Carter Wind Energy

An Advanced Wind Turbine Technology Company
Building its first turbine in 1976, Carter Wind Energy is an industry leader and pioneer of the two-blade wind turbine design.

The Company’s technology advantages and value proposition have been independently evaluated by U.S. National Renewable Energy Labs (NREL) and Garrard Hassan with partnerships having been developed thru Hamilton Standard (division of United Technologies), MAN in Germany, and EDF in France. Notable customers include Southwest Public Service, Newfoundland P&L, and TXU.

Carter Wind Energy’s competitive advantage lies in its proprietary:

- Two bladed design, which eliminate and reduce many of the loads encountered by three blade turbines;
- Self-erecting guyed tower concept which eliminates the need for large expensive cranes for installation and maintenance.

By minimizing loads and utilizing a structurally efficient guyed tower, Carter turbines weigh a fraction of three bladed design. The lighter weight and self-erecting tower, results in a lower manufacturing, installation, and maintenance costs, and as a result, a dramatic reduction in the cost of wind generated renewable energy.

The dramatic reduction in cost of energy afforded by Carter wind turbine technology creates vast new market opportunities for traditional wholesale power projects, but also portable stand-alone wind-diesel power generation in remote, harsh environments.

**Power Solutions for:**

- Cooperatives / Municipalities
- Government/Military
- Mining
- Water desalinization
- Oil/Gas exploration
- Enhanced oil recovery
- Agricultural
- Resort
- Industrial Complex
Building its first turbine in 1976, Carter Wind Energy has 35 years of wind energy experience and is an industry leader and pioneer of the two-blade wind turbine design. The Company’s technology advantages and value proposition have been independently evaluated by U.S. National Renewable Energy Labs (NREL), with partnerships having been developed through Hamilton Standard (division of United Technologies), MAN in Germany, and EDF in France. Over 800 turbines have been installed worldwide in remote, harsh environments accumulating well over 60 million operating hours.

**COMPANY MANAGEMENT**

**The Carter Family of engineers:**

*Jay Carter Sr.* is the inventor of filament winding technology which was used to fabricate all of the solid fuel cases for the Polaris and Minuteman missiles. Mr. Carter formed a company that produced continuous/seamless fiberglass pipe and then sold this company to Ciba-Geigy/Ameron, who is a world leader in this business today.

*Jay Carter Jr.* is the Chairman of Carter Aviation Technologies and inventor of a unique vertical takeoff aircraft that flies like a fixed wing airplane. Textron/AAI has licensed this technology for military UAVs. The rotor employed in the aircraft was first developed as an integral/unique part of the Carter Wind turbine design.

*Matt Carter* is the President of Carter Wind Energy and following in the heritage of his family by reintroducing Carter Wind technology into the mid-size turbine market, initially focused on small wholesale and industrial DG installations for harsh and remote locations.
TECHNOLOGY

Carter turbines produce more energy with less equipment

PROPRIETARY TECHNOLOGY

Carter’s proprietary technology allows more energy to be produced with less equipment weight (the investment required to manufacture, transport, install, and maintain wind turbines, is a function of equipment weight). The result is a lower cost of energy. Carter’s unique patented design features include:

- Proprietary Two Bladed Teetering Rotor
- Flexible Composite Downwind Rotor Design
- Self-erecting, Tilt-up, Guyed Tower
- Simple unitized design, semi free yaw, stall regulated, and fail safe aero shutdown

EASE OF INSTALLATION/MAINTENANCE

The Carter tilt up turbine design does not require cranes and can be installed faster than traditional turbines. Additionally, installation requires substantially less infrastructure than typical wind turbines (less excavation and concrete for foundations and less road infrastructure, as roads leading to the installation site need only support a regular pick-up truck).

From a maintenance standpoint, tilt-down service capability dramatically reduces the cost and complexity of service and increases safety for workers. Carter’s turbines have proven to remain operative in the most harsh climates with excellent survivability in severe weather, including tropical storm prone environments.

INTEGRATED SOLUTION

A Wind Water Integrated Diesel Electricity (W²IDE) solution combines a proven low cost, self-erecting wind turbine technology with advanced water and diesel power generation to create a hybrid energy storage system that is well-suited for operation on mini-grids in remote locations with limited infrastructure.

W²IDE is adapted to meet the most stringent requirements of weak and isolated grids to ensure high reliability and grid stability with excellent power quality.

MORE COST EFFECTIVE

By utilizing W²IDE, project stakeholders are able to build new or expand existing generation capacity, thanks to optimized fuel savings and a significantly lower cost of power generation.

