Saba Niroo

Affiliated to Sadid industrial group

Profile:

SabaNiroo Co. founded in April 2001, had been officially established in November 2003 by the energy and industry&mine ministers. The company's main objectives are design, development and manufacturing of large wind turbines as well as supplying other composite parts, related moulds and material testing which are to be developed. We are the first and only wind turbine manufacturer in Iran and Middle East and we present our products in compliance with world's ongoing technology. Saba Niroo has obtained ISO 9001-2000 certificate in quality management system, ISO 14001-2004 in environmental management system and also OHSAS 18001-1991 in occupational health and safety management system in the fields of design, manufacturing and after sales services of large wind turbine.

Saba Niroo Opening by Power and Industry & mine ex-Ministries

Manjil Wind Farm-Guillan Province

Our philosophy is improving and developing pollution-free electricity generation using wind as a free renewable energy. We believe that wind power generation develops the culture of green resources usage, has fast installation and commissioning capability as well as low O&M costs, generates power economically and facilitates more economical consumption of fossil fuels.

Our core competencies are performing consultative and executive services in manufacturing of large wind turbines and technical and after sale services. The company has especial prosperity in design and manufacturing various types of industrial composite structures and fiberglass moulds that is mainly used in high production rates and experimental processes on composites, in accordance with the international standards.

Finishing shop

Blade production shop

Nacelle assembly shop

Laboratory Equipments

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Wind Turbine's Installation Process

The main clients of SabaNiroo:

- A contract with "Iran renewable energy organization (SUNA)" for manufacturing, installation & commissioning of 143 units of 300, 550 and 660 kW wind turbines as a 90 MW wind farm in Manjil, Harzevil and Siahpoosh regions in Guillan province.
- A contract with SUNA for manufacturing, installation & commissioning of 43 units including 660 kW wind turbines as a 28.4 MW wind farm in Binalood region in Khorasan province. (Transferred from Tavanir Co. to SUNA in 2006)
- A contract with SUNIR co. for manufacturing, installation & commissioning 2.64 MW including 660 kW wind turbines in Armenia.

Binalood Wind Farm-Khorasan Razavi

Visiting of Iran Power Minister from Binalood Wind Farm

Wind Farm Opening ceremony (Armenia) by Iran Power Minister & Armenia Energy Ministry

Pushkin Pass Wind Farm-Armenia

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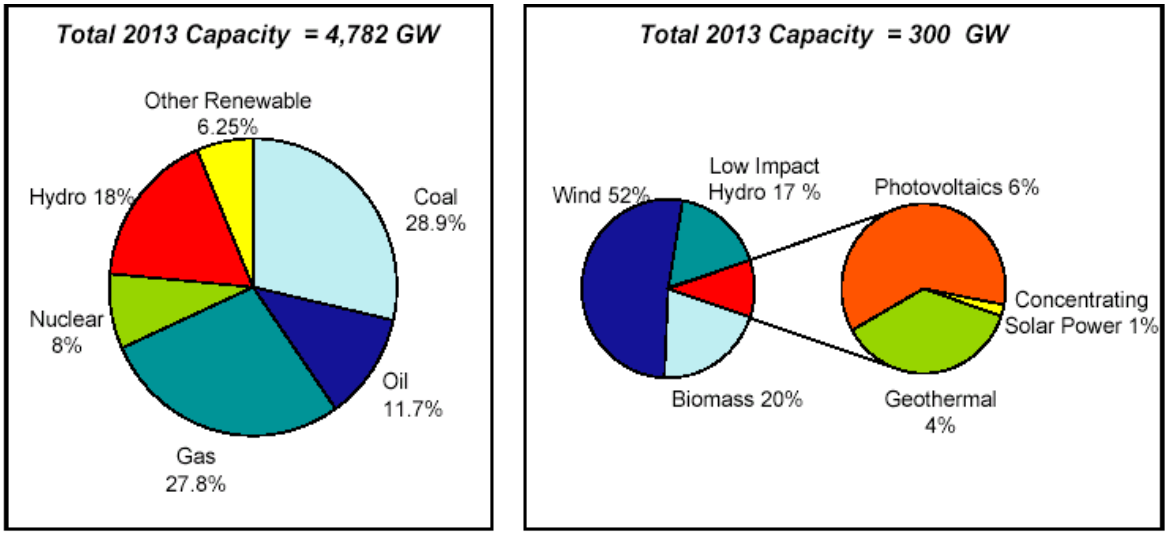
The advantages of renewable energies and the wind power superiorities:

