

DEVELOPMENT PERSPECTIVES OF WIND POWER PLANTS WITH NOMINAL OUTPUT 250 KW IN LATVIA

VĒJA ELEKTROSTACIJU AR JAUDU LĪDZ 250 KW ATTĪSTĪBAS PERSPEKTĪVAS LATVIJĀ

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Introduction

In January 2008 European Commission published the climate and energy package. The main aim of this package is to promote to achieve goals of spring Eurocouncil 2007 – reduce greenhouse gas emissions by 20 % and to increase the use (electricity, thermal energy and biofuels) of renewable energy sources. Taking into account that energy sectors for different EU countries are various, total EU aim –20% is transformed for every EU country. For Latvia it is 42 % from end consumption. Certainly one of the main measure's in the electricity field will be promotion of wind energy use.

In 24 July 2007 Cabinet of Ministers adopted regulations No.503 „Regulations regarding Electricity Production from Renewable Energy Resources” (thereafter - regulations 503), the main aim is promotion of the production of electricity from renewable energy sources. Regarding to economical support for wind energy it is following:

1. Competition about the volume of electricity produced from wind power stations, which is specified in the invitation to competition (Ministry of Economics prescribed it - 404081 MWh);

2. Mandatory procurement volume. Mandatory procurement volume is to purchased from wind power plants if the electric capacity set thereof does not exceed 0.25 MW and if not more than one installation has been connected to one transformer or distributing station of the electricity distribution system or to the substation of the electricity transmission system.

This work aim is to evaluate development perspectives of wind power plants with nominal power till 250 kW in Latvia taking into account legal aspects.

Chose method and results

Specification of the price for electricity produced from wind energy

Regarding with regulations 503 merchant which have acquired the right to sell electricity produced from wind power plants within the scope of mandatory procurement in accordance with the procedures specified in regulations 503, the selling prices for the volume of electricity which they are entitled to sell within the scope of mandatory procurement shall be calculated using the following formulas:

1. Wind power plants - for 10 years beginning with the date of commencement of operation:

$$C = \frac{T_g \times k}{9,2} \times 3,5 \quad (1)$$

2. Wind power plants – after 10 years of commencement of operation:

$$C = \frac{T_g \times k}{9,2} \times 2,6 \quad (2)$$

where

C – is the price without value added tax for which a public trader purchases electricity produced from renewable energy resources (LVL/MWh) from the power plant; T_g – is the trade final tariff for natural gas approved by the regulator without value added tax, which is specified for the consumption of natural gas from 126 thousand n.m³ up to 1 260 thousand n.m³ per year if the calorific power of the natural gas is 7 900 kcal/n.m³ (LVL/thousand n.m³); k – is the price differentiation coefficient referred to in table 1.

Table 1.

Values of Coefficient k Ratio Depending on the Electric Power Set for the Power Plant

No.	Electric power set for the power plant	Value of k ratio
1.	Not exceeding 0.08 MW	1.240
2.	More than 0.08 MW, but not exceeding 0.15 MW	1.231
3.	More than 0.15 MW, but not exceeding 0.20 MW	1.202
4.	More than 0.20 MW, but not exceeding 0.40 MW	1.131

On the basis of equation 1 and 2 in the figure 1 is show appraised electricity purchase price (without taxes and transmission, distribution tariffs and other duties) of different nominal power wind power plants (80 kW, 150 kW, 200 kW and 250 kW) dependence on price of natural gas in period from May 2006 (for illustration, before adoption regulations 503) till April 2008.

