

A Podcast Guided Tour of the Shanghai Wind Power Technology Museum

Leave the traditional guided tours behind and strike out at your own pace with an audio guide. This bilingual podcast is presented by Shanghai Daily and supervised by the Shanghai Science and Technology Committee.

The Shanghai Wind Power Technology Museum was opened in March 2006 to showcase the first wind farm in China – the Nanhui wind farm. Situated in Binhai Forest Park, this is a joint project between government departments and the Shanghai Electricity Company with support from the World Bank. Humans have been using wind power for hundreds of years. Though lately fossil fuels have become our main energy source, wind power still has the advantage of being both environmentally friendly and renewable. Let' s go find out more about this alternative energy source.

Enter via the North gate and the bright green building is the Wind Power museum. Turn right to enter the first hall: The Limit of Natural Resources.

Here you can watch an introductory film playing on the screens directly in front.

Look at the plaques along the wall on your right. They describe the main types of fossil fuels we currently use: coal, natural gas and petroleum. Modern industry has been built on these energy sources and they have dramatically increased the quality of life for humanity in a relatively short amount of time. Fossil fuels could reasonably be called one of mankind' s all-time greatest discoveries.

Yet the burning of fossil fuels has serious consequences such as the emission of greenhouse gases leading to global warming. They are also a finite resource that will one day, inevitably, run out. Thus the exploration of other energy sources, particularly renewable energy, is becoming increasingly important. Turn around to watch a film on new energy sources.

Now walk through the doorway into the next exhibition hall: Wind and Wind Power. Want to know the basic principles behind wind power generation? Along the wall on your right are plaques describing different types of wind and how they're formed, and underneath are two encyclopedias on wind knowledge. Follow the wall further inside and there are more plaques describing how wind strength and direction are measured and how its power can be harnessed.

Test your newly acquired knowledge with the experiment on your left. Move the animated character up and down the hill and make it test for wind speed and directions at different heights and seasons. Can you predict the pattern?

Turn left again to play with some more interactive exhibits: humans have been putting wind to useful work for a very long time, and these are three of the main methods. Make the ship move by pressing the button and move the joystick - this simulates wind blowing into the sails. Sailing vessels provided the primary means of intercontinental travel until only a few hundred years ago. Next are two stationary machines that converted the wind's energy into mechanical force. These were first developed in the Near East, though China also had her own version. Here you can see a Chinese grain grinder and a water irrigation windmill. You can also press the buttons to simulate how the original worked.

Windmills can be split into two types depending on whether they're mounted on a horizontal or vertical axis. All of the earliest windmills used a

vertical-axis whereas horizontal-axis windmill was developed significantly later, circa 1300 AD, in Western Europe. Keep walking forward and turn the corner to see models of a Dutch 'Smockmill' on the left and an American farm windmill on the right. In contrast to the early vertical axis windmills, these were easier to mount at a height where wind speed was greater, and could be rotated to face the wind. Hence they became widespread in the West in the 1700' s and 1800' s.

Windmills are the ancestors of modern day wind turbines which developed during the 20th Century. Unlike windmills, wind turbines generate electricity rather than mechanical movement. At first in the 1930' s when electricity was scarce, wind turbines were used to light up individual households. This was especially common in rural areas of America. However in the 1970' s when people started to recognize the environmental problems caused by burning fossil fuels, they were developed as part of the new interest in renewable energies.

Let' s go upstairs to learn more about modern wind turbines in the exhibition hall Using Wind Power to Generate Electricity. At the top of the stairs turn right. Pedal on the bicycles – you' ll light up the skyscrapers with green lights. On your right are skyscrapers lit by a wind turbine represented by orange lights. You' ll see that the power generated by your action is both weak and inconsistent compared to wind power.

Now walk forward to the silver models of different types of wind turbines. In the middle, the largest sculpture is a life-size model of the wind turbines in operation in Binhai park. There are 11 of these here, and they can generate 1.5MW per hour each. Made by American company General Electric, they' re an example of a typical, modern horizontal-axis wind turbine with three straight propellers. Move round to its right and look at it in profile, you can see its inner workings. A complete wind turbine would be around

65m tall with a 34m wing span. And at 15 million yuan each, they don't come cheap!

