



Wind Turbines

Techs & Specs

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Enerji

- Engaged in the design and manufacture of power generation systems which utilize renewable energy sources.
- The only domestic manufacturer company who uses wind, solar, geothermal, biogas and biomass-based power plants project design and manufacture machines
- Creating product groups, acting responsive to people and the environment, which is contributes to the conservation of natural energy sources.
- Working without compromising on quality and reliability on their products and services.
- Aiming the satisfaction of our partners and customers and taking firm steps towards becoming a leading company in the sector.

1. Wind Turbines/Basics

- Wind Turbine is the general name of the systems where the wind power is transmitted to the blades and a generator that converts electrical energy.
- Newly generated electric power, by using an electronic circuit called an inverter, converts them to a standard network, or transferred to the grid.
- Wind turbines consists of the following five main parts
 - Blades
 - Generator
 - Invertor
 - Controlling & PLC
 - Groundwork & Tower



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2. Designs

- Wind turbines are designed according to vertical and horizontal wing types.
- Electric generator is an electric motor essentially works in reverse mode.
- Wind turbines are divided into two by the generator design
 - Permanent magnet generators
 - Hard-wound rotating magnet generators



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Horizontal Axis



Vertical Axis



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Rotating Magnet Rotor



Rotating Rotor with Windings

3. Advantages

- 5 Enerji wind turbines prefers horizontal axis blades and rotating magnet generators in their designs.
- Advantages of 5 Enerji Wind Turbines:
 - Uses domestically manufactured carbon fiber blades, specially designed for Turkey's environmental condition.
 - Produces highly strong parts which needs less service such as fixed windings.
 - Uses direct drive technology which reduces costs of maintenance encountered to others



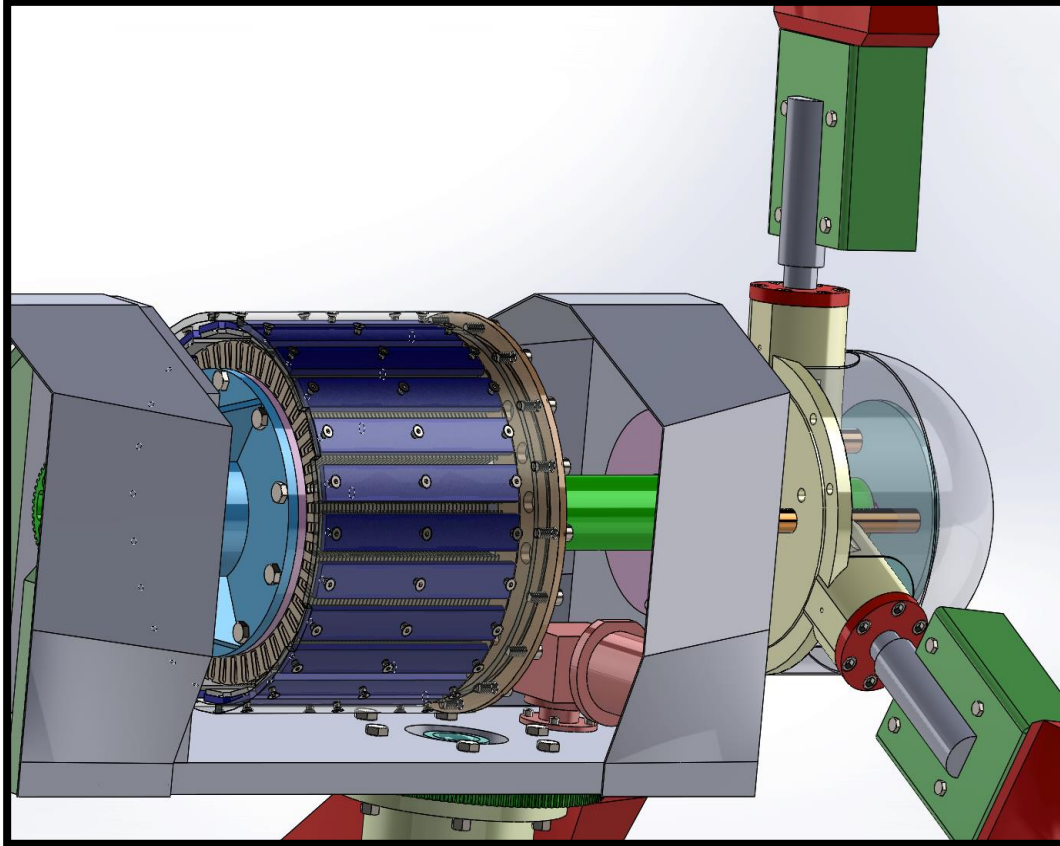
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- Without using gear box, gains high efficiency with minimum torque
- Lower noise
- Easy to find spare parts because of the domestic manufacturing
- High efficiency with neodymium magnets
- Longer productivity periods because it starts with lower wind
- Longer warranty period with using less mechanical parts
- Trouble free control system with speed and temperature protection
- Advantage of selling energy to the state with higher prices, again because of domestic manufacturing



