JOINT IMPLEMENTATION PROJECT DESIGN DOCUMENT FORM
Version 01 - in effect as of: 15 June 2006

CONTENTS

Annexes

SECTION A. General description of the project

A.1. Title of the project:

The title of the project: Didsiliai Wind Power Project
The sectoral scope(s) to which the project pertains: (1) Energy industries (renewable/non-renewable sources)
The version number of the document: PDD 04
The date of the document: 19 July, 2010

A.2. Description of the project:

a) Situation existing prior to the starting date of the project;
Even after closure of Ignalina nuclear power plant there is an overcapacity of the installed power in Lithuania, so only very few new power plants are built or planned. Lietuvos Elektrine, power plant with the largest installed capacity in Lithuania (after Ignalina nuclear power plant, which is closed now) is operating on the electricity grid as a marginal plant. It covers all electricity demand which is remaining after all other electricity producers have supplied their quota electricity to the grid. The producers may also supply the excessive electricity at a lower price. The difference in the national demand for electricity and the total production thereof (quotas and over-quotas) is covered by electricity produced at power plant Lietuvos elektrine using fossil fuel, i.e. natural gas, heavy fuel oil or orimulsion.

The feed-in-tariff scheme for green electricity production in Lithuania is established. The feed-in-tariff for wind electricity is set at 0.30 Lt/MWh (0.087 EUR/MWh). The feed-in-tariffs are valid until 2021, it is not clear which support mechanisms will be applied later.
The National Energy Strategy determines the main trends of energy development in Lithuania. It is provided that the share of renewable energy sources (RES) has to be 20% in the total primary energy balance by 2025. The RES usage action plan has to be presented to the European Commission by Lithuania for the purpose to increase the share of RES to 23% in the final consumption of energy by 2020. At the moment the action plan is under preparation thus it is unclear yet, whether electricity produced at the wind power plants is going to be promoted and whether that promotion is going to be valid for the planned power plants.
Obstacles for implementation of wind power projects show the fact, that only 31 wind plants (wind power parks) were connected to the grid until December 2009, and only 6 of them were more than 2 MW capacity, and connected to the 110 kV grid. In order to build the wind power park with larger capacity than 250 kW, the project developer has to win a tender for the installed capacity licence in one of the 6 zones in the western part of Lithuania. Each zone has a limit for the installed power capacity, as announced in the tender. Maximum allowed capacity amounts to 200 MW. No matter the tender procedures for the installed wind power capacity were launched about 2 years ago, only 80 MW were connected to the grid (see more on B.2. Step 4. Common practice analysis).

b) Baseline scenario;
In case of additional electricity supply to the grid, the production will be reduced at Lietuvos elektrine. Therefore, in order to calculate GHG emission reductions, resulting from implementation of the Didsiliai Wind Power Project, it is necessary to estavlish the amount of CO_2 released to the atmosphere while producing 1 MWh of electricity at Lietuvos elektrine. It was calculated that Lietuvos elektrine, by generating 1 MWh of electricity, contributes to the pollution of atmosphere with 0.626 tones of CO_2.

c) Project scenario (expected outcome, including a technical description).

Under the Didsiliai Wind Power Project it is foreseen to install 12 wind power plants with the total capacity of 21.6 MW (2 MW x 10 and 0.8 MW x 2) in the western part of Lithuania. The wind power park, in a conservative approach, will generate about 58.8 GWh of electricity per year.

The project will reduce greenhouse gas emissions by partially substituting electricity production at other power plants of Lithuania that run on fossil fuel. Applying the baseline ratio of 0.626 tCO_2/MWh_e, the annual CO_2 reduction is equal to 36 809 tCO_2. Reduction of CO_2 in the period of 2008-2012 is 73 618 tCO_2 (2 years)

In addition, the implementation of this project will help to promote renewable energy sources, stimulate their use and improve environmental quality in the country. Not only the greenhouse gas emissions will be reduced, but also the reduction of other pollutants arising from burning of fossil fuel such as SO_2 and NO_x will be achieved. The project will also serve for the promotion of wind power utilisation in Lithuania and for creation of new work places.

A.3. Project participants:

A Joint Implementation project is participated by an investing party and a host party. In the Didsiliai Wind Power Project Lithuania is participating as the host party while the investing party will be defined later. SIA "E kvotas", a company based in Latvia intends to purchase Emission Reduction Units (ERU), designated to the project. Information on the parties, participating in the wind power project, is provided in Table 1.

Table 1 Parties, participating in JI project

Party involved	Legal entitity project participant (as applicable)	Please indicate if the Party involved wishes to be considered as project participant (Yes/No)
Lithuania (Host party) The Netherlands	• UAB Veju spektras • SIA E kvotas	No

The owner of the Didsiliai Wind Power Project is *UAB Veju spektras*. The main business of the enterprise is production of electricity. The enterprise is located in Kretinga (Dvaro str. 4a), in the western part of Lithuania.

A.4. Technical description of the project:

A.4.1. Location of the project:

The Project will be implemented in the western part of Lithuania, Silute district, near Didsiliai, Gnybalai and Rudynai villages (Figure 1).

Figure 1 Location of Didsiliai wind power park

A.4.1.1. Host Party(ies):

Lithuania

A.4.1.2. Region/State/Province etc.:

Klaipeda County

A.4.1.3. City/Town/Community etc.:

Silute district

A.4.1.4. Detail of physical location, including information allowing the unique identification of the project (maximum one page):

The planned location of Didsiliai wind power park is in Silute district, in the territory of Didsiliai, Gnybalai and Rudynai villages. A detailed layout of wind power plants in the project territory is shown in Figure 2. Silute district falls into the windiest area of Lithuania with prevalence of the highest wind speeds and windy days. Referring to the long term meteorological data and measurements of wind speed and strength, the chosen location is well suited for the project implementation.

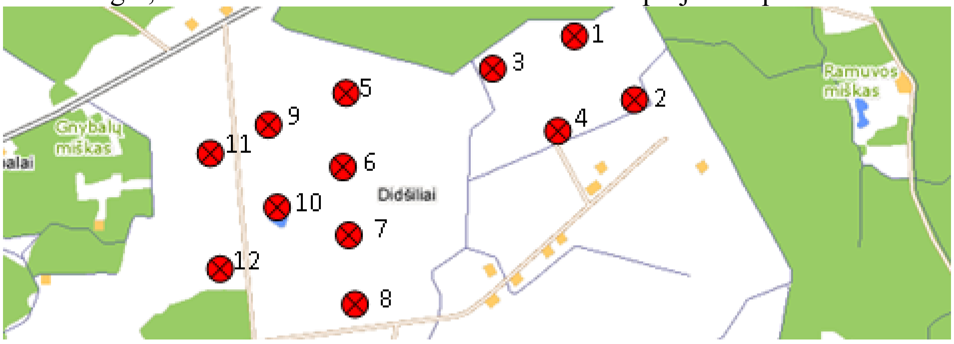

Figure 2 Distribution of wind power plants at the Didsiliai Wind Power Park

The planned activity will be implemented on 5 land parcels:
1. Land parcel in Didsiliai Village, Silute district, real estate registry No. 44/707054, cadastral No. 8817/0001:196 Jonaiciai rural area. Area - 101.0 hectares.
2. Land parcel in Didsiliai Village, Silute district, real estate registry No. 44/1134671, cadastral No. 8817/0001:225 Jonaiciai rural area. Area - 32.33 hectares.
3. Land parcel in Didsiliai Village, Silute district, real estate registry No. 44/1136381, cadastral No. 8817/0001:227 Jonaiciai rural area. Area - 3.23 hectares.
4. Land parcel in Didsiliai Village, Silute district, real estate registry No. 44/695858, cadastral No. 8817/0001:194 Jonaiciai rural area . Area - 94.0 hectares.
5. Land parcel in Didsiliai Village, Silute district, real estate registry No. 44/127632, cadastral No. 8857/0010:41 Saugai rural area. Area - 3.74 hectares.

