Wind power
in the Russian Federation

and

the market status

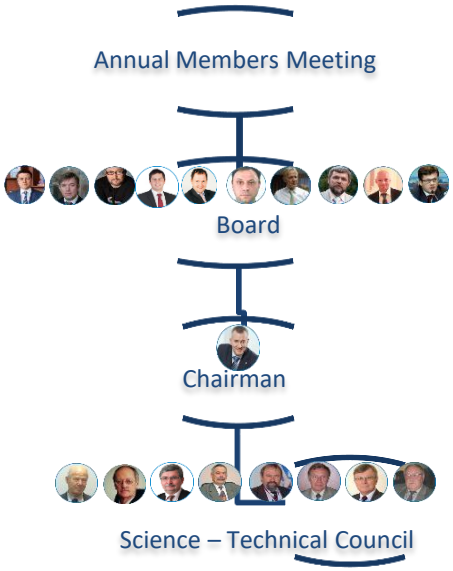
Igor Bryzgunov, Chairman of RAWI

2017.

Russian Association of Wind Power Industry. RAWI

> 80 members at the end of 2017

Management structure



Brief description

Russian Association of Wind Power Industry (RAWI), is independent, nonprofit organization that works in the interests of the members of RAWI.

RWI's main actions are devoted to development of Russian wind power market. The association has the most up to date information on developments in the market, the planned wind turbine manufacturing projects, the construction of wind farms. It provides practical assistance and support to the companies - members of the Association in the development of their business and reduce risks due synergy effect and high competence in the market.

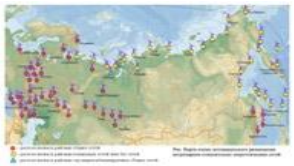
RAWI members are more than 80 companies – global OEM leaders : GE, Vestas,, Siemens - Gamesa, biggest Russian power industrial companies: Power Machines, Rotec, etc., design companies, construction companies, research institutes, diplomatic organizations, etc.

Services

WP register

LCM register

Market possible level research



HR support

Partners search support

Training & education

RES support legislation principles and status

Legislation principles:

1. Defined plan for capacity by 2024 and degree of localization of equipment
2. Defined the procedure of stimulation of development of renewable energy projects through LTCA
3. Defined the procedure of return of investments and the profitability of wind farm investment projects
4. Rising level of the degree of local content of production of wind turbines
5. Fixed for every tender CAPEX level as the part of formula of calculation income. Formula is connected with currency quotation level

- The LTCA tender is helds every year. The tender criterion is the CAPEX.
- Each tender is held "for 5 years ahead".
- A participant with lowest CAPEX wins the tender
- “Quotas” were not contested in the tender, go to the next tender
- Winner gets 15 years LTCA contract with guaranteed 12% annual profit.

Local content	2016	2017	2018	2019 -
Wind farm*	25%	40%	55%	65 %

*Design and construction works are also taken into account and total equal to 21%. For example at 2019: 65% = 21% of works + 44% wind generator

The legislative plan and tender results

	Legislation, MW	Results at 2017
2015	51	
2016	50	**35 MW** - Fortum (2017)
2017	**200**	
2018	**400**	**150 MW - Rosatom** **50 MW- Fortum**
2019	**500**	**200 MW - Rosatom** **200 MW- Fortum**
2020	**500**	**300 MW - Rosatom** **250 MW- Fortum** **90 MW - Enel**
2021	500	**250 MW - Fortum** **40 MW- Rosatom** **200 MW - Enel**
2022	500	**250 MW- Fortum** **280 MW - Rosatom**
2023	500	
2024	199	
	3 350	**2 295**

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Max. basic CAPEX, RUR / kW	110 000*	109 890*	109 780*	109 670*	109 561*	109 451*	109 342*	109 232*	109 123*	109 014*

* - corrects by currency level. For inst. resulted CAPEX for 2015 was 142 kRUR, 2016 – 152 kRUR (1 EURO=70 RUR)

The order of development of a wind farm, participation at the tender for LTCA.