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4. Turbine Design Examples



5.Product Line

Sistem Cinsi	Model	Güç	Kanat Yarı Çapı	Gerilim / Çıkış Gerilimi	Hız	Optimum Hız / Devir
		(W)	(m)	(Volt)	(m/sn)	(m/s) / (rpm)
KÜÇÜK ÖLÇEK RÜZGAR TÜRBİNİ SERİSİ						
OTONOM	5E-WT3 K	3000	1,65	(48)/220	3 – 25	12,5/250
ŞEBEKE BAĞLANTILI	5E-WT3.N	3000	1,65	(48)/380	3,5 – 25	12,5/250
OTONOM	5E-WT5.K	5000	1,65	(48)/220	3 – 25	12,5/250
ŞEBEKE BAĞLANTILI	5E-WT5.N	5000	1,65	(48)/380	3,5 – 25	12,5/250
OTONOM	5E-WT10.K	10.000	3,2	(48)/220	3 – 25	12,5/250
ŞEBEKE BAĞLANTILI	5E-WT10-N	10.000	3,2	(48)/380	3,5 – 25	12,5/250
ORTA ÖLÇEK RÜZGAR TÜRBİNİ SERİSİ						
Sistem Cinsi	Model	Güç	Kanat Yarı Çapı	Gerilim / Çıkış Gerilimi	Hız	Optimum Hız / Devir
		(W)	(m)	(Volt)	(m/sn)	(m/s) / (rpm)
ŞEBEKE BAĞLANTILI	5E-WT20-DS	20000	3-4	(400)/380	3 – 25	12,5/62,5
ŞEBEKE BAĞLANTILI	5E-WT30-DS	30000	4-5	(48)/380	3,5 – 25	12,5/62,5
ŞEBEKE BAĞLANTILI	5E-WT50-DS	50.000	5-6,5	(48)/380	3 – 25	12,5/62,5
ŞEBEKE BAĞLANTILI	5E-WT75-DS	75.000	5,5-8,5	(48)/380	3 – 25	12,5/62,5
ŞEBEKE BAĞLANTILI	5E-WT100-DS	100.000	6-9	(48)/380	3,5 – 25	12,5/62,5
ŞEBEKE BAĞLANTILI	5E-WT150-DS	150.000	9-13	(48)/380	3 – 25	12,5/62,5
ŞEBEKE BAĞLANTILI	5E-WT250-DS	250.000	13-16	(48)/380	3,5 – 25	12,5/40

6.Competition in the Market (Under 1 MW)

- Thousands of application for the licensed production considering the need for electricity in Turkey, with this wind energy potential is not surprising.
- On the other hand, neither high nor low power capacity turbine Brands formed in Turkey yet.
- That's why many low power capacity turbines imported but couldn't maintained in the market.
- Many domestic companies, who invested in wind turbines before the legal regulations couldn't survive in the process.



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- 5 Enerji, produced lean and sustainable model while all the other Brands left the market untrustable for the consumers in this period.
- With our efforts in prioritizing the domestic manufacturing, other companies started to invest in business, such as manufacturing domestic PLC cards and invertors.
- 5 Enerji is also the only company which uses all renewable energy sources like biogas, biogas, jeothermal and ofcourse sun.