Wind energy as a kind of renewable energy, through its advantages such as Cleanness, sustainability, flexibility (regional application as joint or separated to the grid), safety, employment and etc. has been one of the most important sources for producing electricity in the world.
It should be mentioned that the wind farms with lowest rate of pollution and acceptable economical indexes, are the most important types of power plants based on renewable energies. On the other hand, statistics shows that the wind farms have the most rapid growth in producing electricity among all kinds of renewable energies and according to the last predictions for the year 2013, the wind energy is going to have the best world market compared with other types of renewable energies. As it is shown in the following graphs, electricity generated by renewable energies will be 6.25 percent in 2013, of which 52 percents is predicted to be gained from wind energy. In other words, in that year wind energy share in producing electricity will have reached to 3.25 percent which is equal to 156 Gigawatts.

A glance at the wind energy share compared with other types of energy:



1. Source: NCI estimates based on IEA World Energy Outlook 2002 and interviews with renewable energy manufacturers.
2. "Other renewable" includes biomass, wind, geothermal, concentrating solar power, photovoltaics, and small hydro.

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Output power of 660 kW wind turbine:

This type with the capacity of 660 kW is equipped with two unique automatic systems:

1-Optimal picth/Opti Tip (blade angle adjustment system):

S47-660 wind turbine is equipped with a pitch angle adjuster (Opti Tip), which is controlled by a microprocessor and ensures that the blade angles will have the optimum adoption with the maximum wind blow rates and directions. Therefore, for maximizing the output of the wind turbines and minimizing the noise level caused by rotation, the "Optimal Pitch/Opti Pit" system is used.

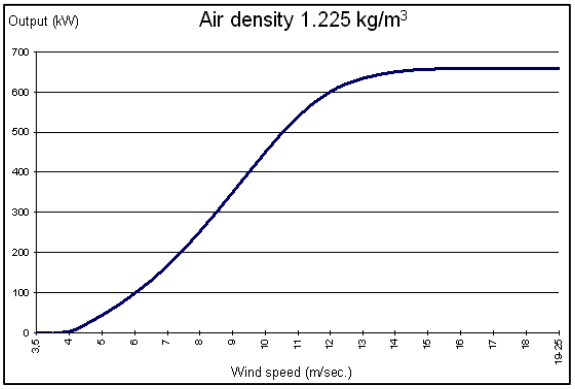
2-Opti Slip (generator output quality system):

One of the most unique characteristic of this type of wind turbine is the use of "Opti Slip" system. It can compensate variation in rotor and generator speed up to 10 percents, also with decreasing the undesired fluctuations of the grid and probable shocks to crucial parts of the wind turbine, improve the quality of the output power of the generator considerably.

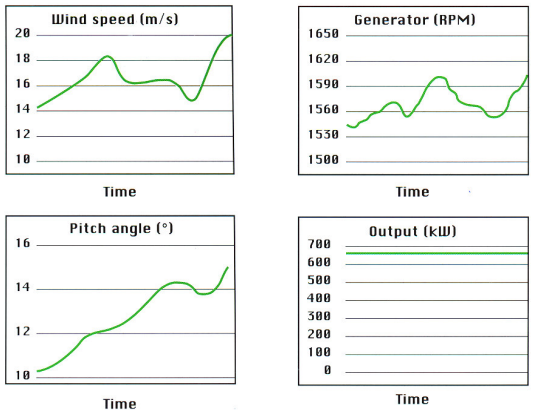
S47-660kW Technical Parameters	
Technical Parameter	**Amount**
Lifetime	**20 Years**
Temperature Range	**-20˚C to 40˚C**
Rotor Diameter	**47m**
Swept Area	**1.735 m2**
Rotor Rotational Speed	**28.5 rpm**
Blade Length	**22.9 m**
Aerodynamic Brake	**Feathered**
Sense of Rotation	**Clockwise**
Controller	**Opti Slip & Opti Tip**
Hub Height	**40m**
Generator Type	**Asynchronous-660kW-50Hz**
Generator Speed	**1515-1650 rpm**
Gearbox Type	**Parallel Axes**
Rotor Position	**Up-Wind**
Cut-in Wind Speed	**4 m/s**
Rated Wind Speed	**15 m/s**
Cut-out Wind Speed	**25 m/s**

Anti Lightening Safety System:

This type of wind turbine (S47-660) is equipped with the "Anti Lightening Safety System", which protects all parts of the turbine (from the blade tips to the foundation section) against lightening.



