Amontada complex - Brazil
ECO 122 wind farm

Country: Brazil
Project: Ilha Grande, Boca do Côrrego and Ribeirão
Customer: Queiroz Galvão
Scope: Supply, installation, commissioning of 28 ECO 122 and full operation and maintenance ECO 122
Electrical output: 75.6 MW
Commercial operation: 2014

The Amontada wind power complex, located in the state of Ceará and Amontada city, is equipped with 28 ECO 122 onshore wind turbines, each with an output of 2.7 MW.

The contract signed with Queiroz Galvão includes the supply, transportation, installation and 10 years of operation and maintenance of the turbines. The project is divided into three wind farms (Ilha Grande, Boca do Côrrego and Ribeirão) located in the North-East of Brazil.

The complex has a power capacity of 75.6 MW and is the first ECO 122 wind farm of Alstom.

With its 2.7 MW nominal output, and its 122 metres rotor diameter, the ECO 122 wind turbine has a capacity factor up to 48%.

The nacelles were manufactured at Alstom Camaçari plant in Bahia state.

INSTALLATION IN FIGURES
- Local work force of 1,000 people
- More than 12 km of internal access roads built

CUSTOMER PROFILE
Acting for more than 50 years, the Queiroz Galvão Group’s work is focused on promoting development, especially in the construction industry, where the company found its origin. The Group includes over 50 companies in sectors such as construction, real estate development, food, investments and concessions, oil & gas, exploration and production, iron and steel industry and environmental engineering.

Queiroz Galvão Energias Renováveis is part of Queiroz Galvão Group and it was founded in 2012 to act as player in power generation by renewable sources.
Company’s business planning foresees 1.5 GW of installed wind power capacity by end of 2020.

HARNESSING BRAZIL’S POWER POTENTIAL
In Brazil, the wind is blowing in a new era of renewable energy. By 2020, Brazil intends to install 2 GW (nearly enough to power São Paulo, South America’s largest city) per year to produce 10% of its electricity from wind at the beginning of the next decade, against 3% currently. At the end of 2014, Brazil will have 5.4 GW in wind power capacity, representing 4.1% of energy mix.

Present in Brazil for over 58 years, Alstom has installed almost 40% of the power generation equipment in the country. Since 2010, Alstom has been selected in Brazil to provide 3 GW of wind power.
TECHNICAL SPECIFICATIONS

<table>
<thead>
<tr>
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<th>ECO 122</th>
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<tbody>
<tr>
<td>Rated power output</td>
<td>2.7 - 3.0 MW</td>
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<tr>
<td>Rotor diameter</td>
<td>122 m</td>
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<tr>
<td>Number of blades</td>
<td>3</td>
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<tr>
<td>Tower height</td>
<td>89 m</td>
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<tr>
<td>Speed Range</td>
<td>7.1 - 12.3 rpm</td>
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<tr>
<td>Rated wind speed</td>
<td>10.0 - 10.5 m/s</td>
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<tr>
<td>Blade length</td>
<td>59.3 m</td>
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ALSTOM PURE TORQUE® TECHNOLOGY

All Alstom’s wind turbines feature the PURE TORQUE® concept, a unique and proven mechanical design that protects the drive train from deflection loads to ensure higher reliability. The rotor is mounted on a fatigue-resistant cast iron hub that transmits the gravitational load and deflection stresses via two sets of bearings to the tower.

Meanwhile, the drive shaft elastically mounted on the front of the hub transfers pure torque (green arrows opposite) to the drive train free of the stresses and strains (red arrows opposite) that can arise due to buffeting.

FOR THE HIGHER ENERGY YIELD

ECO 122 is one of Alstom’s most successful wind turbines with nearly 2.5 GW ordered.

The ECO 122 leading efficiency and high yield sets a new benchmark for medium and low wind sites. Its 122 metres rotor diameter and swept area of 11,700 sqm improves landprint, offering up to 25% uncreased wind farm yield on a given piece of land compared to today’s 1.5-2 MW turbines.