TECHNOLOGICAL PLAN FOR THE IMPLEMENTATION OF THE PROJECT

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1. General Information

1.1. Design and Testing of Rotor with Angled Blades for Efficient Power Generation
1.2. Modernization of the energy complex: A technological breakthrough in the development of wind energy.
1.3. Financing per period:

1.2. Results of scientific and (or) scientific-technical activities proposed for commercialization

The project presents an innovative design of the Angled blade wind turbine with elbow bending of the blades, which is a breakthrough technology in wind energy. The use of the new rotor makes it possible to achieve a higher wind capture coefficient with a smaller blade area, while the power generation of the proposed design is 15-70% higher than that of traditional straight blades.

1.2.2 Technical description of the proposed solution

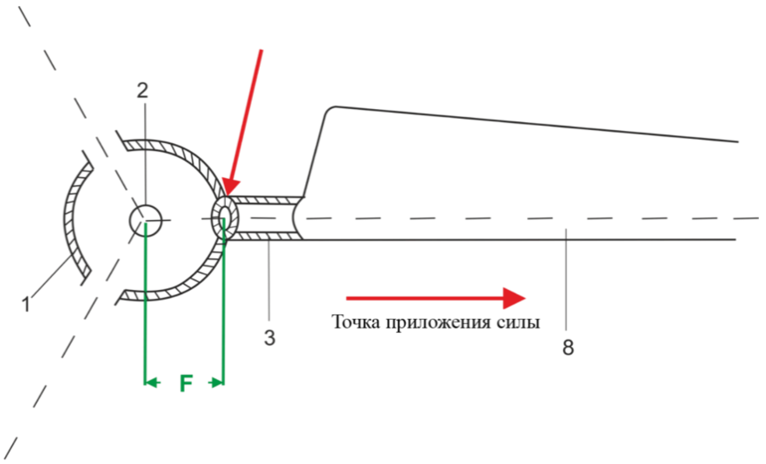

Figure 1. Point of Force Application at Blades of Traditional Rotor Design with Straight Blades

A wind turbine is a lever. It is known that the moment of force is proportional to the arm of the lever, i.e. the distance between the center of rotation (here, the main shaft) and the point of application of the force. In the case of a traditional wind turbine with straight blades**, the force application link F** is the radius of the head, counting from the point where it is attached to the main shaft. The transmission of the kinetic force of the wind from the long blade takes place through the point of its attachment to the head of the installation and is carried out through only one support – attachment points of the wing-shaped blade handle to the mounting head (Fig. 1).

The disadvantage of traditionally used wind turbines is the direct power rotation of the main shaft of the wind turbine, which usually requires lengthening the blades to increase the power generation capacity of the wind turbine. At present, the design improvements of the rotor have reached the limits of technical possibility: the length of the blades reaches 80-112 meters, and the weight is more than 7 tons, which requires increasing costs for materials, manufacturing, and installation of wind turbines.

In our invented rotor design, the blade consists of two parts: a short elbow-bent root part (Fig. 2.3, 2.4) and a long wing-shaped part (Fig. 2.8).

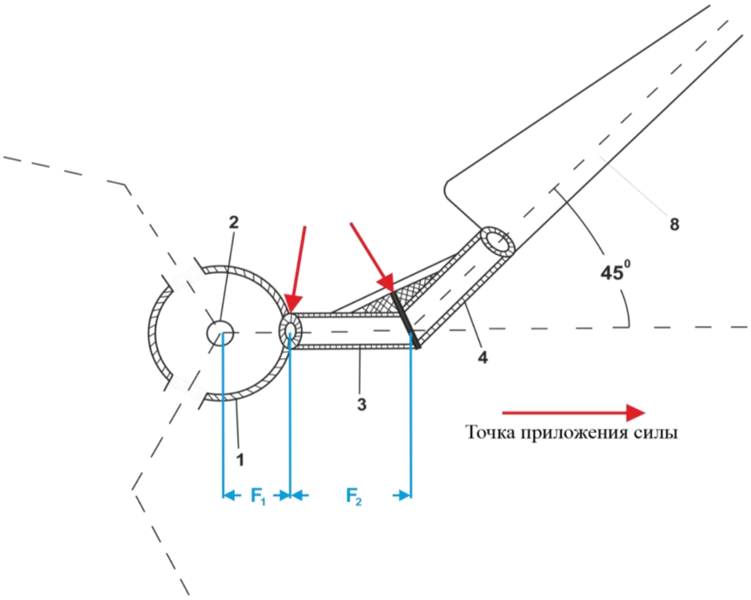

Figure 2. Points of force application at a wind turbine with a elbow bend of the blades

What are the advantages of our design over traditional blades with straight axes?