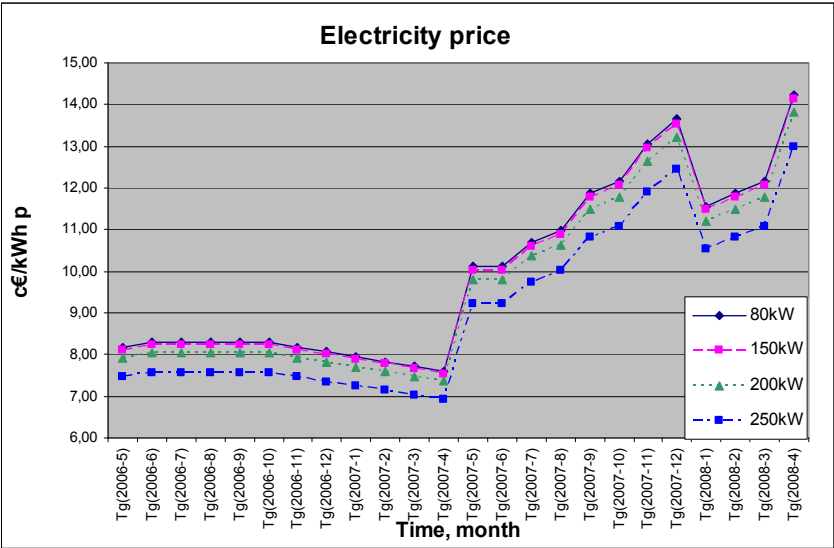


Figure 1. Electricity purchase price dependence from natural gas

Calculation of electricity potential

Using data which is preparing by SJC Latvenergo about electricity consumption in the near years and known percentage distribution (assume that in years after 2010 it will not change) it is possible to calculate how much electricity (GWh) is necessary to produce from wind power plants.

Year	$E_{\text{Consumption, GWh}}$	Total share of WPP, %	$E_{\text{Produced electricity from WPP, GWh}}$	$E_{\Delta \text{GWh (-250kW), GWh}}$	$E_{\Delta \text{GWh+cons. (WPP)+, GWh}}$	P (Installed capacity), MW
2006	7399 (7191) ¹	No	(45) ¹	0.000	0,00	26,8 ¹
2007	7689 (7542) ¹	1,48	113.797 (52) ¹	61.797	61,81	21 (26,8) ¹
2008	8070	2.78	193.181	79.384	79,40	26
2009	8465	4.08	295.75	102.569	102,59	34
2010	8610	5.37	462.357	58.276	58,29	19

¹Real data (statistical data)

$P_{2006} < P_{2007} < P_{2008} < P_{2009} > P_{2010}$, it is mean that in year 2010 will not possible to installed new wind power plants. And if we count produced electricity from wind power plants in 2009 and the volume of electricity produced from wind power stations, which is specified in the invitation to competition, we will obtain 699,831 GWh or 8,12 % in total share.

P, MW	80 kW, quantity	150 kW, quantity	200 kW, quantity	250 kW, quantity
21	263	140	105	84
26	325	173	130	104
34	425	227	170	136
19	238	127	95	76

Component of mandatory procurement

The costs of obligation to purchase the electricity are divided between all electricity consumers in accordance with the methodology accepted by Public Utilities Commission.

Component of mandatory procurement can be formulated as follows:

$$T_{at} = (I_{at} + (I_{adm} + I_{bal}) * E_{at} / E_{liet}) / E_{liet} \quad (3)$$

where

- I_{at} – total mandatory procurement costs of wind energy (EUR);
- E_{at} - total volume of mandatory procurement from wind energy merchant (kWh);
- I_{adm} - administrative costs of **Public Utilities Commission (EUR)**;
- I_{bal} – balancing costs (EUR);
- E_{liet} – total electricity consumption in Latvia (kWh).

Component of mandatory procurement for wind power plats is shown in figure 2.