S47-660 kW output power graph



Real Measurements of 660 kW with OptiSlip System

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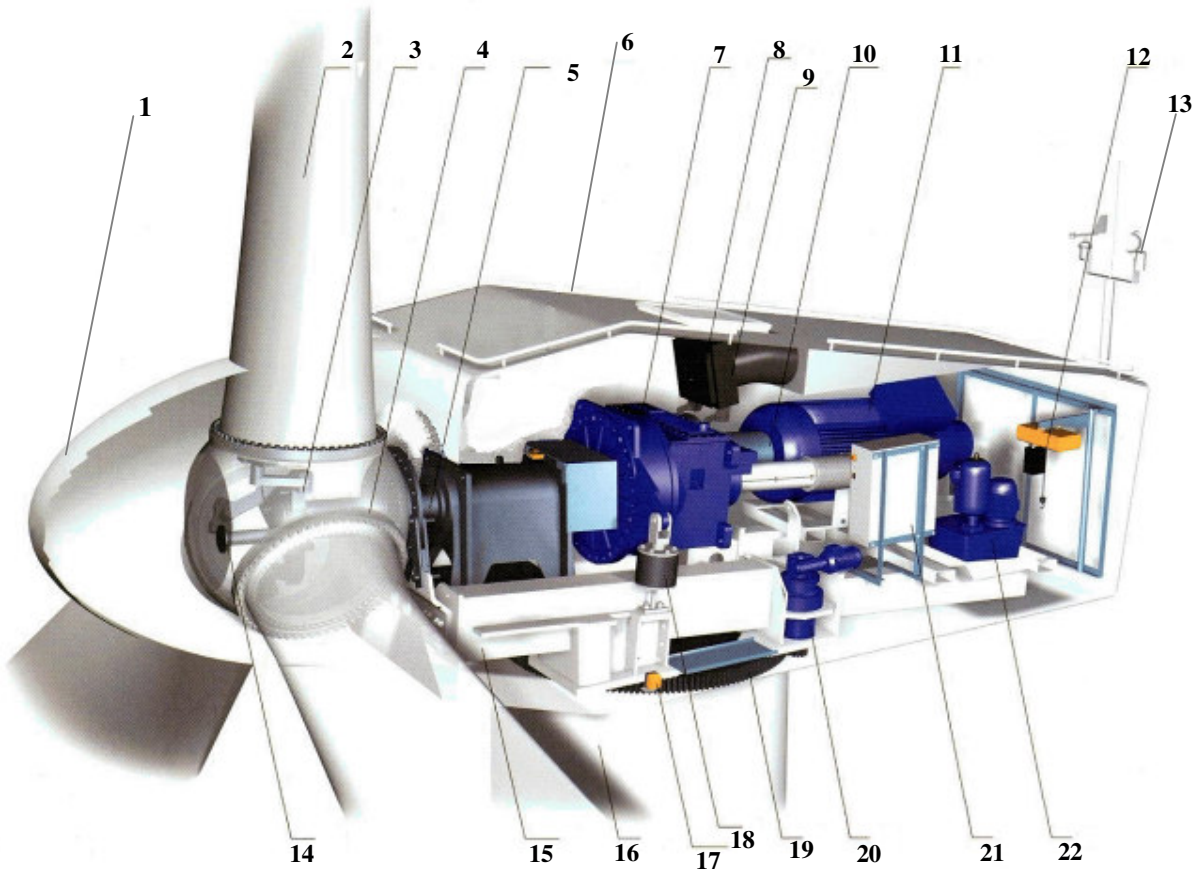
Overview drawing of S47-660 kW:



1- Nose Cone
2- Blade
3- Blade Hub
4- Blade Bearing
5- Main Shaft
6- Nacelle Cover
7- Gearbox
8- Disk Brake
9- Oil Cooler
10- Coupling
11- Generator
12- Service Crane
13- Anemometer & Wind Vane
14- Pitch Cylinder
15- Chassis
16- Tower
17- Yaw Controller
18- Gear Tie Rod
19- Yaw Top
20- Yaw Gears
21- VMP Top Control Unit
22- Hydraulic Unit

