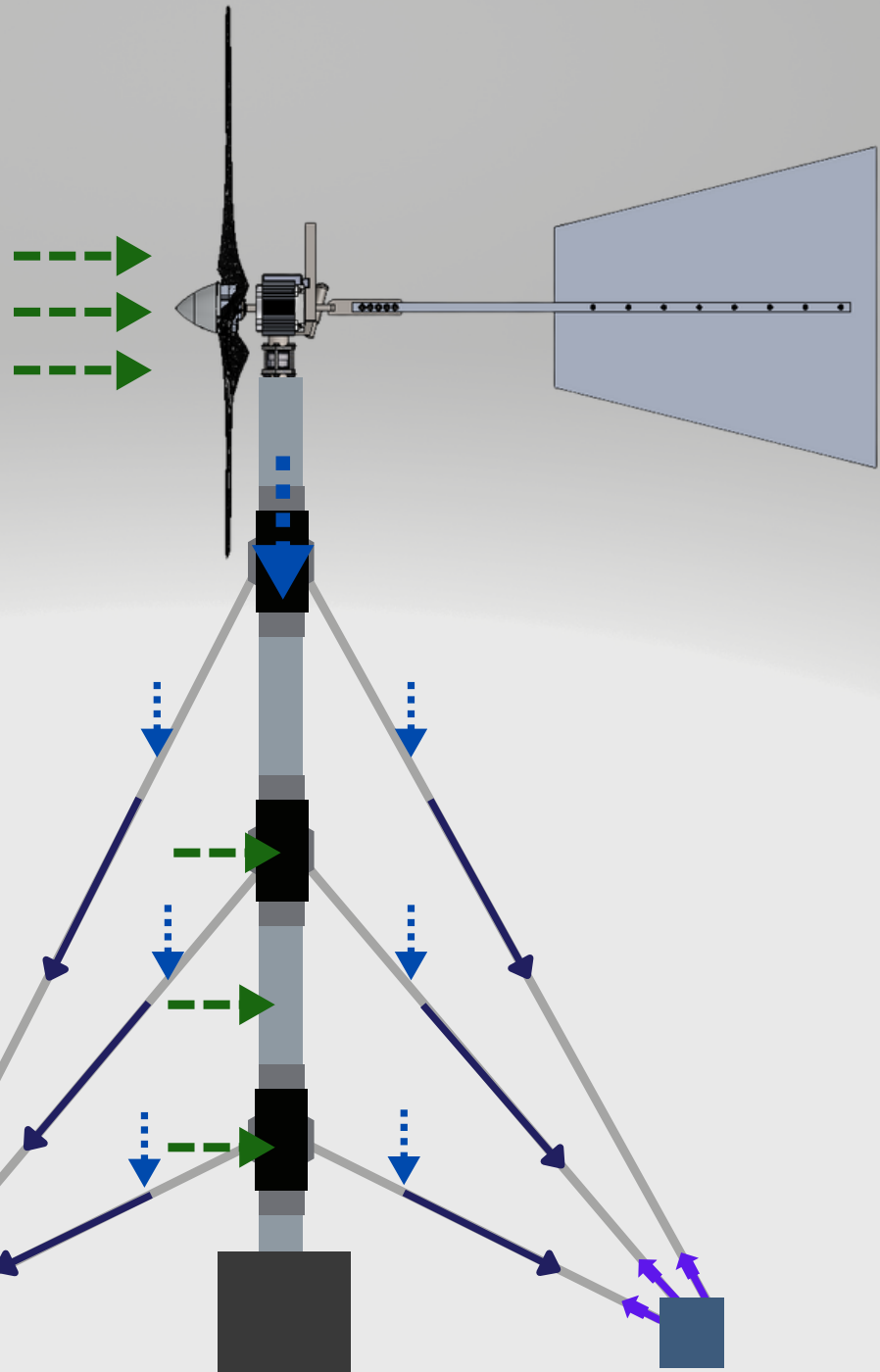
# CONSIDERATIONS WHEN DESIGNING A HOME WIND TURBINE TOWER

## LEGEND



These are the major loads that need to be accounted for when designing a Home Wind Turbine Tower

All the vertical loads are supported by the tower base, while all the lateral loads are supported by the anchors. (F1)



## ICING CONSIDERATION AS PER CSA S37-18

Tower diameter with ice



Guy wire diameter with ice



### Effect on Loads

- Accumulation of ice increases the surface area of the tower exposed to the wind, leading to an increase in wind load that the tower must withstand. (F1)
- Increased icing weight on the tower & guy wires. (F1)