Table 2 Unique identification of the location

No. of wind power plant	Locality	Coordinates in the system LKS94		Longitude and latitude	
		X	Y	N	E
1	Didsiliai	347335	6142440	55°23′36.24″	21°35′24″
2	Didsiliai	347602	6142141	55°23′26.88″	21°35′39.84″
3	Didsiliai	346957	6142282	55°23′30.84″	21°35′3.12″
4	Didsiliai	347223	6141984	55°23′21.48″	21°35′18.6″
5	Didsiliai	346178	6142202	55°23′27.24″	21°34′18.84″
6	Didsiliai	346163	6141810	55°23′14.64″	21°34′18.84″
7	Didsiliai	346190	6141421	55°23′2.04″	21°34′21″
8	Didsiliai	346216	6141032	55°22′49.44″	21°34′23.52″
9	Didsiliai	345816	6142042	55°23′21.48″	21°33′58.68″
10	Didsiliai	345810	6141632	55°23′8.52″	21°33′59.04″
11	Gnybalai	345443	6141877	55°23′15.72″	21°33′37.8″
12	Gnybalai	345474	6141340	55°22′58.44″	21°33′40.68″

A.4.2. Technology (ies) to be employed, or measures, operations or actions to be implemented by the project:

It is planned to install 10 Enercon E-82 and 2 Enercon E-53 type wind turbines manufactured by the German company Enercon GmbH. Technical data of the turbines is presented in Table 3.

Table 3 Technical parameters of the wind power plants

Type of wind turbine	Enercon E-82	Enercon E-82	Enercon E-53
Number of wind turbines	2	8	2
Wind turbine No. (see figure 2 above)	3, 4	5, 6, 7, 8, 9, 10, 11, 12	1, 2
Capacity	2 MW	2 MW	800 kW
Rotor diameter	82 m	82 m	53 m
Number of rotor blades	3	3	3
Height of tower	78.3 m	108 m	73.25 m
Total height of wind power plant	119.3 m	149 m	99.75 m

The wind power park will generate approximately 58.8 GWh of electricity per year.
The height of wind turbine towers will be 73 - 108 meters and the level of the produced noise is assumed to be 102.5-104 dBA. According to the accomplished calculations the planned noise level of the wind power park is within the allowable limits. Noise level is determined in pursuance of the Lithuanian Hygiene Code HN 33-2007 “Acoustic Noise. Allowable Levels in the Residential and Working Environment. General Requirements for Noise Measurements” (according to HN 33:2007 the permissible noise level is: 65dB - 6 a.m. - 6 p.m., 60dB - 16 p.m.- 10 p.m. and 55dB - 10 p.m. - 6 a.m.).
It is planned to install a transformer substation with incoming voltage of 20kV, outgoing voltage of 110 kV and 30 MVA capacities.

It is assumed, that the wind power plants will be manufactured, supplied, installed, adjusted and set into operation by Enercon GmbH.

The Didsiliai Wind Power Project is implemented by UAB Veju spektras. The staff of the company participates in another similar JI project "Rudaiciai Wind Power Park Project". An assumption is made that the same specialists will organise the maintenance of the Didsiliai Wind Power Project or transfer their knowledge to their colleagues.

The project implementation schedule is presented in Table 4.

Table 4 Planned project implementation schedule

Project implementation	Deadlines
Business plan	May 5, 2009
Technical project	Jan 15, 2010
Building roads	Feb 15, 2010
Construction and installation works	Dec 31, 2010
Transportation of wind power plants	Nov 30, 2010
Installation of wind power plants	Dec 31, 2010

Project implementation	Deadlines
Installation of substations	March 30, 2010
Laying down the power cables	Nov 31, 2010
Final works	Dec 31, 2010

For the construction of wind power plants it is necessary to obtain appropriate permits. For now all required permits have been obtained (Table 5).

Table 5 List of permits

No.	License	Obtained	Valid till:
1.	License to increase power production capacity (for 5.8 MW capacity)	3 December, 2008	26 April, 2010
2.	License to increase power production capacity (for 16 MW capacity)	3 December, 2008	31 December, 2010
2.	Detailed plan to build wind power plants and a transformer substation	Approved on 23 July 2009 by the resolution of the Silute district municipality No. T1-1065	-
3.	Construction license to build wind power plants and a transformer substation	Planned till December, 2009	-

A.4.3. Brief explanation of how the anthropogenic emissions of greenhouse gases by sources are to be reduced by the proposed JI project, including why the emission reductions would not occur in the absence of the proposed project, taking into account national and/or sectoral policies and circumstances:

The use of renewable energy resources for electricity production reduces GHG emissions resulting from the fossil fuel firing. Electricity generated and supplied to the national electricity grid by the wind power plants tends to reduce the volume of its production at other power plants in Lithuania. *UAB Veju spektras,* the owner of the Didsiliai wind power park, has signed the contract with *AB Lietuvos energija* for the supply of electricity produced by the wind power park to the national electricity grid.

The Lithuanian electricity network is operated by *AB Lietuvos energija*. Moreover, they purchase power quotas (on the basis of formerly signed contracts) from electricity producers. The producers may also supply the excessive electricity at a lower price. The difference in the national demand for electricity and the total production thereof (quotas and over-quotas) is covered by electricity produced at power plant Lietuvos elektrine. Thus, if the implementation of this project fails, the estimated electricity would be produced by Lietuvos elektrine, using the fossil fuel, i.e. natural gas, heavy fuel oil or Orimulsion. It was calculated that Lietuvos elektrine, by generating 1 MWh of electricity, contributes to the pollution of atmosphere with 0.626 tones of CO_2 (data of the National allocation plan for 2008-2012).

Expertise about the wind potential and the energy output of wind turbines on the site near Didsiliai was performed by the German Company Anemos in May, 2009.
Page 19 of the Anemos wind study contains summary results of the wind farm calculations. According to the table, net annual electricity production (Net AEP [GWh]) is equal to the 60934 MWh.
Page 24 of the study contains explanations on the meaning of the transgression probability. The P50 value corresponds to the mean expected energy yield, which is both exceeded and under-run by a probability of 50%. Furthermore, it is the responsibility of the investor to assume the transgression probability most suited (ibid). Considering this, mean annual energy output under the transgression probability P50 value, and equal to 60934 MWh/a, is used further (see table on page 25 of the Anemos wind study).
It is stated on page 24 of the study that the uncertainty analysis does not include reductions for a limited technical availability and electric losses. These are to be taken into account additionally for financial consideration.
Availability factor shows the percentage of time that a plant is ready to generate. In practice wind turbines need servicing and inspection once every six months to ensure that they remain safe. In addition, component failures and accidents (such as lightning strikes) may disable wind turbines. Very extensive statistics show that the best turbine manufacturers consistently achieve availability factors above 98 per cent, i.e. the machines are ready to run more than 98 per cent of the time. Not all wind turbine manufacturers around the world have a good, long reliability record, however, so it is always a good idea to check the manufacturers' track record and servicing ability before you go out and buy a new wind turbine [source: http://guidedtour.windpower.org/en/tour/econ/income.htm].
As UAB Veju spektras already has experience with wind turbines produced by Enercon, 97 % availability factor and 0.5% electric losses are used for the establishment of the annual energy output used in PDD.
Annual energy output used in PDD = mean annual energy output - 3% due to availability - 0.5% due to electric losses = 60934 - 1828,02 - 304,67 = 58800 MWh/annually

The Didsiliai wind power park will generate 58.8 GWh of electricity per year (conservative scenario). Applying the baseline ratio of 0.626 tCO_2/MWh_e, the annual CO_2 reduction is equal to 36 809 tCO_2. Reduction of CO_2 in the period of 2008-2012 is 73 618 tCO_2 (2 years).