The new design of the wind turbine (Fig. 2, 3, 4), due to the special design of the lever system with two arms and two points of support located on one side, based on Archimedes' law, creates an effective kinematics of the wind flow with a high coefficient of action. In the design of a wind turbine with a elbow bend of the blades, the moment of force **F1** is additionally increased with the connection of the axial section **F2** to it**.** The axial section of the short part of the blade is the link (Fig. 2) that constitutes the moment of additional force (**F = F1 + F2).** The additional force reported is proportional to the increase in the length of the axial section, which, depending on the planned capacity of the wind turbine, is 0.20-5 m (link **F2).**

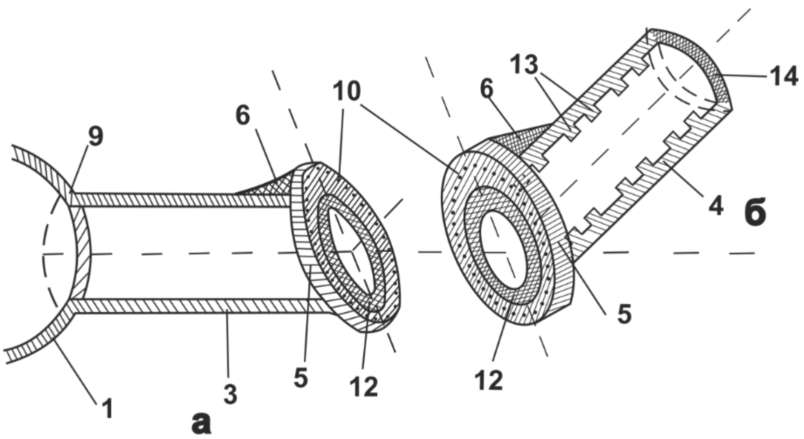

Figure 3. Schematic structure of the axial (a) and sleeve (b) sections of the short part of the blade with an elbow bend

Figure 4. Elbow bend wind wheel

1.2.3. Development of patents.

Based on the results of design surveys, 6 patents of Kazakhstan and 2 patents of the European Patent Organization were obtained (**EPO No. 2937557 dated 15.11.2017; EPO No. 3411592 dated 26.06.2019**), on the basis of which national patents of 8 European countries were obtained: Germany, Denmark, Great Britain, the Netherlands, France, Spain, Turkey, Russia, as well as patents of Japan, South Korea, China, India and the USA.

1.2.4. Demonstration of the design of the invention.

The model was exhibited at the World Exhibition EXPO-2017 "Energy of Life" in the Pavilion "Best Practice" in June-September 2017 in Astana, presenting the scientific achievements of the Republic of Kazakhstan in the field of clean and renewable energy (Fig. 5, 6). The results of the work were consecrated by the media. Currently, the model of the new rotor design "Kayky Zhelkalak" is demonstrated in the EXPO-2017 complex, at the Zher-Alem pavilion, in the "Wind Energy" department

Figure 5. EXPO-2017 Exhibition, Best Practice Pavilion

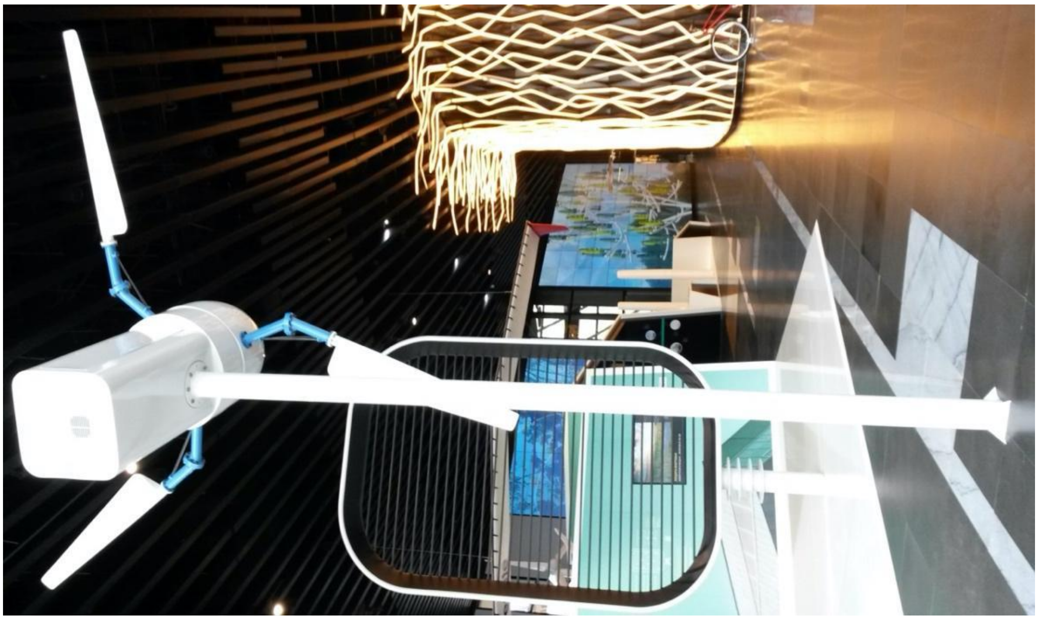

Figure 6. EXPO 2017, Zher-Alem Pavilion, Wind Energy Department

1.2.5. Conducting Tests

To confirm the effectiveness of the invention, comparative tests of the Angled blade and straight-blade rotors were carried out at the wind test site near the village of Nurly in three seasons: October-November 2019, March-May 2020, and September-November 2020 (Figure 7). Two wind turbines made in Germany with a capacity of 0.75 kW were purchased for testing. At the machine-building plant in Almaty, at its own expense, a prototype of a short part of the blade with an elbow bend, which allows you to change the angle of attachment of the long wing-shaped blade, was manufactured.