1. Participation in tender for LTCA and sign LTCA with Association “NP Market Council”*
2. The construction of WP in accordance with requirements of local content
3. Wind farm commissioning and qualification**
4. Return on investment with a yield of 12% on invested capital

1. The joining to Association ”NP Market Council"
2. The sign of the contract on joining to trading system of wholesale market
3. The status of the member of wholesale market of energy and power
4. The registration of group of “supply points” for the wind farm (substation)
5. An applicant provides a guarantee from an energy company or a bank for participation in the tender ***

Participation in tender for Long Term Capacity Agreement

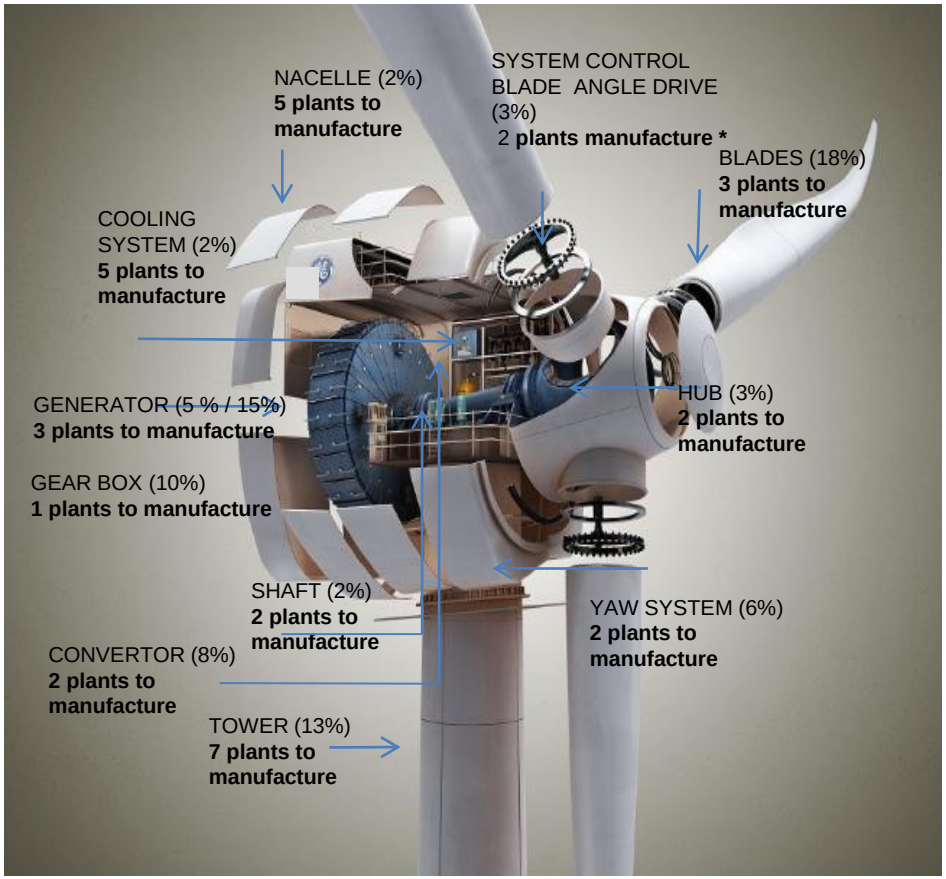
*Regulator of wholesale and retail energy and capacity markets, authorized by the state to oversee the implementation of legislation in the field of energy

** Qualification is carried out by the Association "NP Market Council" in conjunction with the Ministry of Industry and Trade

***An applicant should submit a guarantee from energy company that owns at least 2,500 MW of generating capacity, or a major bank. Guarantee that the applicant will build a wind farm in a certain year. If he does not build, the guarantor is fined 5% of the sum of the CAPEx.

Wind farm qualification and local content manufacturing status. RAWI's local content manufacturers register. The market players.

Manufacturers for each component are existed in Russian Industry.



Main the market current players' 2017

fortum → Vestas

enel → SIEMENS Gamesa

ROSATOM → Lagerwey

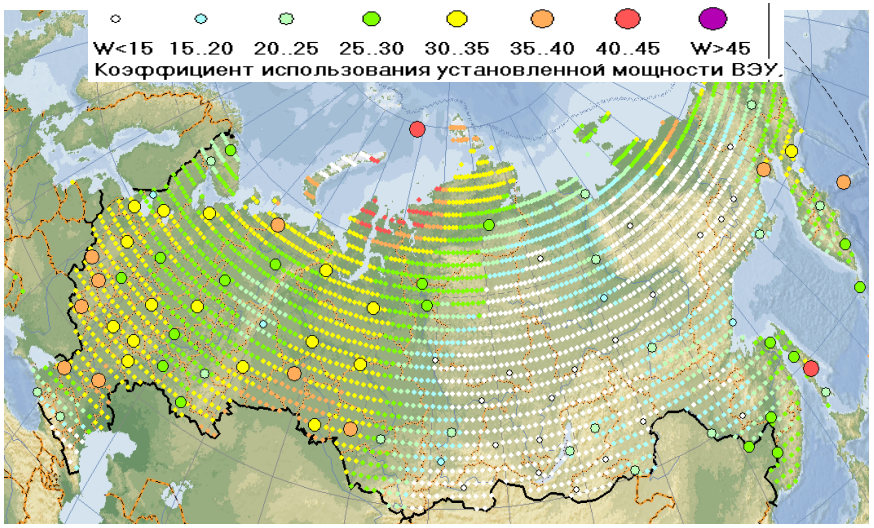
A wind park must be qualified after construction and commissioning