The National Energy Strategy determines the main trends of energy development in Lithuania. It is provided that the share of renewable energy sources (RES) has to be 20% in the total primary energy balance by 2025. Also, the strategy states that Lithuania will reach the goal of 7% electricity production from RES by 2010, if the planned power plants are constructed.
The RES usage action plan has to be presented to the European Commission by Lithuania for the purpose to increase the share of RES to 23% in the final consumption of energy by 2020. At the moment the action plan is under preparation thus it is unclear yet, whether electricity produced at the wind power plants is going to be promoted and whether that promotion is going to be valid for the planned power plants.

In order to build the wind power park, the project developer has to win a tender for the installed capacity licence in one of the 6 zones in the western part of Lithuania. Each zone has a limit for the installed power capacity, as announced in the tender.

The feed-in-tariff scheme for green electricity production in Lithuania is established by the Regulation on the promotion of electricity produced from renewable energy sources, approved by the Lithuanian government's Resolution No. 1474 passed on the 5th of December 2001 (Official Gazette, 2001, No. 104-3713; No. 49-1958; available on http://www3.lrs.lt/pls/inter3/dokpaieska.showdoc_l?p_id=342973; in Lithuanian). The regulation obliges the grid operator to purchase green electricity from the licensed grid-connected producers at the feed-in-tariffs set by the resolution of the National Price and Energy Control Commission. The feed-in-tariff for wind electricity is set at 0.30 Lt/MWh (0.087 EUR/MWh) from 2009 by the 21st February 2008 resolution of the National Price and Energy Control Commission No. O3-27 (Information Publication, 2008, No. 16-21; available on http://www3.lrs.lt/pls/inter3/dokpaieska.showdoc_l?p_id=315044; in Lithuanian). After introduction of power spot market in Lithuania, the difference of power spot price and the feed-in-tariff will be compensated for green power producers. The regulation envisages the feed-in-tariff scheme to be replaced by green certificate scheme in 2021 hence the feed-in-tariffs are valid until 2021.

For the moment no permanent purchase/sale is ensured for the whole volume of energy produced by the project. In case of high electricity loading, the grid operator is eligible to disconnect the wind power park from the grid. Therefore, if such unfavourable situation occurs, the company will not supply a certain part of the planned electricity to the grid and will loose a respective part of its profit. Hereby, the project payback time will lengthen further leading to reduced attractiveness of the project.

A.4.3.1. Estimated amount of emission reductions over the crediting period:

Table 6 Estimated emission reductions

	Years
Crediting period	**2 (2010-2012)**
Year	**Estimate of annual emission reductions in tonnes of CO_2 equivalent**
2011	36 809
2012	36 809
Total estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	73 618
Annual average of estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	36 809

If agreement will be reached, crediting period may be extended and estimated annual emission reductions in tonnes of CO_2 equivalent equal to 36 809 tonnes each year.

A.5. Project approval by the Parties involved:

The idea of the Didsiliai wind power JI project was given a preliminary approval (Letter of Endorsement) on 6 November 2009 by the Communication No (10-7)-D8-9629 of the Ministry of Environment of the Republic of Lithuania. The evaluation of the Project Idea Note was made in consideration of the provisions set out in the regulation for the JI project Implementation in Lithuania, approved by the Order of the Minister of Environment of the Republic of Lithuania (Official Gazette, 2005, No. 50-1671; 2007, No. 109-4473). Furthermore, the assents from the Ministry of Energy of the Republic of Lithuania and the Lithuanian Environmental Investment Fund were taken into consideration in the decision making procedure.
Letter of Approval has not been issued yet, as according to the Lithuanian National Joint Implementation Project development rules the final Project approval might be issued only after the Project determination report submission to the Lithuanian DFP.

SECTION B. Baseline

B.1. Description and justification of the baseline chosen:

Step 1. Indication and description of the approach chosen regarding baseline setting

Baseline is the amount of GHG that would be emitted to the atmosphere during the crediting period of the project, i.e. in 2010-2012, in case the project was not implemented.

BASREC Regional Handbook on Procedures for Joint Implementation in the Baltic Sea Region indicates three methods of baseline approach:

1. Existing actual or historical greenhouse gas (GHG) emissions, as applicable;
2. Emissions from a technology that represents an economically attractive course of action, taking into account barriers to investment;
3. Average emissions of similar projects undertaken in the previous 5 years, in similar social, environmental and technological circumstances, and the performance of which is in the top 20 % of their category.

In the Didsilai wind power project the baseline is calculated referring to the historic data as this method is the best suited for the Lithuanian electricity market. Approved CDM ACM0002 methodology is not used for the baseline calculation due to the following reasons:

1. Lietuvos Elektrine, power plant with the second largest installed capacity in Lithuania (after Ignalina nuclear power plant –INPP) is operating on the electricity grid as a marginal plant. It covers all electricity demand which is remaining after all other electricity producers have supplied their quota electricity to the grid. Hence, by simply including all these power plants operating on the grid (excl. INPP) would bias the Operating Margin emissions factor.

2. There is an overcapacity of the installed power in Lithuania, so only very few new power plants are built or planned. Because of that, it is impossible to calculate properly the Built Margin emissions factor.

The chosen baseline approach is similar to the approaches already taken in comparable cases (wind power plant JI projects in Lithuania).

GHG emissions from electricity production depend on the type of fuel used and the efficiency of installations in which the fuel is combusted. Thus, for the baseline calculation it is important to know, which power plants will reduce production due to the supply of additional electricity, generated in the JI project. This can be easily determined knowing the structure of the Lithuanian electricity network. When the manufacturers of electricity supply all quota-based electricity to the integrated Lithuanian electricity network, the rest of power demand is covered by the electricity produced at Lietuvos elektrine. Besides, variable costs of electricity production at Lietuvos elektrine are the highest, compared to other power plants in Lithuania. Taking this into consideration, we can say that in case of additional electricity supply to the grid, the production will be reduced at Lietuvos elektrine. Therefore, in order to calculate GHG emission reductions, resulting from implementation of the JI projects related to production of electricity, it is necessary to know the amount of CO_2 released to the atmosphere while producing 1 MWh of electricity at Lietuvos elektrine.

Step 2. Application of the approach chosen

The amount of CO_2 released to the atmosphere while producing 1 MWh of electricity at Lietuvos elektrine was calculated in mid 2006 by a consulting company Ekostrategija in the process of preparation of the National allocation plan of the EU Allowances for 2008-2012. Calculations are performed on the basis of historical data. For better reliability the data of a 4-year period have been used for the calculations.

For determination of the baseline consumption and production efficiency, the data were provided by AB Lietuvos elektrine as well as production of electricity and heat at Lietuvos elektrine in 2002-2005 (Table 7). For evaluation of the emission reductions we also use forecasts of electricity production at the Didsiliai wind power park, provided by *UAB Veju spektras*.

Table 7 Energy production and fuel consumption in Lietuvos elektrine

Year	Electricity produced (MWh)	Heat produced (MWh)	Natural gas (1000nm3)	Heavy fuel oil (t)	Orimulsion (t)
2002	736 604	202 060	199 104	7355	52 534
2003	723 858	195 553	225 813	5241	21 238
2004	745 372	212 399	207 690	2750	55 50
2005	1 072 814	199 383	280 559	1815	86 160

The amount of the consumed fuel is transferred to oil equivalents using such factors: natural gas – 0.800 toe/1000nm3, heavy fuel oil – 0.955 toe/t, orimulsion – 0.660 toe/t[1] (Table 8).

Table 8 Fuel consumption at Lietuvos elektrine, expressed in oil equivalents

Year	Natural gas (toe)	Heavy fuel oil (toe)	Orimulsion (toe)
2002	159 289	7025	34 675
2003	180 657	5005	14 018
2004	166 158	2626	36 633
2005	224 455	1733	56 869

Hereafter, the percentage is calculated for each type of fuel consumed every year (Table 9).