Short elbow-bending parts were installed on the blades of the first wind turbine, and a straight link with the same length was added to the blades of the second wind turbine so that the diameter of the rotor or the so-called swept area of both wind turbines was the same. To account for the functional activity of each of the wind turbines, we connected the ACLR-5000 recorder, manufactured by the plant, which records several data: current generation, rotation rate, reading of the power battery and energy consumption by additional load. Since the wind turbines produced a current of 12 W, an inverter was connected to the ACLR recorder to convert the voltage to 220 W, to which an additional load in the form of electric lamps of 40-100 W was connected. In this form, the generators represented a low-power power plant with a closed system.

The results of the generators' operating parameters via ACLR were recorded in two computers provided with a special program using the Excel system, which recorded fluctuations in the current generation, rotor rotation speed, battery charging status and the consumption of excess current additionally connected by load every 5 seconds of time. To measure the wind speed, an anemometer made in the United States was connected and its readings were also recorded in the first computer, while a special program was used to record the wind flow, and its speed exceeded 1 m/s.

Figure 7. Testing of rotors at the Nurly test site, Almaty region

The Angled blade rotors and the rotor with straight auxiliary links were tested at different angles of attack by the wind. The instructions for use of the AC-750 indicate that the modal (more efficient) position of the blades against the wind is 9^0. Therefore, in the first version of the test, both rotors, the Angled blade and the rotor with straight auxiliary links, set the angle of attack of the wind to 9^0. The test was carried out for several days at different wind speeds. This version of the experiment was repeated several times in 2019 and 2020. In addition, to determine the modal position of the Angled blade rotor blades, the test was carried out with the following options: 1) Angled blade – 6^0 blade and rotor with straight blades – 6 0; 2) Angled blade blades – 3^0 and rotors with straight blades – 3^0; 3) Angled blade blades – 6^0 and rotors with straight blades – 9^0; 4) Angled blade blades – 3^0 and rotors with straight blades – 9^0;

A key point in generating energy using wind is to increase the coefficient of capture of the kinetic energy of the free-flowing wind. Therefore, it is necessary to achieve a significant density of the wind flow in the area of contact with the surface of the wing-shaped blade and the "catch" of its increasing mass, respectively, to ensure a large aerodynamic effect of the wind flow within the swept area. The higher wind resistance of the Angled blade rotor is easily overcome thanks to the new blade design based on the use of a lever system with a corner connection with two links and two legs located on the same side. This is the whole design feature of our invention.

The results of the comparison of objective data showed that the functional data of the generator with the Angled blade rotor in all modes of the angle (3^0, 0, 6^0, 9^0) of wind attack exceeded those of the rotor with straight blades. At the same time, the differences in the performance of the Angled blade rotor increase diametrically with increasing wind speed. If, at a wind speed of 5-6 m/s, the Angled blade rotor has a current output and rotational speed that exceeds that of a straight-bladed rotor by 15-17%. At a wind speed of 9-10 m/s, this difference reaches 25-30%, and at a wind speed of more than 12-13 m/s, the difference between these indicators increases to 50-70% (Figure 8).