The electricity generated from this wind farm is combined with China's national grid. Though wind power still only contributes a small amount to China's electricity supply, it is a developing sector. Along the wall behind the turbine is a map of current and future plans for wind farms across China, but we will come back to this later.

First have a look at the other turbines around the central display. Examples of modern vertical-axis wind turbines are just in front. On the right is a Savonius wind turbine, invented by Sigurd Savonius of Finland in 1924. On the left is the Darrieus Wind Turbine which was invented a year later by French aeronautical engineer George Jean Marie Darrieus in 1925. This turbine is sometimes known as the 'Eggbeater Turbine' because of its shape.

The map of China along the back wall has arrows indicating wind direction and strength so you can see how wind farms have been positioned in relation to it. Since wind speed is the single most important criteria in increasing a wind farm's productivity, you can see most of the wind farms are around coastal areas. Can you find the Nanhui wind farm on the map?

Keep walking forward and turn right into the blue room, you'll see a model of offshore wind turbines split into two halves. This represents the two main ways electricity is used: on the right is a single Darrieus turbine which serves an individual fishing operation; on the left is a wind farm which serves the national grid. The left hand model is actually one of a real project being planned near the East China Sea Bridge. Like the model, the real farm will have 18 turbines.

Have you mastered all the knowledge you' ve learned at the museum? Test yourself on one of the computer stations behind you, there' s a selection of cartoon quizzes and interactive experiments to choose from.

If you need a rest walk back out of the room to the last exhibition hall: Wind Power and Us. Follow the sound of a documentary that' s playing to get there. When you leave, go right and there' s a map of the world. The screens in front of it tell you about the development of wind power worldwide, you can touch the screen to stop the text scrolling by.

Next enter the doorway on your left; you' ve entered a green world! This room is all about 'green' energies, not just wind but also solar, water, geothermal etc.

Finally, walk back out to the centre of the room where there is a scale model of the Binhai park with its 11 wind turbines. The control panel on the side of the table allows you to turn the wind turbines on as well as displaying some more facts about this wind farm. Does it surprise you the wind turbines are not lined up in neat rows? What seems like an illogical layout has actually been scientifically worked out. Great attention must be paid to the exact positions of the turbines (a process known as micro-siting) because a difference of 30m can sometimes mean a doubling in output.

The control panels at either ends of the oval table allow you to look at the park through security cameras. Between these two cameras you can see the whole park.

That' s it for our tour today. We hope you enjoyed your visit to the Shanghai Wind Power Technology Museum.

Museum address: 118 Dong Da Gong Rd., inside Binhai Forest Park, Nanhui District.

Admission: 15 yuan adult, 10 yuan student, children under 1.20m (around 3ft 11) free.

Opening times: Daily 9am – 4pm; last admittance 3:30pm; closed Mondays. Group visits by prior arrangement.

Transport: nearest metro station Longyang Rd., line 2. Change for the 'Long-Bin' direct line bus and get off at Binhai Holiday Village.

For more details contact the museum at: 5829-3030

Key Words:

1. Windmill (n). A building containing machinery for grinding corn or for pumping, driven by sails that are turned by the wind.风车
2. Wind Turbine (n). A machine that converts kinetic energy in wind into electrical energy.风电机
3. Fossil Fuel (n). A hydrocarbon deposit, such as petroleum, coal, or natural gas, derived from living matter of a previous geologic time and used for fuel.化石能源
4. Renewable Energy (n). Also known 'green enerby' utilizes natural resources such as sunlight, wind, tides and geothermal heat, to produce energy. It is therefore renewable since the resource is naturally replenished.可再生能源
5. Horizontal-Axis (n). A straight line or object about which a body or geometric object rotates or may be conceived to rotate lying in a horizontal state.平行轴机构

6. Vertical-Axis (n).A straight line or object about which a body or geometric object rotates or may be conceived to rotate lying in a vertical state.垂直轴机构