Table 9 Proportion of fuels consumed at Lietuvos elektrine

Year	Natural gas (%)	Heavy fuel oil (%)	Orimulsion (%)
2002	79.25%	3.49%	17.25%
2003	90.47%	2.51%	7.02%
2004	80.89%	1.28%	17.83%

[1] Ratios are from Annex 4 of the Fuel and Energy Balance Technique (Official Gazette 2004, No. 172-6363)

2005	79.30%	0.61%	20.09%

In order to estimate the total emissions from fuel combustion the total tCO_2 emission factors are estimated for fuel, expressed in tons of oil equivalents (Table 10).
The total emission factor [tCO_2/toe] = net calorific value [TJ/t] * emission factor [tCO2/TJ] * oxidation factor. Key information on the data used for the establishment of the baseline is presented in **Table 15**.

Table 10 Total CO_2 emission factors

Natural gas	Heavy fuel oil	Orimulsion
1.8960531 tCO2/1000 nm3	3.1028478 tCO2/t	2.2268399 tCO2/t
0.8000287 toe/1000 nm3	0.9550656 toe/t	0.6600416 toe/t
2.3699814 tCO_2/toe (EF_{Gas})	3.2488322 tCO_2/toe (EF_{HFO})	3.3737873 tCO_2/toe (EF_{Orm})

The total annual amount of CO_2 emitted by Lietuvos Elektrine is calculated by multiplying the amount of each type of fuel consumed annually (expressed in toe) by the corresponding total emission factor tCO_2/toe (Table 11).

$$T_{CO2} = (F_{Gas} \times EF_{Gas}) + (F_{HFO} \times EF_{HFO}) + (F_{Orm} \times EF_{Orm}) \quad [1]$$

T_{CO2} - total annual amount of CO_2 emitted by Lietuvos elektrine;
F_{Gas} – annual consumption of Natural gas at Lietuvos elektrine, 1000 m^3
F_{HFO} – annual consumption of Heavy Fuel Oil at Lietuvos elektrine, tons
F_{Orm} – annual consumption of Orimulsion at Lietuvos elektrine, tons
EF_{Gas} - CO_2 emission factor for Natural gas, tCO_2/toe
EF_{HFO} - CO_2 emission factor for Heavy fuel oil, tCO_2/toe
EF_{Orm} - CO_2 emission factor for Orimulsion, tCO_2/toe

Table 11 shows the emissions from each type of fuel at Lietuvos elektrine.

Table 11 Fuel specific CO_2 emissions at Lietuvos elektrine

Year	Natural gas, tCO_2	Heavy fuel oil, tCO_2	Orimulsion, tCO_2	**Total: tCO_2**
2002	377 512	22 821	116 985	517 318
2003	428 153	16 262	47 294	491 709
2004	393 791	8533	123 592	525 916
2005	531 955	5632	191 865	729 451

The amount of CO_2 emissions, released while producing heat at Lietuvos elektrine, is calculated as follows:

$$H_{CO2} = \sum \frac{H_{LE}}{E_h \cdot K_{toe}} \cdot R_{\%} \cdot K_{tCO2/toe}; \quad [2]$$

H_{CO2} – CO_2 emissions, generated while producing heat;

H_{LE} – Annual amount of heat produced;
E_h - Average efficiency of heat production in Lithuania[2];
K_{toe} – Coefficient for transfer of heat to conditional fuel (toe - tons of oil equivalents). It is equal to 11.63;
$R_{\%}$ - Percentage of each type of fuel within the annual fuel consumption;
$K_{tCO2/toe}$ – Emission factor for one unit of conditional fuel (tne - tons of oil equivalents) of different fuel types.

Results of calculations are presented in **Table 12**.

Table 12 Emissions attributable to heat production at Lietuvos elektrine

	Natural gas, tCO_2	Heavy fuel oil, tCO_2	Orimulsion, tCO_2	CO_2 emissions (t)
2002	38 528	2329	11 939	52 796
2003	42 566	1617	4702	48 885
2004	41 335	896	12 973	55 204
2005	38 039	403	13 720	52 161

CO_2 emissions released for production of electricity are calculated by deducting the amount of CO_2 attributable to heat production from the total CO_2 amount released by Lietuvos elektrine.

$$P_{CO2} = T_{CO2} – H_{CO2} \quad [3]$$

P_{CO2} – annual CO_2 emissions attributable to electricity production at Lietuvos elektrine, tCO_2
T_{CO2} - total annual amount of CO_2 emitted by Lietuvos elektrine;
H_{CO2} – annual CO_2 emissions attributable to heat production at Lietuvos elektrine, tCO_2

To calculate emissions factor, CO_2 emissions attributable to electricity production were divided by annual electricity production. The results are presented in **Table 13**.

Table 13 Emissions attributable to electricity production at Lietuvos elektrine

Year	Electricity production, MWh	Emissions, t CO2	$tCO2/MWh_e$
2002	736 604	464 522	0.631
2003	723 858	442 824	0.612
2004	745 372	470 712	0.632
2005	1 072 814	677 290	0.631
Average	819 662	513 837	0.626

In order to check the emission factor, we have performed the same methodology as described above, using publicly available data of Lietuvos elektrine for the recent years (2006, 2007 and 2008). The following data were available publicly: amount of electricity supplied to the electricity network (column No. 1 in **Table 14**), amount of heat supplied to the district heating network (column No. 2 in **Table 14**), verified total CO_2 emissions (column No. 4 in **Table 14**),

[2] Efficiency rate of 84.7% was used while preparing the National allocation plan for 2002-2005, Rudaiciai and Benaiciai Wind Power Joint implementation projects. Both Joint implementation projects have passed the Final determination. Hence, efficiency rate of 84.7% was used for the Didsiliai Wind Power Project.

Table 14 Results of emissions factor recalculations

Year	Electricity sold, MWh	Heat production, MWh	Total energy production, MWh	Emissions, tCO_2 (total)	Emissions, tCO_2/ MWh	Emissions, tCO2 (heat)	Emissions, tCO_2 (electricity)	tCO_2/ MWhe (sold)	tCO_2/ MWhe (produced)
	1	2	3	4	5	6	7	8	9
2005	970.850	199.383	1.272.197	715.073	0,562	48.625	666.448	0,686	0,621
2006	883.754	194.731	1.166.752	638.523	0,547	47.491	591.032	0,669	0,608
2007	865.680	187.447	1.141.393	624.616	0,547	45.714	578.902	0,669	0,607
2008	779.708	190.147	1.058.121	600.126	0,567	46.373	553.753	0,710	0,638
Average	**874.998**	**192.927**	**1.159.616**	**644.585**	**0,556**	**47.051**	**597.534**	**0,684**	**0,619**

Column No. 4. Verified total emissions, available on http://ec.europa.eu/environment/climat/emission/citl_en.htm

Column No. 9. The total electricity production at Lietuvos elektrine is a sum of electricity supplied to the electricity network and electricity consumed for own needs. Data on the electricity supplied to the electricity network is available publicly. Electricity consumption for own need was calculated based on the assumptions derived from the actual data available for 2002-2005.

Actions of Lietuvos elektrine and announcements in the press show that Lietuvos elektrine will continue the use fuel with high emissions factor (heavy fuel oil or emulsified fuel). Lietuvos elektrine has installed equipment allowing the use of heavy fuel oil for energy production in consistency with the environmental requirements regarding sulphur content. Lietuvos elektrine has performed tender procedures for the purchase of heavy fuel oil for 2009-2010[3]. Besides, Lietuvos elektrine has successfully completed the trial test of emulsified fuel, the new product of oil refinery plant. Excellent results of the trial test of Lietuvos Elektrine prove the adequacy of Mazeikiu Nafta oil refinery product and the readiness of Lietuvos Elektrine to use it for energy production.[4] As emulsified fuel is produced from residual products of oil refinery, the price might be competitive comparing to other fuels.