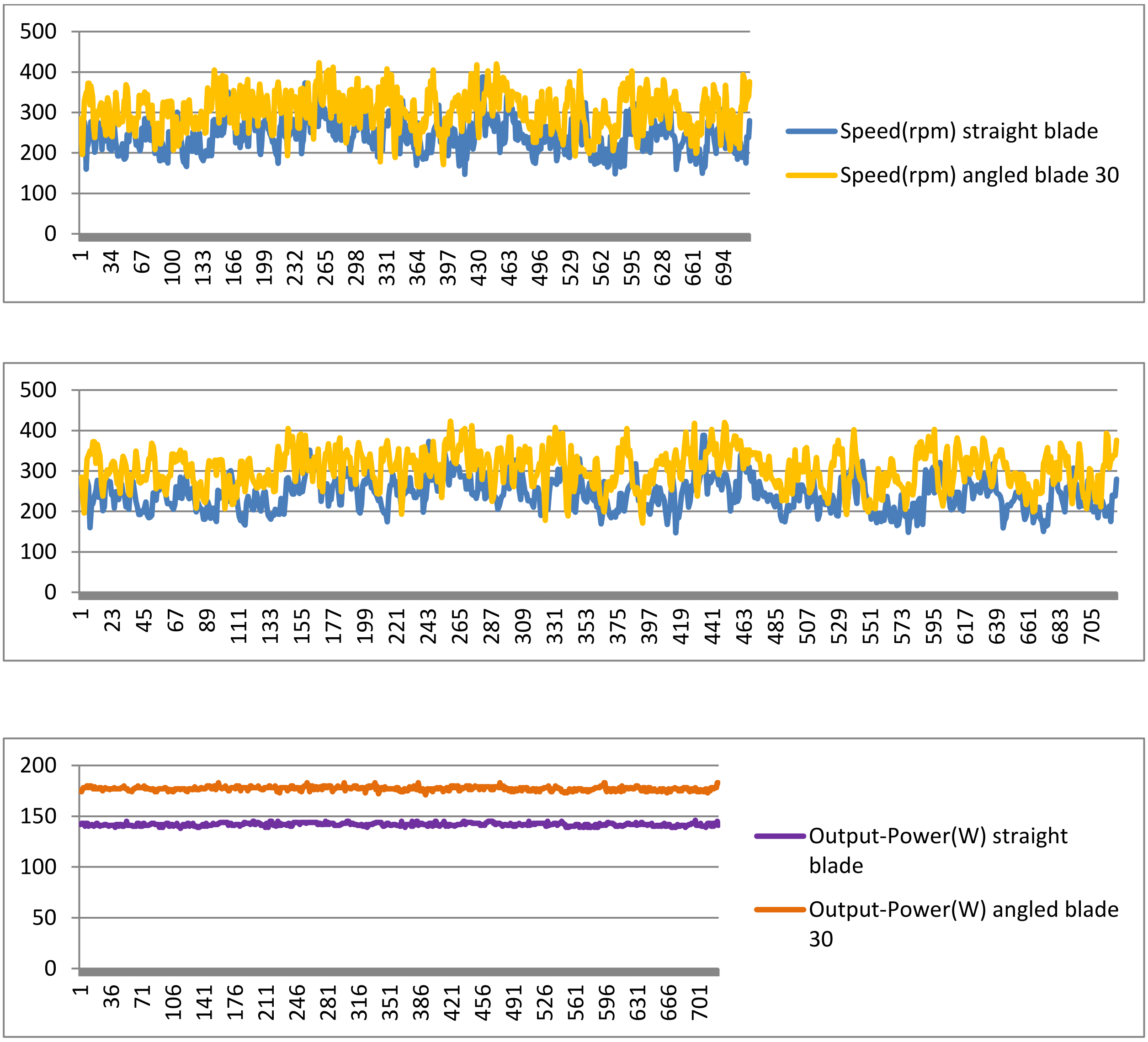

Figure 8. Test results at wind speeds up to 5.9 m/s

Thus, as a result of field tests of the Angled blade rotor in comparison with the rotor with straight blades with the same wind force in the wind range near the village of Nurly, the high efficiency of the Angled blade rotor was confirmed. Depending on the wind speed, the functional efficiency of the Angled blade rotor is 15-70% higher than that of the traditional straight-blade rotor.

1.2.6. What business problem does the proposed result of scientific and (or) scientific-technical activity solve?

Currently, straight-blade rotors are the standard for wind turbines produced. The disadvantage of traditionally used wind turbines with straight blades is the direct power rotation of the main shaft of the wind turbine, which usually requires lengthening the length of the blades to increase the power of the wind turbine. The efficiency of the wind flow for rotors with straight blades is only 16-25%.

The proposed solution is the new design of the Angled blade wind turbine with elbow bending of the blades, which allows to achieve a higher wind capture coefficient, while the power generation of the proposed design is 15-50% higher than that of traditional straight blades. We believe that this technology has the potential to become a breakthrough in the field of wind energy.

On a more global level, another major issue now is the reduction of the cost of energy (COE). In connection with the disaster of the Fukushima-1 nuclear power plant, the question of the environmental safety of mankind has again arisen acutely. In Germany, after this event, 8 nuclear power plants were immediately shut down. These problems have forced us to look for alternative renewable energy sources: hydro resources, solar and wind energy potential. In the developed countries of the West, they began to build large factories for the production of wind turbines. Share of energy generated by wind farms in 2017 d was 44.4% in Denmark, 24.2% in Portugal, 24% in Ireland, 18.6% in Spain and 20.8% in Germany. At the end 2017 China already had 188 GW of wind farms, which accounted for about 35% of the world's wind capacity.

In Kazakhstan, attention has been paid to the development of wind energy only in the last 10 years. There are significant prerequisites for the development of wind energy in our country. Large polygons with constant gusts of wind are known: the Zhongar Gate, the Kordai Pass, the north-eastern coast of the Caspian Sea, the north-eastern tip of Karatau, Ereymentau, the Syugatinskaya Valley, Betpakdala, Karkaraly, Chingistau. Accelerating the pace of wind energy development in Kazakhstan will be significantly helped by new types of wind turbines with a highly efficient design for the transmission of wind kinetic energy. The project is dedicated to solving this problem.

1.2.7. Comparative description of the proposed product, work or service with existing analogues or substitutes on the market, indicating technical characteristics

As a result of the analysis of potential customers of the technology, a list of potential buyer companies was compiled (Table 1):

Table 1

№	Company Name	Country of origin
1	Vestas	Denmark
2	Sinovel	PRC
3	GE Energy	United States
4	Goldwind	PRC
5	Enercon	Germany
6	Suzlon Energy	India
7	Dongfang Electric	PRC
8	Gamesa	Spain
9	Siemens Wind	Germany
10	United Power	PRC

The patent landscape of global wind turbine manufacturers was studied to understand the picture and the degree of importance of patents in the wind energy market. According to the patent search for the IPC F03D1/0658 classifier in accordance with our invention, the main companies and 1454 active patents were identified (Fig. 9).