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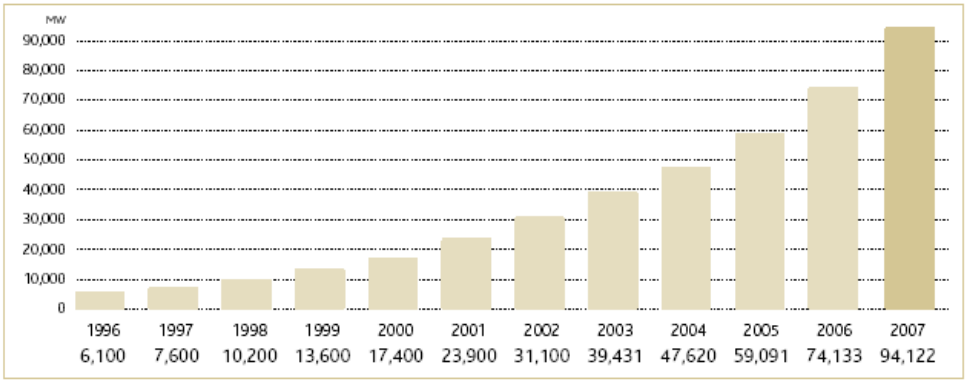
Wind energy in Iran:

After approval of Iran's joining to Kyoto Protocol in the government (installing clean power plants for reducing the amount of greenhouse gases), also the worldwide tendency in using the clean and costless energies, this industry will have good perspectives in Iran. Considering Iran's area, climate variety, high mountainous areas, vast plains, long coastal areas and the obtained information, there is good wind potential in Iran. Fortunately, the desert areas of Iran have suitable and powerful wind flow. Total potential for wind power was initially estimated as 30,000 MW.

The global growth of wind farms at the end of year 2007:

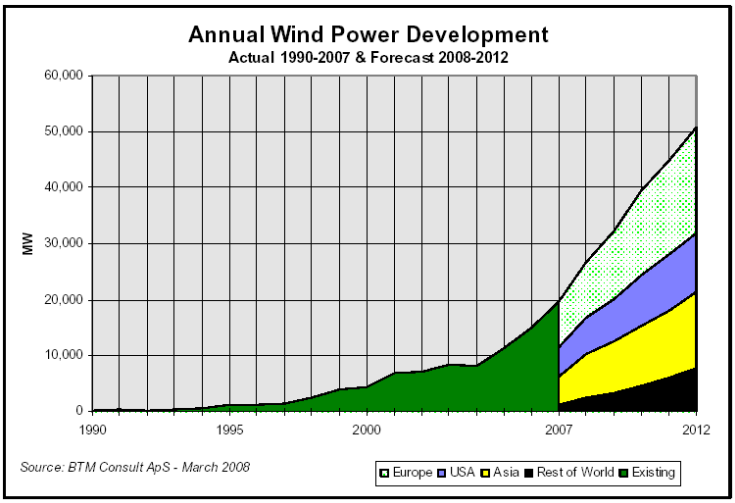
The total installed wind power capacity now stands at 94,122 MW worldwide, an increase of 27% compared to 2006. Europe is still leading the market with over 57,135 MW of installed capacity at the end of 2007. While Europe remains the leading market for wind energy, new installations represented just 43% of the global total, down from nearly 75% in 2004. For the first time in decades, more than 50% of the annual wind market was outside Europe, and this trend is likely to continue into the future. Asia has experienced strongest growth of over 51% of installed capacity, bringing the continent up to a total of over 16,091 MW. In 2007, the continent accounted for 27% of new installations.

GLOBAL CUMULATIVE INSTALLED CAPACITY 1996-2007



Wind energy forecast (2008 – 2012):

Annual installation of capacity will grow from today's 19,791 to around 50,000 MW per year in 2012. It is forecasting that the global wind market will grow by over 155% to reach 240 GW of total installed capacity by 2012. Global Wind Energy Council forecasts an addition of 146 GW in the coming five years, equaling an investment of more than 180bn EUR or 277 bn US$ in 2007 values. In 2012, Europe will continue to host the largest wind energy capacity, with the total reaching 102 GW, followed by Asia with 66 GW and North America with 61.3 GW.



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