7. How to calculate Characteristics of Investment Feasibility

- First of all, based on the received coordinates and statistical wind data provided from official sources, we calculate the annual productivity periods.
 - Adding the Low altitude and topographic variables we calculate the lapses.
 - With current electricity pricing listed by government we calculate the costs and saves <http://www.tedas.gov.tr/bilgibankasi/sayfalar/elektriktarifeleri.aspx>
 - We add guaranteed purchase support of the government for domestic production to the first 10 year plan.
 - We add the planned or unplanned off-period of the turbines to the list.
- As a result, After all these calculations, 5 Enerji wind turbines is the best choice**
With offering shorter refund in investment and long term efficiency in the domestic market

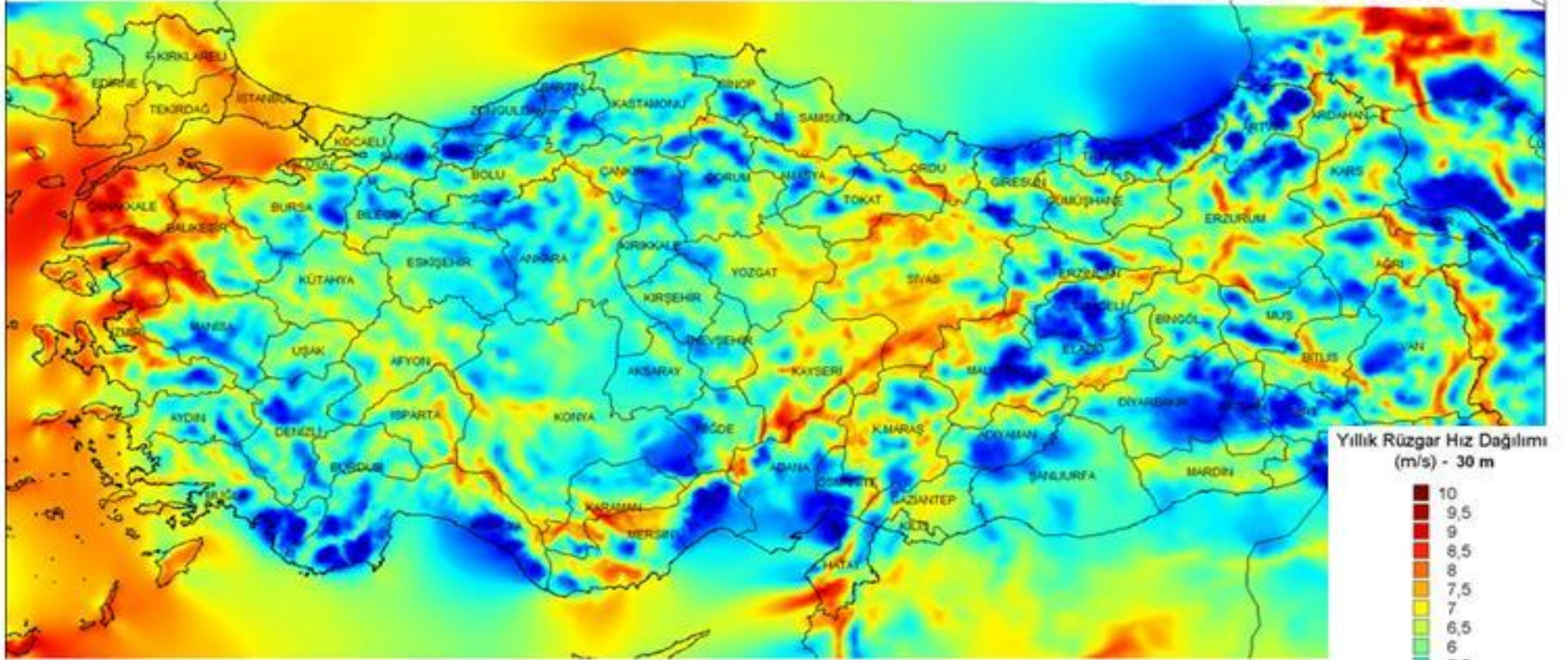


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TÜRKİYE RÜZGAR ENERJİSİ POTANSİYEL ATLASI

Rüzgar Hızı Haritası

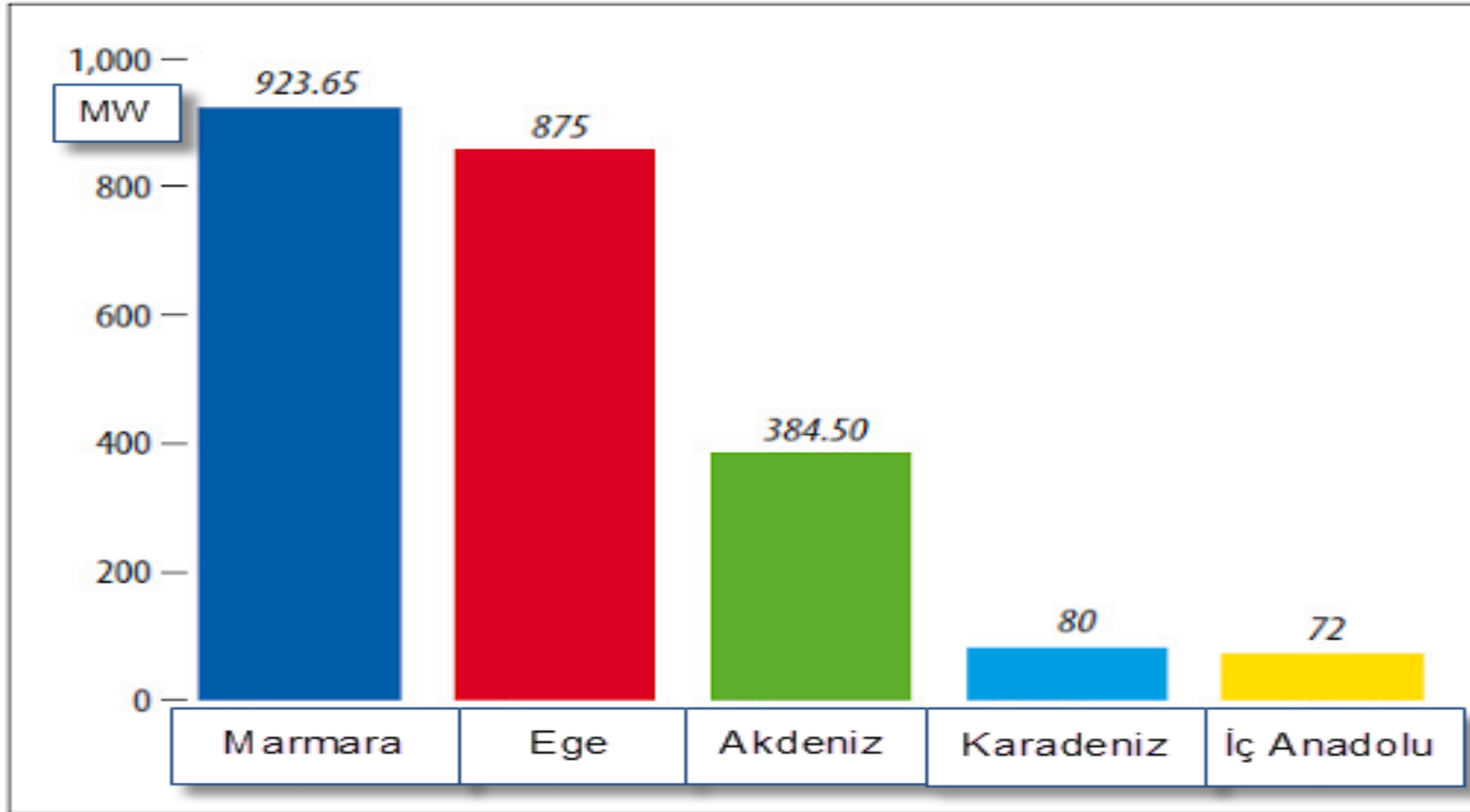
100 m Yükseklikte Yıllık Ortalama





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Bölgelere Göre Türkiye Rüzgar Potansiyeli