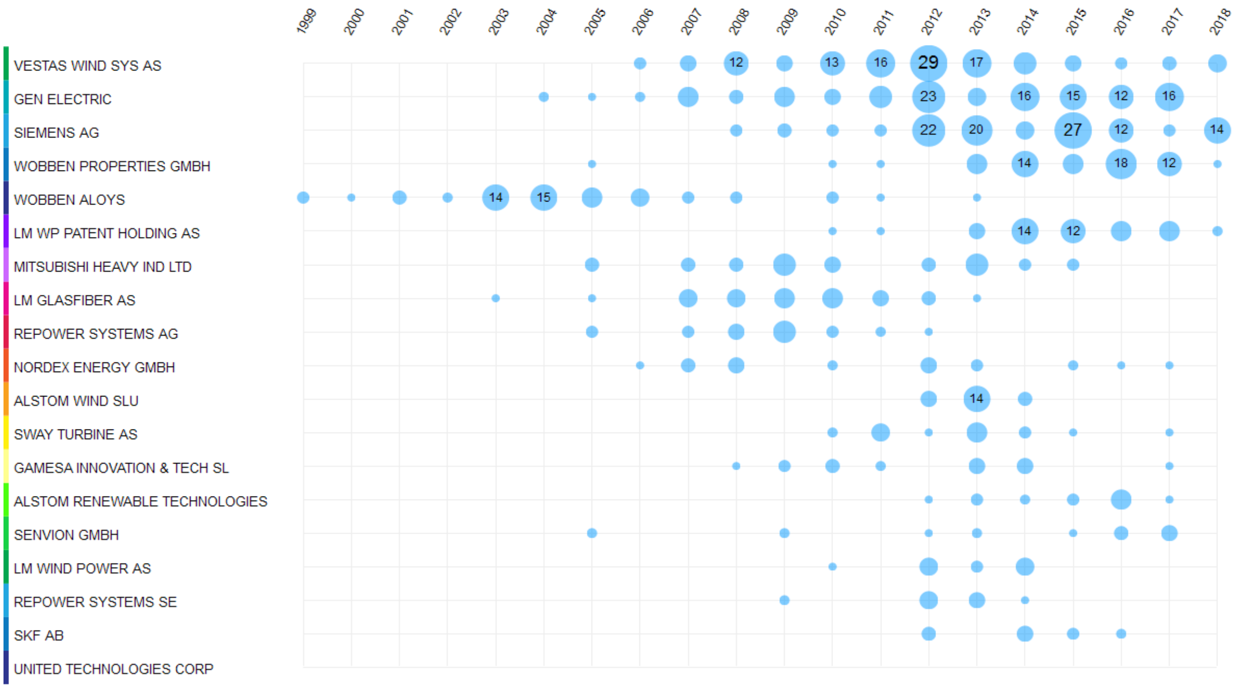

Figure 9. Patent Landscape of Global Wind Turbine Manufacturers

According to the figure, many large companies are working in this direction, which are constantly developing and licensing new inventions to improve the efficiency of wind turbines and solve problems associated with the need to constantly increase the size of wind turbines. Moreover, given the high competition in the market, most of the above-mentioned companies are expected to demonstrate interest in our development, as evidenced by the patenting of our invention in the patent offices of the countries producing wind turbines. At present, there are no direct analogues of inventions in terms of efficiency.

1.2.8. Certification of inventions

Based on the results of the test, it is necessary to pass the certification procedure and obtain either the IEC 61400-2 or DNVGL-SE-0441 "Certification of Components and Types" certificate.

In 2019, we contacted 4 companies engaged in the examination of new technical equipment and devices: ORE Catapult (https://ore.catapult.org.uk/testing-validation/facilities/blades/),Tuv-Sud (https://www.tuv-sud.co.uk/nel/our-services/activities /calibration-testing/wind-energy-systems/wind-turbine-testing/), Intertek (http:// zoy www.intertek. com/wind/turbine-testing/), DNVGLhttps://www.dnvgl. com/ services/modelling-of-wind-farms-and-wind-turbines-7190). DNVGL is the leader and developer of minimum standards in the field of wind energy.

Out of 4 companies, 3 companies informed that they do not have the opportunity and interest to travel to Kazakhstan. While DNVGL has shown interest.

Certification is required for the technical part of a commercialization project and generally represents the greatest barrier for Kazakh companies to bring products to international markets for a number of reasons, including the costly certification process.