1. Wind park operates solely on the basis of renewable energy sources
2. Wind park is commissioned
3. Wind park is connected to the electric grids and equipped with measuring equipment
4. Wind park is listed in the local plan or program of perspective development of electric power
5. Wind park corresponds to the required level of local content corresponding to the year of commissioning

Register of wind farms in the Russian Federation for 2017 includes full information of wind power projects

The development of wind parks in Russia started in 2008. Currently, several companies at various stages have prepared wind farm projects for more than 2500 MW. All of them are marked on the map of the Wind Park Register, prepared by the RAWI and keeping up to date. The map shows all the necessary information about the project, contact information about its owner, the current status of the project.

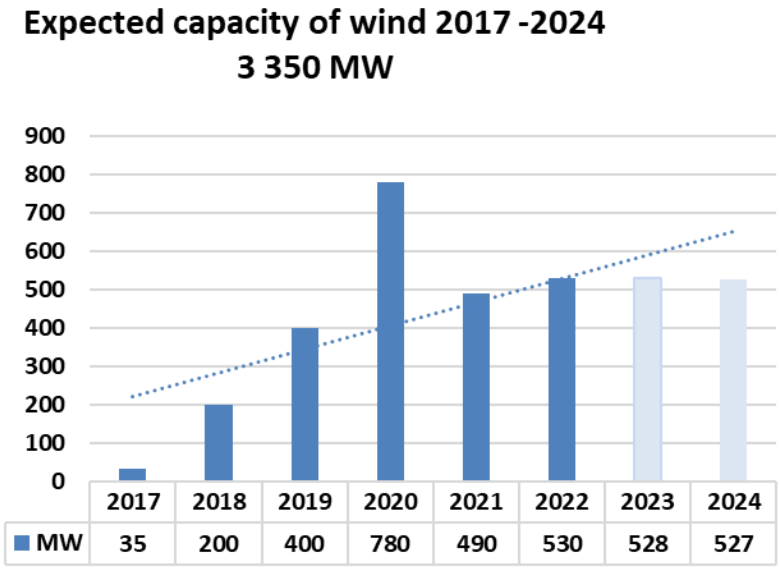
Screen shot of register of Russian wind parks

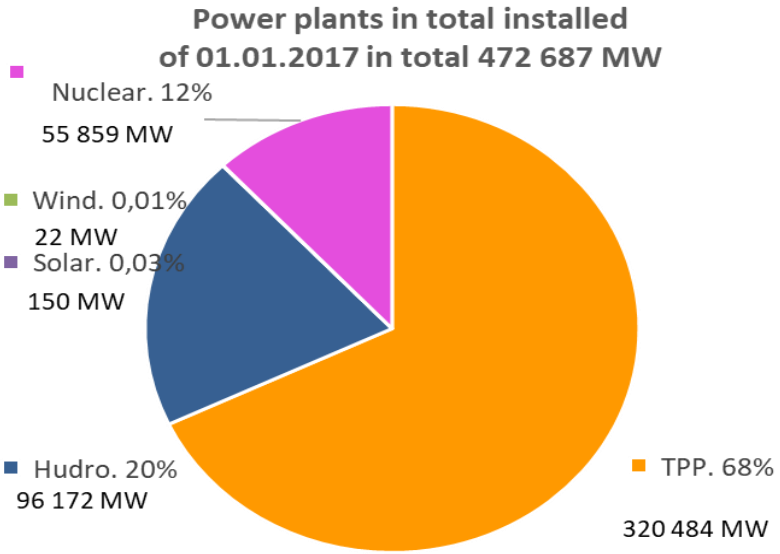


Territorial distribution of the Capacity Factor of a 3 MW wind turbine

The register contains projects of private developers, both large investors and private developers. The developers' projects are qualitatively prepared and have a long history of measurements . Developers are independent and not affiliated with one of the major market participants . Developers' projects are ready for acquisition by independent investors