Access to affordable and reliable electricity provides societies with the opportunity for clean water, healthcare, irrigation, educational opportunities, communications infrastructure, and other social and economic benefits which are desperately needed to enrich life and improve social productivity in developing regions of the world.
### PRODUCT SPECIFICATIONS

#### TECHNICAL DATA MODEL 300

<table>
<thead>
<tr>
<th>Rotor</th>
<th>Type</th>
<th>Number of Blades</th>
<th>Area</th>
<th>Diameter</th>
<th>Speed</th>
<th>Type of Hub</th>
<th>T/S Angle</th>
<th>Pre-cone</th>
<th>Blades</th>
<th>Material</th>
<th>Blade Design</th>
<th>Blade Pitch</th>
<th>Foundation</th>
<th>Foundation</th>
<th>Foundation</th>
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<tr>
<td></td>
<td></td>
<td>2</td>
<td></td>
<td>79 ft</td>
<td>30 - 65 rpm</td>
<td>Twisting Hub</td>
<td>2º</td>
<td></td>
<td></td>
<td>Fiberglass Composite</td>
<td>Non-linear Twist &amp; Taper,</td>
<td>Fixed - Except Shutdown</td>
<td>30 - 30 yd³ concrete</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Performance
- **Max Power**: 500 kW
- **Cut-in Windspeed**: 33 mph
- **Cut-out Windspeed**: 40 mph
- **Rated Power**: 400 kW
- **Rated Power (adjustable)**: 60 mph
- **OverSpeed**: 160 mph

**Control System**
- **Type**: Aerodynamic Stall Controlled
- **Type**: Deep Stall, by Twisting the Spar & Increasing Blade Pitch
- **Type**: Brake Backup

**Yaw Drive**
- **Type**: Active Outside ±15º Window, Inside Window Free Yaw with Dampering

**Shell**
- **Material**: Fiberglass Composite
- **Size (LxWxH)**: 11 x 6 x 4.5 ft

**Weights**
- **Nacelle**: 3,903 lbs
- **Hub/Assembly**: 5,200 lbs
- **Machine (control bus, guy wires, etc.)**: 3,250 lbs
- **Total Weight**: 11,500 lbs

#### TECHNICAL DATA MODEL 500

<table>
<thead>
<tr>
<th>Rotor</th>
<th>Type</th>
<th>Number of Blades</th>
<th>Area</th>
<th>Diameter</th>
<th>Speed</th>
<th>Type of Hub</th>
<th>T/S Angle</th>
<th>Pre-cone</th>
<th>Blades</th>
<th>Material</th>
<th>Blade Design</th>
<th>Blade Pitch</th>
<th>Foundation</th>
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<td></td>
<td></td>
<td>2</td>
<td></td>
<td>117 ft²</td>
<td>30 - 45 rpm</td>
<td>Twisting Hub</td>
<td>2º</td>
<td></td>
<td></td>
<td>Fiberglass Composite</td>
<td>Non-linear Twist &amp; Taper,</td>
<td>Fixed - Except Shutdown</td>
<td>30 - 30 yd³ concrete</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Performance
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- **Cut-in Windspeed**: 33 mph
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- **Size (LxWxH)**: 11 x 6 x 4.5 ft

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- **Hub/Assembly**: 5,200 lbs
- **Machine (control bus, guy wires, etc.)**: 3,250 lbs
- **Total Weight**: 11,500 lbs

### MODEL 300
The Model 300 turbine is one of the most versatile and modern turbines designs on the market today having proven itself reliable in harsh tropical and artic conditions. Suitable for high and medium wind speed sites, the turbine is compact and portable, with easy shipping. The complete turbine assembly is shipped quickly in a standard cargo container anywhere in the world and can be erected in one day.

The Model 300 is ideal for standalone portable wind diesel or industry applications where height restrictions are a concern.

### MODEL 500
The Model 500 is an efficient and powerful turbine specifically designed and optimized for low to medium wind sites, without comprising the robust design features required for installation in the most harsh tropical and artic conditions. It is based on the proven and reliable Model 300 turbine, and retains the easy shipping, self-erecting, portable attributes required for low-cost distributed power generation.

The Model 500 is ideal for standalone wind diesel or single turbine installation applications for industry and small wholesale power projects that require the lowest cost of energy.

### ENERGY PRODUCTION
Carter’s proprietary technology allows more energy to be produced with less equipment weight resulting in a lower cost of energy.