In the Schedule for Use of the Special Programme for Climate Change (Official Gazette, 2010, No. 42-2040) baseline emission factor for electricity is suggested to be 0.707 t CO_2/MWh_e.

Considering the facts described above we assume that the use of emissions factor of 0.626 tCO_2/MWh_e would represent a conservative approach to the baseline.

Table 15 Key information on data used to establish the baseline

Data/Parameter	**Calorific value of fuel: natural gas**
Data unit	TJ/t
Description	Calorific values are used to establish total CO_2 emissions factors
Time of determination/monitoring	24 November 2004
Source of data (to be) used	Annex 4 of the Fuel and Energy Balance Technique, approved by the Order No. DĮ-228 of the Managing Director of Department of Statistics to the Government of the Republic of Lithuania of November 24, 2004 (Official

[3] http://www.orlenlietuva.lt/en/main/news/news?id=107564

[4] http://www.orlenlietuva.lt/en/main/news/news?id=5469

	Gazette 2004, No.172-6363)
Value of data applied (for ex ante calculations/determinations)	Naturals gas 0.0339
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Public available reliable data, approved by the Department of Statistics
QA/QC procedures (to be) applied	Department of Statistics applies its internal QA/QC procedures before issuing documents publicly
Any comment	
Data/Parameter	**Emission factor of fuel: natural gas**
Data unit	t CO_2/TJ
Description	Emission factors of fuels are used to establish total CO_2 emissions
Time of determination/monitoring	2009
Source of data (to be) used	Annex 1 of the National Greenhouse gas emission inventory report of the Republic of Lithuania, 2008
Value of data applied (for ex ante calculations/determinations)	Naturals gas 56.9
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Public available reliable data, National Greenhouse gas emission inventory report prepared in accordance with the requirements and using QA/QC procedures
QA/QC procedures (to be) applied	QA/QC procedures are applied in accordance with the requirements for preparation of National Greenhouse gas emission inventory. QA/QC procedures are explained in the Section 2.6 of the National Greenhouse gas emission inventory report for 2008
Any comment	
Data/Parameter	**Oxidation coefficient of fuel: natural gas**
Data unit	
Description	Oxidation coefficient is used to establish total CO_2 emissions factors
Time of determination/monitoring	29 January 2004
Source of data (to be) used	Commission decision of 29 January 2004 establishing guidelines for the monitoring and reporting of greenhouse gas emissions pursuant to Directive 2003/87/EC of the European Parliament and of the Council
Value of data applied (for ex ante calculations/determinations)	Naturals gas 0.995
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Public available reliable data
QA/QC procedures (to be) applied	
Any comment	

Data/Parameter	Calorific value of fuel: heavy fuel oil
Data unit	TJ/t
Description	Calorific values are used to establish total CO_2 emissions factors
Time of determination/monitoring	24 November 2004
Source of data (to be) used	Annex 4 of the Fuel and Energy Balance Technique, approved by the Order No. DĮ-228 of the Managing Director of Department of Statistics to the Government of the Republic of Lithuania of November 24, 2004 (Official Gazette 2004, No.172-6363)
Value of data applied (for ex ante calculations/determinations)	Heavy fuel oil 0.03998
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Public available reliable data, approved by the Department of Statistics
QA/QC procedures (to be) applied	Department of Statistics applies its internal QA/QC procedures before issuing documents publicly
Any comment	
Data/Parameter	Emission factor of fuel: heavy fuel oil
Data unit	t CO_2/TJ
Description	Emission factors of fuels are used to establish total CO_2 emissions
Time of determination/monitoring	2009
Source of data (to be) used	Annex 1 of the National Greenhouse gas emission inventory report of the Republic of Lithuania, 2008
Value of data applied (for ex ante calculations/determinations)	Heavy fuel oil 78.0
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Public available reliable data, National Greenhouse gas emission inventory report prepared in accordance with the requirements and using QA/QC procedures
QA/QC procedures (to be) applied	QA/QC procedures are applied in accordance with the requirements for preparation of National Greenhouse gas emission inventory. QA/QC procedures are explained in the Section 2.6 of the National Greenhouse gas emission inventory report for 2008
Any comment	
Data/Parameter	Oxidation coefficient of fuel: heavy fuel oil
Data unit	
Description	Oxidation coefficient is used to establish total CO_2 emissions factors
Time of determination/monitoring	29 January 2004
Source of data (to be) used	Commission decision of 29 January 2004 establishing guidelines for the monitoring and reporting of greenhouse gas emissions pursuant to Directive 2003/87/EC of the European Parliament and of the Council

Value of data applied (for ex ante calculations/determinations)	Heavy fuel oil 0.995
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Public available reliable data
QA/QC procedures (to be) applied	
Any comment	
Data/Parameter	Calorific value of fuel: orimulsion
Data unit	TJ/t
Description	Calorific values are used to establish total CO2 emissions factors
Time of determination/monitoring	24 November 2004
Source of data (to be) used	Annex 4 of the Fuel and Energy Balance Technique, approved by the Order No. DĮ-228 of the Managing Director of Department of Statistics to the Government of the Republic of Lithuania of November 24, 2004 (Official Gazette 2004, No.172-6363)
Value of data applied (for ex ante calculations/determinations)	Orimulsion 0.02763
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Public available reliable data, approved by the Department of Statistics
QA/QC procedures (to be) applied	Department of Statistics applies its internal QA/QC procedures before issuing documents publicly
Any comment	
Data/Parameter	Emission factor of fuel: orimulsion
Data unit	t CO2/TJ
Description	Emission factors of fuels are used to establish total CO2 emissions
Time of determination/monitoring	2009
Source of data (to be) used	Annex 1 of the National Greenhouse gas emission inventory report of the Republic of Lithuania, 2008
Value of data applied (for ex ante calculations/determinations)	Orimulsion 81.0
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Public available reliable data, National Greenhouse gas emission inventory report prepared in accordance with the requirements and using QA/QC procedures
QA/QC procedures (to be) applied	QA/QC procedures are applied in accordance with the requirements for preparation of National Greenhouse gas emission inventory. QA/QC procedures are explained in the Section 2.6 of the National Greenhouse gas emission inventory report for 2008
Any comment	

Data/Parameter	Oxidation coefficient of fuel: orimulsion
Data unit	
Description	Oxidation coefficient is used to establish total CO2 emissions factors
Time of determination/monitoring	29 January 2004
Source of data (to be) used	Commission decision of 29 January 2004 establishing guidelines for the monitoring and reporting of greenhouse gas emissions pursuant to Directive 2003/87/EC of the European Parliament and of the Council
Value of data applied (for ex ante calculations/determinations)	Orimulsion 0.995
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Public available reliable data
QA/QC procedures (to be) applied	
Any comment	
Data/Parameter	Data on electricity production
Data unit	MWh
Description	Values are used to establish CO2 emissions
Time of determination/monitoring	24 November 2004
Source of data (to be) used	Actual data provided by Lietuvos elektrine
Value of data applied (for ex ante calculations/determinations)	See **Table 7**
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Actual data obtained directly from the company
QA/QC procedures (to be) applied	Data was provided by Lietuvos elektrine, and cross checked with public available statistical data
Any comment	
Data/Parameter	Data on heat production
Data unit	MWh
Description	Values are used to establish CO2 emissions
Time of determination/monitoring	24 November 2004
Source of data (to be) used	Actual data provided by Lietuvos elektrine
Value of data applied (for ex ante calculations/determinations)	See **Table 7**
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Actual data obtained directly from the company
QA/QC procedures (to be) applied	Data was provided by Lietuvos elektrine, and cross checked with public available statistical data
Any comment	