Wind power market in Russia prognose





The market volume calculation:

236 343 000 MW x 20%= 47 269 MW.
47 269 MW x 142 mln.RUR =
6 712 198 mln.RUR

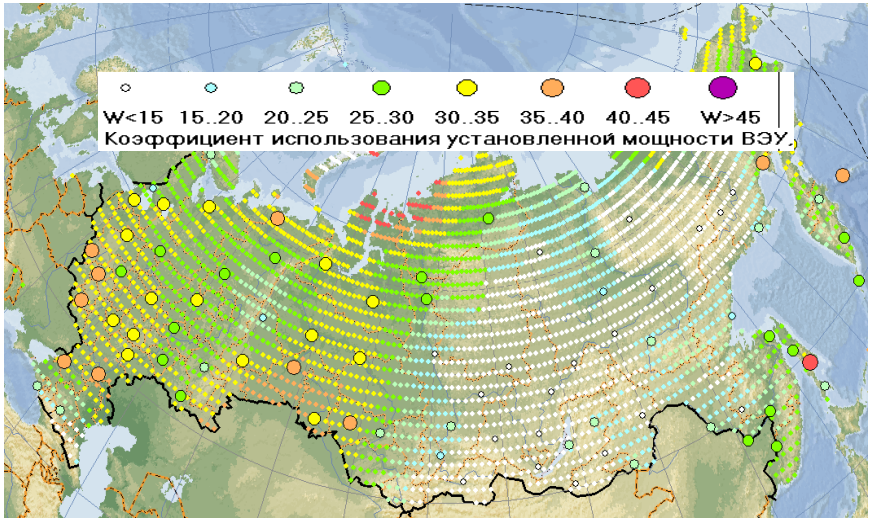
6 712 198 mln.RUR / 70 = **95 897 mln.EUR**

Taking into account the technological possibility of connecting 20% of wind generation to electric grids, the technological limit of the market at the current stage of technology development is more than 47 GW, the estimated capital costs, of the 2017 tender, for such a volume of the market will be about 7 trillion rubles or 95 897 mln.Ruro

Medium and small wind turbines market

Local wind farms based on diesel power stations and wind power stations, consisting of one or several diesel generators and wind power plants accumulating, can become the most important for remote areas from centralized energy networks (more than 65% of Russia's area) energy devices, power electronics and automated control system.

Market only for 7 types sizes of the small, medium and big turbines



Territorial distribution of the Capacity Factor of a 3 MW wind turbine

The potential volume of the Russian market for medium sized small and large wind turbines of each size for remote power supply systems exceeds 1200 units, and the number of the most sought-for windmills of the order of 600 and 500 kW, respectively, is close to two and three thousand.

The total installed capacity of the windmill of all types considered in the composition of wind farms in Russia is, according to estimates, about 3.61 GW

We are working under precise study of the market volume estimates for each type of turbine available on the market

How many turbines they could produce and sale at the market?

Criteria for calculating the number of turbines for the Russian market for the future

1	Meteorological criterion for each region
2	Assessment of the possibility of a regional electric grid to take electricity from wind farms
3	Assessment of the possibility to consume electricity from a wind farm in each region
4	Evaluation of the logistic situation of transportation of large components for wind generators in each region
5	Assessment of the possibility of providing qualified personnel

All major participants of the Russian wind energy market will gather at the events

Anniversary, Xth **National Conference**
of the Russian Association of Wind Power Industry (RAWI)

“Wind power in Russia. Summing up the results of 2017, prospects and challenges of development “

December 6th, 2017. Venue: **Novotel, Moscow City**

Russia, Moscow, Presnenskaya emb., 2, metro Vystavochnaya

12Days 18Hours

www.rawi.ru

RAWI
RUSSIAN ASSOCIATION OF WIND POWER INDUSTRY

"The first exhibition in Russia on renewable energy sources"

Alternative resources of world energy EXPO 2018 (ARWE)

“Wind power in Russia is a market of protected investments, striving for balance“

April 10th & 11th , 2018. Venue: **Hotel Imeretinskiy, Sochi**

Russia, Sochi, Imeretinskaya lowland, Marine Boulevard, 1

arwe-expo.ru

THANK YOU FOR ATTENTION!

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