

Horizontal Axis Wind Turbine (HAWT)

Integrated aerodynamic simulation, structural design & localized fabrication for sustainable power generation

3
ROTOR BLADES

HAWT
TURBINE TYPE

IEC 61400-2
PERFORMANCE
STANDARD

DUCTED
ROTOR CONFIGURATION

PROJECT OVERVIEW

A comprehensive engineering development program focused on the aerodynamic modeling, structural optimization, and physical fabrication of a high-efficiency Horizontal Axis Wind Turbine (HAWT). The project covers the full development lifecycle — from airfoil profile selection and CFD transient flow analysis to full-scale fabrication, assembly, and field performance testing.

KEY FACTS

 **Blade Technology**
Light-weight extruded airfoil blades

 **Rotor Configuration**
3-blade ducted wind-lens rotor

 **Testing Standard**
IEC 61400-2 compliant testing

 **Target Application**
Off-grid, rooftop & telecom power

DESIGN PHILOSOPHY

Engineering robust, low-maintenance urban energy solutions. Our design approach prioritizes high efficiency wind capture, low acoustic signature, and high structural reliability. By combining transient CFD optimization with finite element analysis, we ensure maximum power output across low-to-medium wind speed regimes while extending operational lifespan.

FIELD-DEPLOYED HAWT PROTOTYPE



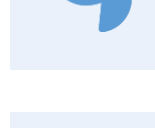
Fully assembled ducted HAWT prototype — rooftop field installation

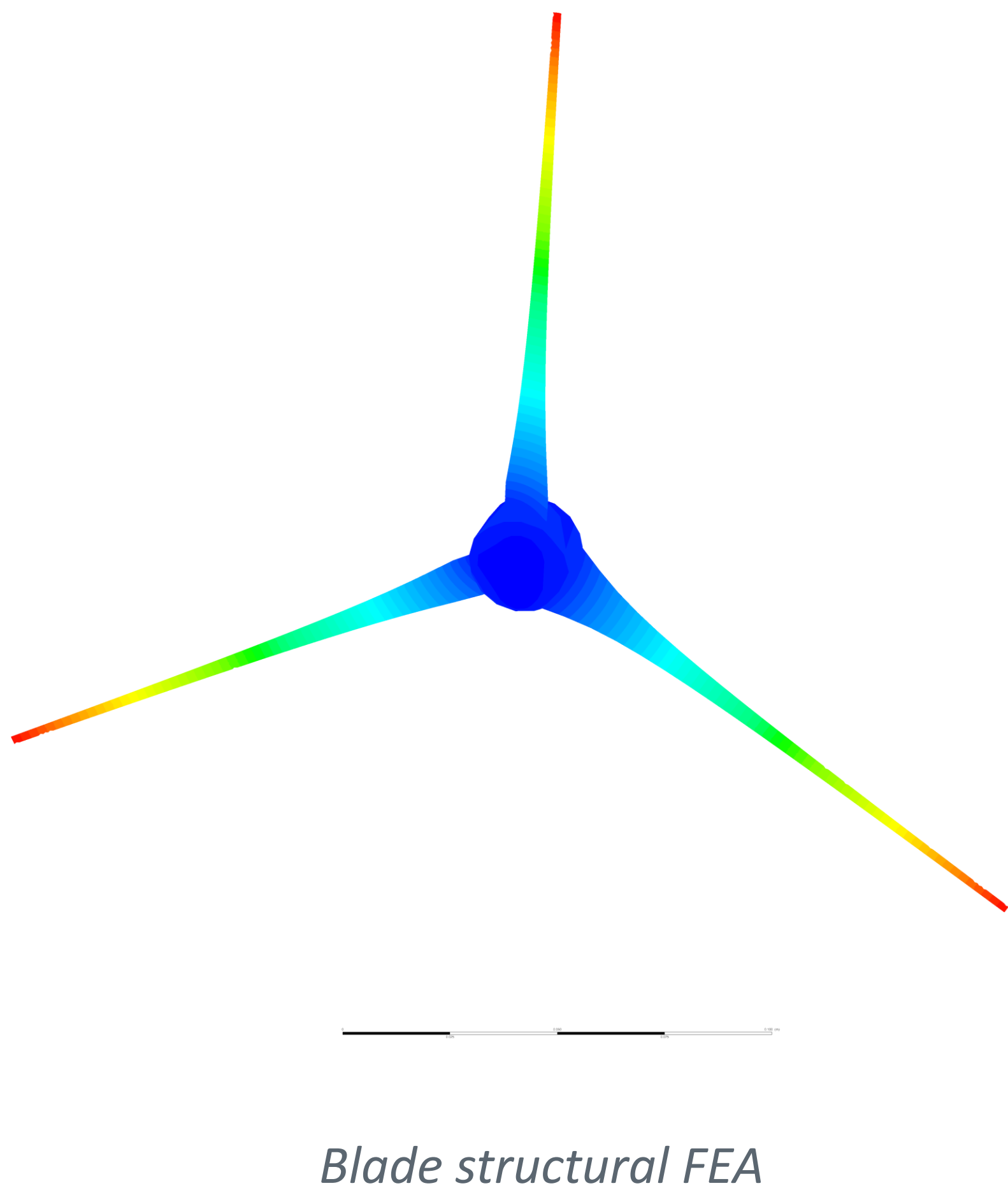
The three-blade ducted rotor accelerates inflow through the surrounding wind-lens shroud, boosting energy capture at low-to-medium wind speeds while keeping acoustic signature and self-starting torque low — suited to distributed energy, off-grid, and urban rooftop applications.

SCOPE OF WORK

-  Airfoil selection & aerodynamic profile design
-  3D transient CFD flow modeling & blade shape optimization
-  Structural & dynamic FEA — modal analysis and force assessment
-  Precision blade manufacturing, balancing & frame assembly
-  Wind tunnel / field testing for power curve validation
-  Vibration spectrum analysis & cut-out safety verification

DELIVERABLES

-  Complete engineering CAD & fabrication drawings
-  Aerodynamic & dynamic FEA simulation reports
-  Fully assembled & dynamically balanced prototype unit
-  Field performance test & power curve certification data
-  Standard operating procedures, BOM & cost analysis



Blade structural FEA