## CSA S37 Importance

## Built-up Ice Effect on Turbines

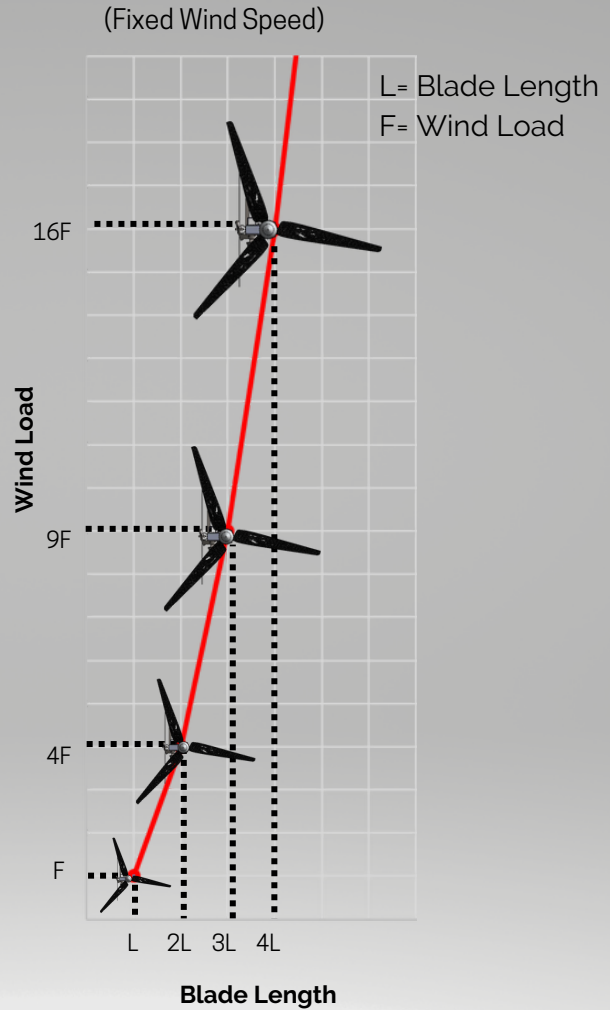
F1: Guy Wire Tilt Tower Example

This graph illustrates the relationship between the blade length and the wind force acting on the turbine. At a constant wind speed, an increase in blade length results in a drastic increase in the wind load that must be supported by the tower. (F2)

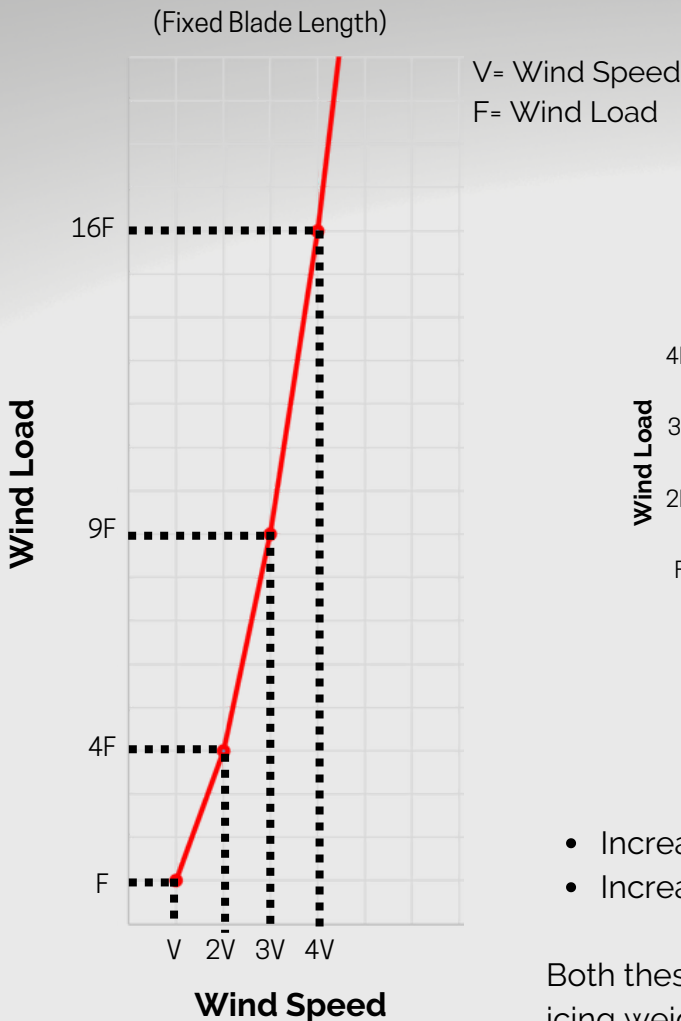
Ex. If blade length increases by a factor of 2, the wind load will increase by a factor of 4

For the same blade length, an increase in wind speed has a similar effect on the wind load, which also must be supported by the tower. (F3)

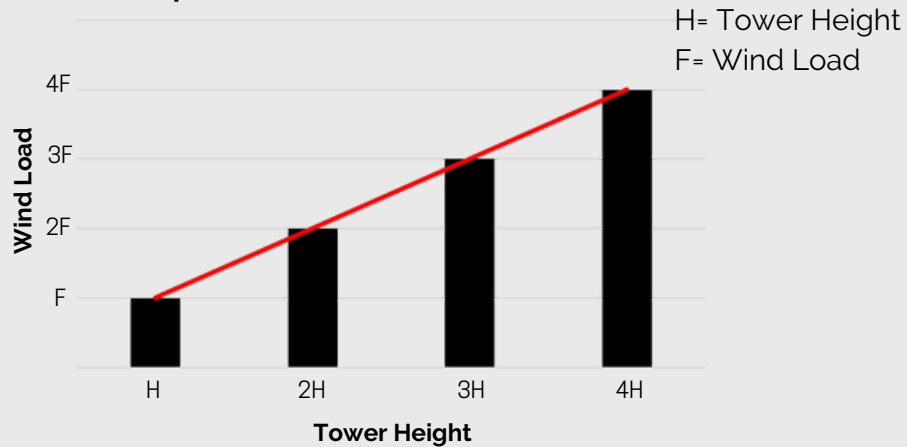
### F2: WIND FORCE V.S. BLADE LENGTH



### F3: WIND FORCE V.S. WIND SPEED



### F4: WIND FORCE V.S. TOWER HEIGHT



#### Effects of Increase in Tower Height

- Increase in surface area of the tower exposed to the wind
- Increase in guy wire length required to support the tower

Both these factors together result in increased wind load and icing weight on the tower and guy wires. (F4)