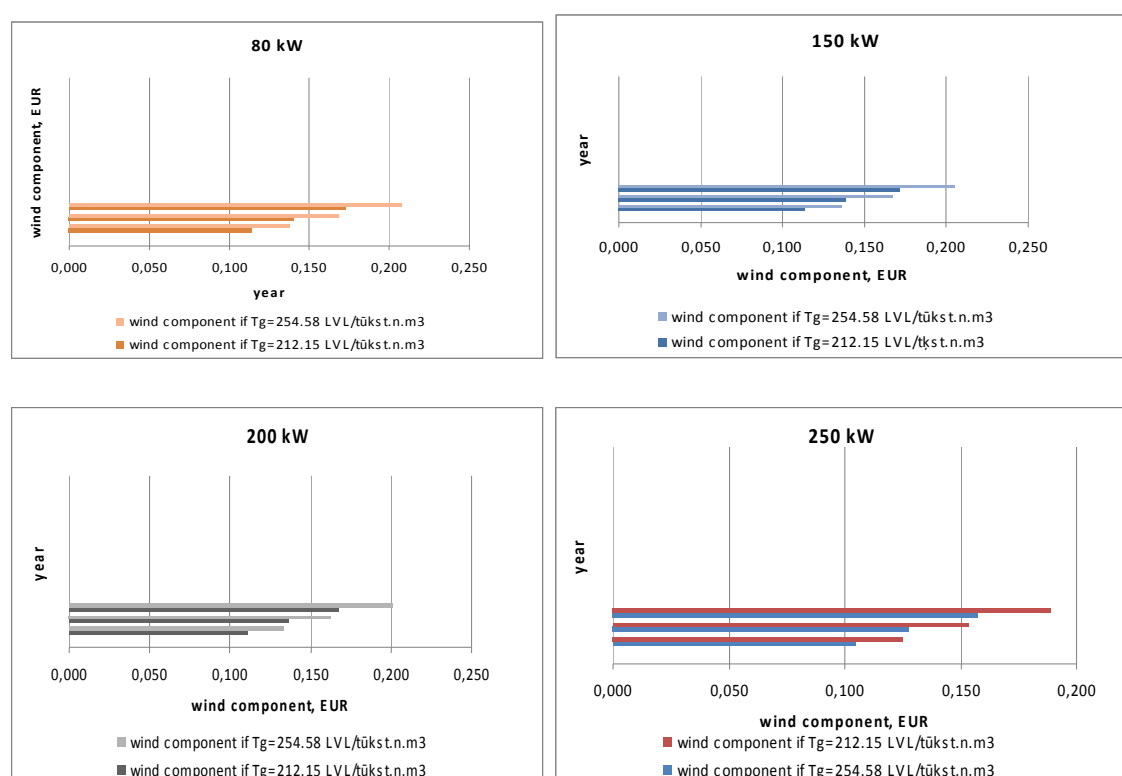


Figure 2. Component of mandatory procurement for 80 kW, 150 kW, 200 kW and 250 kW wind power plants in 2007, 2008 and 2009

From the figure 2 we can see that component of mandatory procurement is in range between 0.111 cEUR/kWh in 2007 (if Tg=212.15 LVL/thousand n.m3) till 0.207 cEUR/kWh in 2009. (if Tg=254.58 LVL/thousand n.m3 or 20% increase). It is mean that one household in one month for wind energy support will pay about 11.1 to 20.7 cEUR or 1.1% to 2.05% of total payment (total payment in month for one household is approximately 10.1 EUR, if 1 kWh=10.10 cEUR).

Wind power plant connection possibilities and balancing aspect

For small wind power plants connection to joint grid technically is not problem. But from economical point of view there is a obstacle, because in regulations 503 is told that mandatory procurement volume is to purchased from wind power plants if the electric capacity set thereof does not exceed 0.25 MW and if not more than one installation has been connected to one transformer or distributing station of the electricity distribution system or to the substation of the electricity transmission system. And regarding with legislation for all wind power plants which are connected to the grid balancing is necessary. Balancing costs for examples in this work are included previously.

Main conclusions

1. In 2007 the projective aim was not achieved.
2. Data about consumption are not correct (mismatch with EU directive).
3. The total installed capacity from small wind power plants in 2010 is 34 MW (425 installations of 80 kW wind power plant or 227 installations of 150 kW wind power plant, or 170 installations of 200 kW wind power plant, or 135 installations of 250 kW wind power plant).
4. The impact in tariff for one household will be 0.111 cEUR/kWh to 0.207 cEUR/kWh or 1.1% to 2.05%.
5. Bad conditions for connection and balancing from economical point of view.