In 2019, we drew up a contract for a technical examination with DNVGL, where the initial results were reported, and then one employee was invited to check the technical test at the Nurly test site in the Almaty region. During this period, our Angled blade rotor design was tested with a 1 kW generator made in Germany. Rotation, generator current generation and wind speeds were recorded in a computer using a special program and a video camera. The results of computer recording of the operation of a generator with a rotor with a elbow bend showed a clear advantage of this generator in comparison with a generator with straight blades, exceeding by 15-50% at different speeds of the wind flow. However, the recording of the operation of the generators by the video camera turned out to be unsatisfactory, since the rotation speed of the rotors exceeded 700-1200 revolutions per minute, the speed of the video camera was insufficient to record the rotation of the generators. In this regard, we were advised to repeat the test of the Angled blade rotor with generators with a power of more than 100 kW. Such tests are hampered by a lack of funding.

1.2.9. Commercialization of intellectual property

It is planned to commercialize the technology through licensing, i.e. through the conclusion of licensing agreements. The calculation of revenues will be expressed in terms of the amount of Royalty proceeds from technology licensing.

The preferred form of selling the ownership of an IPO elbow bending wind turbine is a license agreement, as it allows you to grant the intellectual property rights to more wind turbine manufacturers and maximize profits. In this case, the monetization of the technology is supposed to be carried out by receiving royalties from the licensee for the use of intellectual property rights. Entering into several licensing agreements with several companies will lead to the widespread dissemination of the invention in many countries.

An intellectual property object will be sold, a wind turbine with a elbow bend of blades, which is a unique intellectual property for wind energy. The technology will be sold - the device of a wind turbine with a elbow bend of the blades and the method of its manufacture, which is a breakthrough technology in wind energy. Elbow-bending blades easily achieve a higher wind capture coefficient, hence the power generation is 15-50% greater than that of traditional straight blades.

In fact, it is possible to retrofit all existing and installed wind turbines in the world by adding a short part of the blade with a elbow bend, and any turbine will be 1.5-2 times more efficient.

For the new production of wind turbines, this technology will save billions in costs for materials and turbine installation work. If earlier the length of the blade was increased for efficient energy generation, which today reaches 80-112 meters and weighs 7 tons, [1] then according to this technology, it is necessary to change the angle of attachment of the blade with the help of a elbow bend and it is possible to use much smaller blades, and it will generate the same amount of electricity. On the scale of wind turbine production, the cost of which reaches $1.3 -$1.5 million for each megawatt and up to a maximum of 8-10 megawatts, the savings that wind turbine manufacturers will achieve with the new blade mounting technology will be enormous.[2]

1.2.10. Assessment of the potential market of the project

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[1] https://pikabu.ru/story/yenerkon_e126_samyiy_bolshoy_vetrogenerator_v_mire_3881291

[2] http://www.windustry.org/how_much_do_wind_turbines_cost

For power generation on an industrial scale, three-blade wind turbines with a horizontal axis are currently mainly used.

The intensive introduction of wind energy into practice is significantly constrained by the high cost of electricity generated by wind farms (20-25% more expensive than thermal power plants), the high cost of installation and maintenance of wind turbines and an insufficient limit of land suitable for the construction of a wind farm. Due to the lack of land, manufacturers began to actively develop offshore wind turbines.

The global wind energy market was valued at USD 77.77 billion in 2021. The surge in carbon dioxide emissions from the utility industry has prompted a number of new legislative and policy measures from governments around the world. In addition, regulators have adopted favorable rules and by-laws to encourage the development of sustainable energy technologies, such as wind power. The growing development of infrastructure in developing regions is known to increase the demand for wind power in the market during the forecast period.

According to a study by Preceedence Research, the global wind energy market size is projected to reach approximately USD 174.75 billion by 2030 and increase at a CAGR of 9.4% between 2021 and 2030.

In 2021, wind power generation increased by a record 273 TWh (an increase of 17%), reaching a record 1,870 TWh. This was 55% higher than the growth achieved in 2020 and was the highest among all renewable energy technologies. This rapid development was made possible by an unprecedented increase in added wind capacity, which reached 113 GW in 2020 from just 59 GW in 2019.

In many countries of the world, wind energy has moved from alternative sources to mainstream ones. In Denmark, for example, wind energy covers 40% of the country's needs. By 2020, the Danes plan to produce 50% of all electricity from wind, and by 2035 - 85%. In 2050, the country will switch to 100% wind energy consumption. In Portugal, wind energy covers 23% of the country's needs, in Spain - 27%, in Ireland - 20%, in the UK - 12%, in Germany - 11%. In the U.S., wind capacity was 70 GW in 2015. According to the government's plans, in 15 years, at least 20% of all energy in the United States should be generated from wind.

China accounted for nearly 70% of wind power growth in 2021, followed by the U.S. (14%) and Brazil (7%). In the European Union, despite near-record capacity growth in 2020 and 2021, wind power production declined by 3% in 2021 due to unusually long periods of weak wind.

The International Energy Agency (IEA) predicts that wind power generation in the net zero scenario will reach nearly 8,000 TWh by 2030 (Figure 10). "Forecast of Wind Energy Production in a Net Zero Scenario, 2010-2030").

About 22% of the total 94 GW of wind capacity gain came from offshore technology in 2021, the highest on record and three times the average of the previous five years. This high share is the result of a combination of record offshore capacity growth in China, which accounted for 80% of offshore growth, and slowing global onshore growth. While the rate of increase in onshore wind capacity is expected to remain stable in the coming years, offshore systems are expected to further accelerate in existing markets such as the European Union and China, as well as in emerging countries such as the United States, China's Taipei and Japan.