Data/Parameter	Data on natural gas consumption
Data unit	nm3
Description	Values are used to establish CO_2 emissions
Time of determination/monitoring	24 November 2004
Source of data (to be) used	Actual data provided by Lietuvos elektrine
Value of data applied (for ex ante calculations/determinations)	See **Table 7**
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Actual data obtained directly from the company
QA/QC procedures (to be) applied	Data was provided by Lietuvos elektrine, and cross checked with public available statistical data
Any comment	
Data/Parameter	Data on heavy fuel oil consumption
Data unit	tones
Description	Values are used to establish CO_2 emissions
Time of determination/monitoring	24 November 2004
Source of data (to be) used	Actual data provided by Lietuvos elektrine
Value of data applied (for ex ante calculations/determinations)	See **Table 7**
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Actual data obtained directly from the company
QA/QC procedures (to be) applied	Data was provided by Lietuvos elektrine, and cross checked with public available statistical data
Any comment	
Data/Parameter	Data on orimulsion consumption
Data unit	tones
Description	Values are used to establish CO_2 emissions
Time of determination/monitoring	24 November 2004
Source of data (to be) used	Actual data provided by Lietuvos elektrine
Value of data applied (for ex ante calculations/determinations)	See **Table 7**
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Actual data obtained directly from the company
QA/QC procedures (to be) applied	Data was provided by Lietuvos elektrine, and cross checked with public available statistical data
Any comment	

B.2. Description of how the anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the JI project:

Step 1. Indication and description of the approach applied

Calculation of the baseline is presented in Section B.1. Table 13 shows that production of additional 1 MWh of electricity reduces emissions to the environment by 0.626 tCO_2 in average. It is foreseen to produce 58.8 GWh of electricity per year from the Didsiliai Wind Power project, thus every year CO_2 emissions will be reduced by 36 809 tones.

In addition the JI project indicates the GHG reduction after implementation of the JI project in comparison to the baseline. Usually the financial efficiency of JI projects is low, thus ERUs help to promote their development and implementation. This economic promotion also reduces the payback time of the project. Besides, project implementation as the JI project helps to overcome the local institutional barriers. The CDM Methodological Tool "Tool for the demonstration and assessment of additionality" (version 05.2) is used to demonstrate the additionality of the Didsiliai Wind Power project.

Step 2.Application of the approach chosen

Step 1. Identification of alternatives to the project activity consistent with current laws and regulations

Sub-step 1a. Define alternatives to the project activity:

A) The proposed project activity to be undertaken as non-JI project activity;
   This alternative is identical to the project activity but without JI initiative.

B) Power is produced by new cogeneration power plants.

C) Continuation of the current situation - power is produced at the existing power plants

Sub-step 1b. Consistency with mandatory laws and regulations:

Even after the closure of Ignalina NPP in 2009, Lithuania will have a sufficient number of the existing power plants to cover power demand. Maximal power demand amounted to 2050 MW in 2008. Including the necessary long term reserve Lithuania still had surplus of power capacity in 2008. This shows that even after the closure of Ignalina NPP (capacity of Ignalina NPP amounts to 1300 MW) Lithuania will have sufficient existing power plants to cover power demand. This situation creates strong limitations for the installation of new power plants, and is not in favour either for alternative A, or B.

Table 16 Lithuanian power balance, MW[5]

The disposition of Lithuanian power plants capacity, at all	4650
Maximal necessary capacity of the system (gross)	2050
Necessary long term reserve	1300
Power balance (surplus)	1300

[5] Report "Security of electricity supply in Lithuanian market", Ministry of Energy, 2009, table 1.2.2, on page 8, available on http://www.ukmin.lt/lt/veiklos_kryptys/energetika/elektra/doc/Monitoringas_2009.pdf

The existing legal and regulatory requirements in Lithuania are in favour of alternative B - power production at the existing or new cogeneration power plants and are not in favour of alternative A - the proposed project activity not undertaken as a JI project activity. The regulation on supporting renewable energy does not promote wind power enough to make it financially attractive (Sub-step 2c).

Construction of new cogeneration power plants is usually performed near the existing boiler houses. It is much easier to perform all necessary territorial planning, public consultation, land acquisition, environment and health impact assessment procedures, especially for natural gas based power plants, because they do not require additional territory for fuel storage. The existing laws and procedures on territorial planning, grid connection and others create barriers and support alternative B and are not in favour of alternative A.

The outcome of Step 1:

- All alternatives are in compliance with mandatory laws;
- The existing regulatory requirements are more favourable to t alternatives B and C.

Step 2. Investment analysis

Sub-step 2a. Determine appropriate analysis method

Simple cost analysis (option I) is not applicable for the project as the income from ERU’s are not the only source of revenues for the project.

The *investment comparison analysis (option II)* is not used because alternative B is based on the investment that is out of control of the Project developer, i.e. the project can be developed by a different entity. Nevertheless the project IRR is compared to the IRR of cogeneration power plants projects, the authors of the PDD of which had reliable and comparable data.

Benchmark analysis (option III) is applied.
There is no specific investment benchmark for the Lithuanian power sector that currently exists. Thus the needed interest rate for that analysis will be derived from the economic indicators that are standard for the country and are publicly available.

Sub-step 2b. – Option III. Apply benchmark analysis

Interest of bank deposits is used for benchmark analysis. The decision on the project development was made in June 2008. The average interest for deposits in Lithuania for the next 12 months (evaluating deposits within the period from 6 months to 1 year) was 8.16%[6]. The data for the interest of bank deposits were taken from the archives of the Lithuanian Bank information system. The system's archives present the statistical data on deposits and loan interest provided by financial institutions to households and non-financial corporations. The data are calculated applying the average weigh method. While establishing benchmark this value shall be increased by a suitable risk premium that would attract private investment.

Sub-step 2c. Calculation and comparison of financial indicators

IRR for the Didsiliai wind power project without revenues from ERUs is estimated to be 7.42 %[7]. Planned investments will be covered by 15% from the owner's equity and another 85% from the loans

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[6] Public data available on the web-site of the central bank of the Republic of Lithuania: http://www.lb.lt/stat_pub/statbrowser.aspx?group=7280&lang=lt

[7] Project financial calculation tables are included in the excel sheet

(credit interest rate - 5.50%). Additional revenues from ERU sales increase IRR of the Didsiliai project up to 7.59 % (ERU price considered to be 12 €/tCO_2e).

Table 17 Basic parameters of the project

Parameter	Value	Dimension
Total installed power	21.6	MW
Total investment costs	37343	1000 EUR
Annual operation and maintenance costs	473.7; 758.7; 885 respectively for the year 1-5 ; year 6-12; year 12-20	1000 EUR
Annual electricity production	58800	MWh/year
Feed-in tariff	0.087	EUR/kWh
Project lifetime	20	years
ERU Crediting period	**2** (01.01.2011 – 31.12.2012)	years

The calculations are based on the current feed-in tariff, applied for the electricity produced from RES since the 1st of January 2010. It is estimated, that the same tariff will be applied for the entire project period. Though there is an uncertainty regarding the tariff, because its application is ensured only till 2020. Thus it can be expected that afterwards electricity will have to be sold on the market. Currently the electricity price on the market is lower than the applied feed-in tariff.

Average IRR for new cogeneration power plants is approx. 10%. Additionally, the EU structural funds are available in Lithuania for new cogeneration power plants, but not for the wind power projects. Due to the EU structural support the IRR of new cogeneration plants increase to approx. 15 %[8]. This fact makes the cogeneration option (alternative B) more attractive to investors compared to the wind power.

Other available indicator is the interest of bank deposits. The average interest rates for deposits for the next 12 months (6 to 12 months period) after the decision has been taken was equal to 8.16% (risk premium is not included). Despite the fact that Project IRR is lower than the interest rate for the bank deposits the project has poor economic viability, mainly due to high project risk. The low project IRR does not stimulate private investments.

The project will be insured in order to overcome emergency cases, such as failure of the project activities or encountering of financial problems.