Source: NREL



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8. Production Stage



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Factory





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Manufacturing





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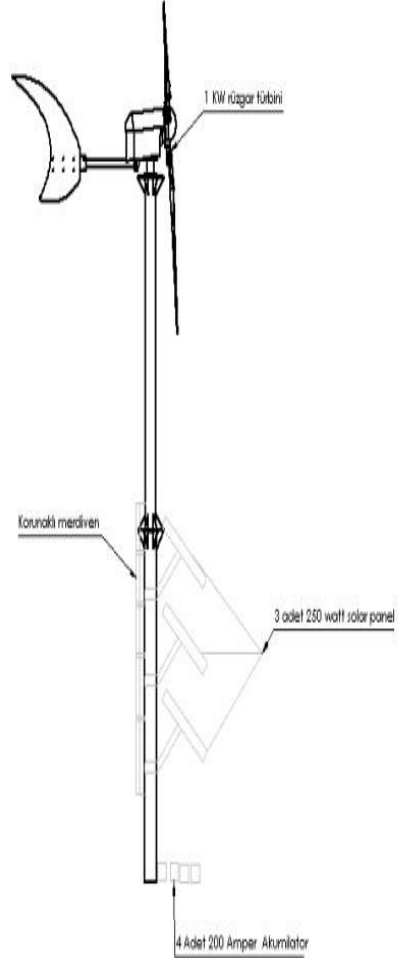




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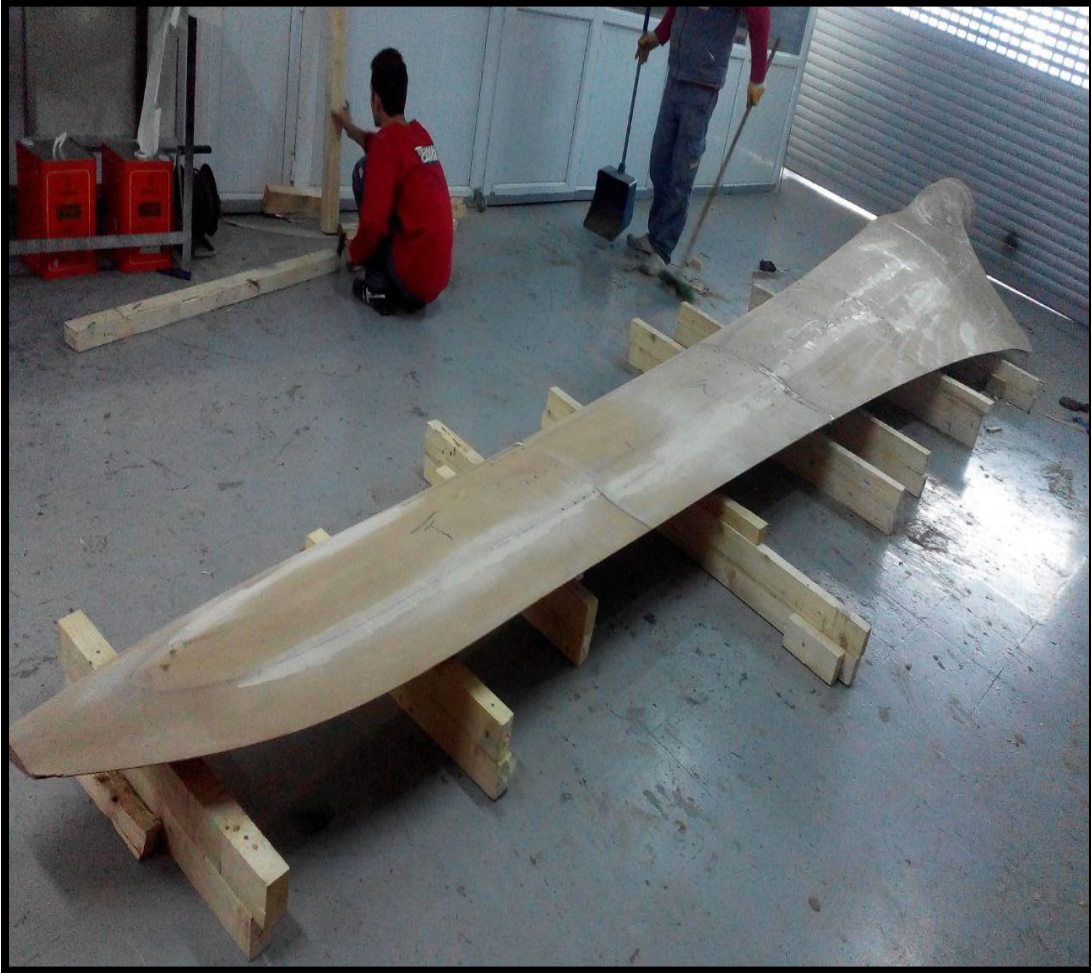


Blades





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Tower







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Assembly





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On the Field





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Thanks

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