1.3. Purpose, objectives and expected results of the proposed project for the commercialization of a new design of a wind turbine rotor with elbow bending of the blades

Goal of the project:

The goal of the project is to commercialize the rotor of a wind turbine with elbow bending blades to generate economical electricity by entering into a license agreement and/or an assignment agreement.

Objectives of the project:

1. **Technical part of the project**. Preparation of a full package of technical documentation necessary to enter the stage of negotiations with global manufacturers of wind turbines:
    1. Development of design estimates for the conversion of a wind turbine with straight blades into a wind turbine with a elbow bend;
    2. Computer simulation of a wind turbine with a elbow bend on more powerful models of 1, 3, 5, 7 MW.
    3. Purchase of three wind turbines with a capacity of 100-500 kW with straight blades, delivery, customs clearance, temporary storage of equipment in Almaty.
    4. Production of an industrial prototype of a short part of a blade with a elbow bend on a wind turbine with a capacity of 100-500 kW;
    5. Lease of land, preparation of an area with a concrete foundation for the installation of wind turbines, re-equipment of the wind turbine with the addition of a new rotor structure with a elbow bend and a direct pipe addition to the head of the wind turbine and the connection of the long blade, adapting them to work on the wind range;
    6. Conducting field tests of a elbow-bending wind turbine with the participation of an independent engineering company, recording the results with appropriate instruments, computer processing them and submitting them for technical evaluation.
    7. Passing the product development assessment process according to the DNVGL-ST-0376 standard "Wind turbine blades for wind turbines" with subsequent submission of applications for certification;
    8. Obtaining IEC 61400-2i or DNVGL-SE-0441 "Certification of Components and Species."
2. **Legal part of the project.** Preparation of a full package of legal documents necessary to enter the stage of negotiations with global manufacturers of wind turbines, including a Patent Valuation, various IPO reports, for example, a report on the verification of the results of field tests (Freedom to Operate), etc., as well as the preparation of a draft license agreement.
3. **Marketing part.**
    1. Development of marketing materials for participation in world exhibitions on wind energy.
    2. Presentations and preliminary negotiations at Clean Power in Minneapolis, USA, Wind Expo Japan and WindEnergy in Hamburg, Germany.
    3. Promotion of the elbow-bending wind turbine by participating in professional communities of manufacturers and developers of wind turbine components and technologies; presentation of the idea to the scientific community; providing media support for the project in recognizable magazines and websites on wind energy; promotion of the site among professional communities, as well as establishing interaction with KOLs (key opinion leaders), significant and well-known persons

in the field of wind energy to support the project of commercialization of a wind turbine with an elbow bend of blades.

4. **The final part of the project.**
   1. Negotiating with potential buyers.
   2. Conclusion of a license agreement for intellectual property.
   3. Obtaining commercial income from the project in the form of royalties.
   4. Investing in the economy of Kazakhstan in the form of paying taxes on profits, creating a wind farm with wind turbines equipped with a new design of a wind turbine with a elbow bend, creating jobs, promoting the development of wind energy in the country.

1.3.5. References

1. Enercon E-126 is the largest wind turbine in the world.
2. https://pikabu.ru/story/yenerkon_e126_samyiy_bolshoy_vetrogenerator_v_mire_3881291 How the Fukushima accident forced Germany to abandon nuclear power plants – DW – 09.06.2021. (n.d.).
dw.com. https://www.dw.com/ru/kak-avarija-na-fukusime-zastavila-germaniju-otkazatsja-ot-ajes/a-56826930

3 FIGURE 14 Percentage of the average annual electricity demand covered by wind. Wind in power 2017 - Annual combined onshore and offshore wind energy statistics WindEurope, p.22. https://windeurope.org/wp-content/uploads/files/about-wind/statistics/WindEurope-Annual-Statistics-2017.pdf

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7 See Cameron McKenna's offer in English with translation into Russian.

8 IEC 61400-2:2013 | IEC Webstore | rural electrification, wind power. (n.d.). IEC 61400-2:2013 | IEC Webstore | Rural Electrification, Wind Power. https://webstore.iec.ch/publication/5433

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10 DNV-SE-0441 Type and component certification of wind turbines - DNV. (n.d.). DNV. https://www.dnv.com/Default

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1.16.1 Appendix. International Patents

Europäisches Patentamt
European Patent Office
Office européen des brevets

URKUNDE	CERTIFICATE	CERTIFICAT
Es wird hiermit bescheinigt, dass für die in der Patentschrift beschriebene Erfindung ein europäisches Patent für die in der Patentschrift bezeichneten Vertragsstaaten erteilt worden ist.	It is hereby certified that a European patent has been granted in respect of the invention described in the patent specification for the Contracting States designated in the specification.	Il est certifié qu'un brevet européen a été délivré pour l'invention décrite dans le fascicule de brevet, pour les Etats contractants désignés dans le fascicule de brevet.