Sub-step 2d. Sensitivity analysis

The main variables on which the project costs and project revenues depend are as follows: investments, electricity production, electricity price, ERU price, interest rate and income tax rate. The investments shall not fluctuate a lot as they are already figured, proposals are obtained, and in some cases agreements are signed. IRR sensitivity to electricity production and ERU price is analyzed. None of other variables constitute more than 20% of either the total project costs or the total project revenues. Electricity price (feed-in tariff) is assured till the year 2020, and it is not clear if the feed-in tariff is going to be applied afterwards. Thus electricity price might decrease to the market level having negative impact on the project revenues.

The results of IRR sensitivity to electricity production, ERU price and electricity price are presented in the tables below:

Production Margin	-30%	-20%	-10%	0%	10%	20%	30%

[8] UAB COWI Lietuva performed business plans for natural gas based cogeneration plant in Panevezys in 2005, biomass based cogeneration plants in Utena and Siauliai in 2009

Production, MWh	41,160	47,040	52,920	58,800	64,680	70,560	76,440
IRR (incl ERUs)	3.75%	5.14%	6.41%	7.59%	8.69%	9.73%	10.72%
IRR (excl ERUs)	3.63%	5.01%	6.26%	7.42%	8.51%	9.53%	10.50%

Margin	-30%	-20%	-10%	0%	10%	20%	30%
ERU price, EUR	8.4	9.6	10.8	12.0	13.2	14.4	15.6
IRR (incl ERUs)	7.54%	7.56%	7.58%	7.59%	7.61%	7.63%	7.64%
IRR (excl ERUs)	7.42%	7.42%	7.42%	7.42%	7.42%	7.42%	7.42%

Margin	-30%	-20%	-10%	0%
Electricity price, EUR/kWh	0.061	0.070	0.078	0.087
IRR (incl ERUs)	6.37%	6.81%	7.22%	7.59%
IRR (excl ERUs)	6.19%	6.63%	7.04%	7.42%

As it can be seen from the results of sensitivity analysis, IRR is much more sensitive to power production than to ERU price.

The outcome of Step 2:

- The proposed project activity, without the additional revenues from the sale of the ERUs is unlikely to be economically and financially attractive to investors.
- Due to high sensitivity of electricity production, additional revenues from the sale of the ERUs increase the credit of the project.

Step 3. Barrier analysis

This Step is not applied, because Step 2 concludes, that the proposed project activity without the additional revenues from the sale of the ERUs is unlikely to be economically and financially attractive to investors.

Step 4. Common practice analysis

Sub-step 4a. Analyze other activities similar to the proposed project activity:

Good evidence of the presence of implementation barriers for the wind power projects in Lithuania is the fact that only 31 wind plants (wind power parks) were connected to the grid until December 2009[9], and only 6 of them were more than 2 MW capacity, and connected to the 110 kV grid. The data on the largest wind power parks is presented the table below. All of them are developed as JI projects. It is also ascertained that wind power is one of the most expensive types of electricity generation.

Table 18. Extract from the guarantees of origin data base

Producer	Producer No. in the Registry	Power park address	Capacity, MW
UAB „Vėjų spektras“	KG-G-003	Rūdaičių vlg., Kvecių vlg., Kiauleikių vlg., Kretingos distr.	30

[9]Guarantees of origin data base available on http://www.lietuvosenergija.lt/lt/main/klm/Duombaze/Gamint_d

Kreivėnų VE grupė	KG-G-118	Kreivėnų vlg., Griežpelkių II vlg., Gilangviršių vlg., Tauragės distr.	20
Laukžemės VE	KG-G-094	Benaičių vlg. and Žynelių vlg. Darbėnų l.a. Kretingos distr.	16
Sūdėnų VE	KG-G-115	Sūdėnų vlg., Kretingos distr.	8
Lendimų VE	KG-G-116	Lendimų vlg., Kretingos distr.	6

According to the regulation the commercial scale wind power parks are currently allowed only in the defined zones in the western part of Lithuania. Maximum allowed capacity amounts to 200 MW. No matter the tender procedures for the installed wind power capacity were launched about 2 years ago, the table reflects the connection of only 80 MW to the grid.

The above described situation shows that there are significant barriers for construction of the wind power parks.

Sub-step 4b. Discuss any similar options that are occurring:

Registry of all wind power parks (single plants) connected to the grid in Lithuania is available on AB Lietuvos energija web-site. Most of the wind power parks are small scale, less than 250 kW. The reasons for that are: comparably lower initial investments, granted purchase of all electricity, supplied to the grid, lower environmental requirements, and lower land use requirements.
All larger scale wind power parks in Lithuania are developed as JI projects.

The outcome of Step 4:

- All larger wind power parks in Lithuania are implemented as JI project activity.

Step 3. Provision of additionality proofs

All relevant additionality proofs are discussed in the Steps above.

B.3. Description of how the definition of the project boundary is applied to the project:

The BASREC regional handbook describes project boundaries as theoretical boundaries, determining the scope of the project impact on GHG emissions. The sources of GHG involved in project boundaries represent the sources involved in baseline calculations.

The boundaries of the project are shown in Figure 3.

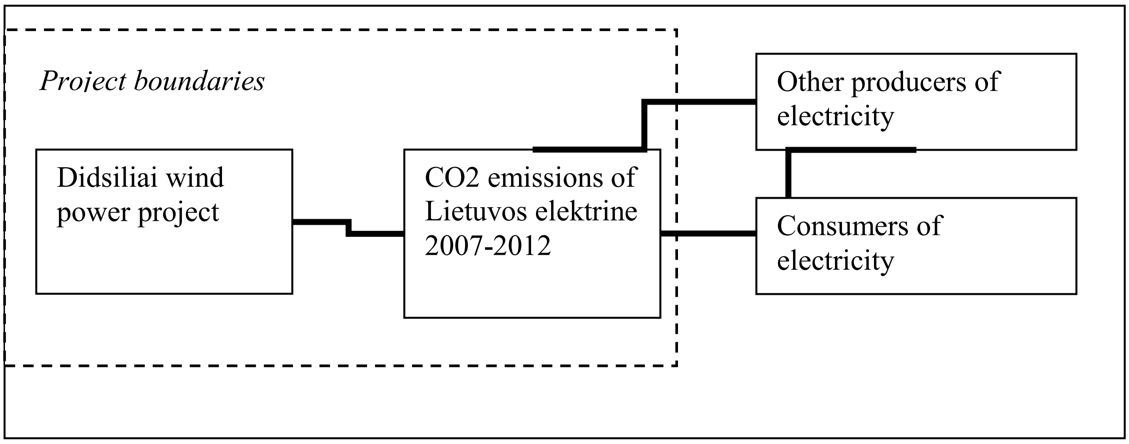

Figure 3 Project boundaries

Boundaries of the Didsiliai wind power project encompass the wind power park and Lietuvos elektrine. Other producers as well as consumers of electricity are not included into the project boundary due to the structure of Lithuanian electricity network (see section B1).

B.4. Further baseline information, including the date of baseline setting and the name(s) of the person(s)/entity(ies) setting the baseline:

Date of the baseline setting: 29/03/2010.
Project organizer: *UAB COWI Lietuva*. Contact information is presented in Table 17. The person/entity is not a project participant listed in Annex 1.

Table 17 Contact information of project organiser

Company name	*UAB COWI Lietuva*
Street	Ukmerges
Building No	369A
State/Region/City	Vilnius
Post code	LT-06327
Country	Lithuania
Telephone number	+370 5 2107610
Fax number	+370 5 2124777
E-mail	info@cowi.lt
Website	www.cowi.lt
Representative	Inga Valuntiene
Position	Head of Energy division
Salutation	Ms
Surname	Valuntiene
Second name	-
First name	Inga
Subdivision	-
Telephone number (direct)	-
Fax number (direct)	-
Mobile phone number	+370 655 70743
E-mail (personal)	inva@cowi.com

SECTION C. Duration of the project / crediting period

C.1. Starting date of the project:

23/07/2009 -the detailed plan approval date by the Council of Silute district Municipality

C.2. Expected operational lifetime of the project:

20 years 0 months.