Acknowledgement

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Kašs R., Zelčs M. Vēja elektrostaciju ar jaudu līdz 250 kW attīstības perspektīvas Latvijā

Darba mērķis ir novērtēt mazas jaudas vēja elektrostaciju (80 kW, 150 kW, 200 kW un 250 kW) attīstības perspektīvas Latvijā, ņemot vērā tiesiskos aspektus. Novērtējumā ir aprēķinātas elektroenerģijas iepirkuma cenas, balstoties uz apstiprinātajiem Ministru kabineta 24.07.2007. noteikumiem Nr.503 “Noteikumi par elektroenerģijas ražošanu, izmantojot atjaunojamos energoresursus”. Izmantojot šos datus, ir aprēķināts elektroenerģijas daudzums, kāds ir jāsarāžo vēja elektrostacijās, un novērtēta tā jauda. Kā viens no pirmajiem secinājumiem ir jāmin tas, ka izvirzītie mērķi 2007.gadā netika sasniegti. Izmantojot aprēķinātos datus, tika novērtēta arī ietekme uz tarifu, tas ir, cik par to būtu jāmaksā iedzīvotājiem. Secinājums ir viennozīmīgs, tie ir 1-2% no kopējā elektroenerģijas rēķina. Vēja enerģijas izmantošanas iespēju novērtējuma un aprēķinu

sagatavošanā izmantots autora (R.Kašs) izstrādātais maģistra darbs, Amerikas vēja enerģētikas asociācijas informācija un cita jaunākā informācija šajā jomā. Darbā tika izmantotas formulas, kas ir apstiprinātas ar Ministru kabineta noteikumiem, tomēr rezultāti liecina, ka veiksmīgākai vēja enerģētikas attīstībai ir nepieciešami grozījumi arī citu jomu tiesību aktos.

Kašs R., Zelčs M. Development perspectives of wind power plants with nominal output 250 kW in Latvia

This work aims to evaluate the development perspectives of wind power plants with nominal power 80 kW, 150 kW, 200 kW and 250 kW in Latvia, taking into account the legal aspects. Calculations are made on the basis of the Cabinet of Ministers Regulation No.503 „Regulations regarding Electricity Production from Renewable Energy Resources” (adopted in 24 July 2007). Using these data the produced amount of electricity and installed capacity is calculated. One of the first conclusions is that in 2007 the projected goal was not reached. The costs of the obligation to purchase the electricity are divided between all electricity consumers in accordance with the methodology accepted by the Public Utilities Commission. This work evaluates the influence to tariff and how much pay one household for support of wind energy. The conclusion is equipollent – it is approximately 1-2% of total electricity payment. Analysis of the available literature was made and formulas were adopted with several assumptions in order to achieve the aim of the paper. The data and information were provided by the author’s master degree paper, the American Wind Energy Association and the latest information in this sphere. The method and results of the paper can be used for knowledge elaboration, for detailed planning of a WPS installation, as well as for calculation of electric energy amount produced.

Каис Р., Зелчс М. Оценка потенциала ветровой энергии на суше и морской территории в Латвии

Цель этой работы состоит в том, чтобы оценить перспективы развития электростанций ветра с номинальной мощностью 80 кВт, 150 кВт, 200 кВт и 250 кВт в Латвии, принимая во внимание юридические аспекты. Вычисления сделаны на основе инструкций Кабинета Министров №503 „Инструкции относительно производства электричества из возобновляемых энергетических ресурсов ” (принятый 24 июля 2007). Используя эти данные вычислено произведенное количество электричества и установленная мощность. Одно из первых заключений - то, что в 2007 году планируемая цель не была достигнута. Затраты на обязательно закупаемое электричество разделены между всеми потребителями электричества в соответствии с методикой, принятой Комиссией Предприятий коммунального обслуживания. В этой работе оценено влияние на тариф и сколько одно домашнее хозяйство должно платить для поддержки энергии ветра. И заключение однозначно– это - приблизительно 1-2 % от суммарной платы за электроэнергию. Был сделан анализ доступной литературы и были использованы принятые формулы с несколькими предположениями. Для оценки и подготовки расчетов возможности использования энергии ветра были использована магистерская работа одного из авторов (Р.Каис), информация Американской ассоциации ветряной энергии и новейшая информация в этой области. В работе были использованы формулы, которые утверждены правилами Кабинета Министров, тем не менее результаты свидетельствуют о том, что для дальнейшего успешного развития ветряной энергетики необходимы изменения в правовых актах в других областях.