Europäisches Patent Nr. / European patent No. / Brevet européen nº

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Munich,
Fait à Munich, le 15.11.17

EPA/EPO/OEB 2031 0710

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URKUNDE

Europäisches Patent

Es wird hiermit bescheinigt, dass für die in der Patentschrift beschriebene Erfindung ein europäisches Patent für die in der Patentschrift bezeichneten Vertragstaaten erteilt worden ist.

CERTIFICATE

European patent

It is hereby certified that a European patent has been granted in respect of the invention described in the patent specification for the Contracting States designated in the specification.

CERTIFICAT

Brevet européen

Il est certifié qu'un brevet européen a été délivré pour l'invention décrite dans le fascicule de brevet, pour les Etats contractants désignés dans le fascicule de brevet.

Europäisches Patent Nr.
European patent No.
Brevet européen n°

3411592

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特　許　証
(CERTIFICATE OF PATENT)

特許第６６５７４８８号
(PATENT NUMBER)

発明の名称 (TITLE OF THE INVENTION)	ブレードのエルボー曲がり部を有する風車
特許権者 (PATENTEE)	カザフスタン共和国，０１００００　アスタナ，アパートメント　８６，ウリーダラ　ストリート　６／２ 国籍・地域　カザフスタン共和国 シャイケノフ，ブロック
	その他別紙記載
発明者 (INVENTOR)	シャイケノフ，ブロック シャイケノフ，イェルサン　ブロコビッチ
出願番号 (APPLICATION NUMBER)	特願２０１９－５３４７０８
出願日 (FILING DATE)	平成３０年　１月２３日(January 23, 2018)
登録日 (REGISTRATION DATE)	令和　２年　２月　７日(February 7, 2020)

この発明は、特許するものと確定し、特許原簿に登録されたことを証する。
(THIS IS TO CERTIFY THAT THE PATENT IS REGISTERED ON THE REGISTER OF THE JAPAN PATENT OFFICE.)

令和　２年　２月　７日(February 7, 2020)

特許庁長官
(COMMISSIONER, JAPAN PATENT OFFICE)

松永　明

특허증
CERTIFICATE OF PATENT

특 허 제 10-2033366 호
Patent Number

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Registration Date

발명의 명칭 Title of the Invention
블레이드 엘보우 굽힘부를 가지는 풍차

특허권자 Patentee
등록사항란에 기재

발명자 Inventor
등록사항란에 기재

위의 발명은 「특허법」에 따라 특허등록원부에 등록되었음을 증명합니다.
This is to certify that, in accordance with the Patent Act, a patent for the invention has been registered at the Korean Intellectual Property Office.

2019년 10월 11일

QR코드로 현재기준 등록사항을 확인하세요

특허청장
COMMISSIONER,
KOREAN INTELLECTUAL PROPERTY OFFICE

박 원주

특허청
Korean Intellectual Property Office

证书号第3993669号

发明专利证书

发明名称：具有叶片弯头弯曲部的风轮

发明人：B·沙伊克诺夫;Y·B·沙伊克诺夫

专利号：ZL 2018 8 0006221.6

专利申请日：2018年01月23日

专利权人：B·沙伊克诺夫;Y·B·沙伊克诺夫

地址：哈萨克斯坦阿斯坦纳

授权公告日：2020年09月18日　　授权公告号：CN 110168218 B

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申长雨

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2020年09月18日

其他事项参见背面

United States of America

To Promote the Progress of Science and Useful Arts

The Director

of the United States Patent and Trademark Office has received an application for a patent for a new and useful invention. The title and description of the invention are enclosed. The requirements of law have been complied with, and it has been determined that a patent on the invention shall be granted under the law.

Therefore, this United States

Patent

grants to the person(s) having title to this patent the right to exclude others from making, using, offering for sale, or selling the invention throughout the United States of America or importing the invention into the United States of America, and if the invention is a process, of the right to exclude others from using, offering for sale or selling throughout the United States of America, products made by that process, for the term set forth in 35 U.S.C. 154(a)(2) or (c)(1), subject to the payment of maintenance fees as provided by 35 U.S.C. 41(b). See the Maintenance Fee Notice on the inside of the cover.

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РОССИЙСКАЯ ФЕДЕРАЦИЯ

ПАТЕНТ

НА ИЗОБРЕТЕНИЕ

№ 2793268

ВЕТРОКОЛЕСО С КОЛЕННЫМ ИЗГИБОМ ЛОПАСТЕЙ

Патентообладатель: ***ШАЙКЕНОВ БЛОК (KZ)***

Автор(ы): ***ШАЙКЕНОВ БЛОК (KZ)***

Заявка № **2022111848**
Приоритет изобретения **06 мая 2021 г.**
Дата государственной регистрации
в Государственном реестре изобретений
Российской Федерации **30 марта 2023 г.**
Срок действия исключительного права
на изобретение истекает **29 апреля 2042 г.**

Руководитель Федеральной службы
по интеллектуальной собственности

Ю.С. Зубов

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[i] **IEC 61400-2:2013 Wind turbines - Part 2: Small wind turbines**

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