C.3. Length of the crediting period:

Crediting period of the project is 2 years – lasting from January 1, 2011 to December 31, 2012.
In case the agreement is reached, the crediting period may be extended, but it shall not take longer than the operational life time of the project.

SECTION D. Monitoring plan

D.1. Description of monitoring plan chosen:

The monitoring plan is prepared with reference to the CDM monitoring methodology AM0019 “Renewable energy projects replacing part of the electricity production of one single fossil fuel fired power plant that stands alone or supplies to a grid, excluding biomass projects” (Version 02, 19 May 2006).

This methodology is applicable to the projects generating power based on renewable energy sources under the following condition: proposed project activities with electricity production from the zero-emission renewable energy sources: wind, geothermal, solar, run-of-river hydro, wave and/or tidal projects that displace electricity production from an identified individual plant.

The methodology requires monitoring of the electricity generation from the proposed project activity. The project needs to monitor its electricity production following standard practices of electricity metering. The net electricity generated by the project needs to be monitored through the use of onsite metering equipment at the substation (interconnection facility connecting the facility to the grid). The meter reading records will have to be readily accessible for auditors and calibration tests records will be maintained for the auditors.

The monitoring plan is attached as Annex 3.

D.1.1. Option 1 – Monitoring of the emissions in the project scenario and the baseline scenario:

D.1.1.1. Data to be collected in order to monitor emissions from the project, and how these data will be archived:

ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

The wind power park itself does not emit any kind of pollutants. Some GHG emissions are released due to transportation of wind turbines and other equipment as well as from the construction works but these emissions are negligible compared to the project emission reductions. Some CO_2 will be released to the atmosphere while performing the maintenance (transportation, etc.) of the wind turbines, however the amounts will be minute. These GHG sources can be considered as insignificant and should not be taken into consideration.

D.1.1.2. Description of formulae used to estimate project emissions (for each gas, source etc.; emissions in units of CO_2 equivalent):

Not applicable.

D.1.1.3. Relevant data necessary for determining the baseline of anthropogenic emissions of greenhouse gases by sources within the project boundary, and how such data will be collected and archived:

ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

Not applicable.

D.1.1.4. Description of formulae used to estimate baseline emissions (for each gas, source etc.; emissions in units of CO_2 equivalent):

Baseline emissions will be monitored using the following formula.

$$\mathbf{E_B = P_{WPP} \text{ x } EF_{LE}} \quad \textbf{[4]}$$

Where:
E_B - baseline emissions
P_{WPP} – Net annual electricity production at the Didsiliai Wind Power Park. P_{WPP} is the difference between produced and consumed power at the Didsiliai wind power park in MWh.
EF_{LE} – emission factor for electricity production at Lietuvos elektrine, 0.626tCO_2/MWh

$$\mathbf{EF_{LE} = P_{CO2} / P_{LE}} \quad \textbf{[5]}$$

Where:
EF_{LE} - emission factor for power production at Lietuvos elektrine, tCO_2/MWh
P_{CO2} - Emissions attributable to power production at Lietuvos elektrine, tCO_2
P_{LE} - Annual power production at Lietuvos elektrine, MWh

For the formula on how P_{CO2} is calculated, please refer to chapter B1.

D. 1.2. Option 2 – Direct monitoring of emission reductions from the project (values should be consistent with those in section E.):

Not applicable.

D.1.2.1. Data to be collected in order to monitor emission reductions from the project, and how these data will be archived:

ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

D.1.2.2. Description of formulae used to calculate emission reductions from the project (for each gas, source etc.; emissions/emission reductions in units of CO_2 equivalent):

Not applicable.

D.1.3. Treatment of leakage in the monitoring plan:

Leakage does not occur.

D.1.3.1. If applicable, please describe the data and information that will be collected in order to monitor leakage effects of the project:								
ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

Not applicable.

D.1.3.2. Description of formulae used to estimate leakage (for each gas, source etc.; emissions in units of CO_2 equivalent):

Not applicable.

D.1.4. Description of formulae used to estimate emission reductions for the project (for each gas, source etc.; emissions/emission reductions in units of CO_2 equivalent):

$$E_R = P_{WPP} \times EF_{LE} \quad [6]$$

Where:
E_R – project emission reductions
P_{WPP} – Net annual power production at the Didsiliai wind power park. P_{WPP} is the difference between the produced and consumed power at the Didsiliai wind power park in MWh.
EF_{LE} – emission factor for power production at Lietuvos elektrine, 0.626tCO_2/MWh

D.1.5. Where applicable, in accordance with procedures as required by the host Party, information on the collection and archiving of information on the environmental impacts of the project:

It is planned to perform noise level monitoring in accordance with Article No. 11 of the Law on Health Impact Monitoring (Official Gazette, 2002, No. 72-3022).

D.2. Quality control (QC) and quality assurance (QA) procedures undertaken for data monitored:		
Data *(Indicate table and ID number)*	Uncertainty level of data (high/medium/low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
P_{WPP} (D1.1.3)	*Low*	*P_{WPP} will be monitored via the commercial power metering device that is regularly calibrated. To ensure the quality of the data, the data are double-checked using sales record and electricity production records(see more on D.3)*

D.3. Please describe the operational and management structure that the project operator will apply in implementing the monitoring plan:

The following management structure is in place:

Director - managing the company;
Project Manager - supervision of the project;
Site Manager - daily supervision of the construction;
Business coordinator - daily office work, documentation, paper work, cash flows;
Chief accountant - accounting.
Maintenance of wind power park should be performed by Enercon under agreement with *UAB Veju spektras*.

The monitoring report will be compiled by an engineer from *UAB Veju spektras*. Monitoring of electricity production will be performed by the director of *UAB Veju spektras*. Monitoring of electricity production will be combined with the commercial accounting of the produced electricity. Once a month, an inspector from *AB Lietuvos energija* together with a representative from *UAB Veju spektras* will check the commercial electricity metering device and will write down the dispatched electricity quantity on the dispatch confirmation document. After electricity dispatch document is signed by both parties, the director of *UAB Veju spektras* will make an entry of the figure of dispatched electricity into the monitoring sheet. Other monitored factors will be collected and CO_2 reductions will be calculated by an engineer from *UAB Veju Spektras* in January each year.

For the quality assurance, a consulting company will be contracted to revise the monitoring reports. Revision will include verification of the data sources and calculations. Power dispatch documents will be archived at *UAB Veju spektras* for later reference for the proof of the monitoring results. *AB Lietuvos energija* is responsible for the calibration of the commercial power metering device. In case of emergency (for example, in case of commercial metering device failure), the power dispatched to the grid will be monitored using an emergency power metering device.

Copies of calibration and maintenance documents for commercial power devises, electricity production accounting documents and compiled monitoring reports will be collected by the business coordinator and will be stored by *UAB Veju spektras* for 2 years after the end of the crediting period.

D.4. Name of person(s)/entity(ies) establishing the monitoring plan:

The person/entity being not a project participant is listed in Annex 1.

Company name	COWI Lietuva
Street	Ukmerges
Building No	369A
State/Region/City	Vilnius
Post code	LT-06327
Country	Lithuania
Telephone number	+370 5 210 7610
Fax number	+371 5 212 4777
E-mail	info@cowi.lt
Website	www.cowi.lt
Representative	Inga Valuntiene
Position	Head of Energy division
Salutation	Mrs.
Surname	Valuntiene
Second name	-
First name	Inga
Subdivision	BU Energy and Environment
Telephone number (direct)	-
Fax number (direct)	-
Mobile phone number	+370 655 70743
E-mail (personal)	inva@cowi.lt

SECTION E. Estimation of greenhouse gas emission reductions

E.1. Estimated project emissions:

Project emissions are considered to be equal to 0

E.2. Estimated leakage:

Leakage is not present Ly = 0

E.3. The sum of E.1. and E.2.:

E1 + E2 = 0

E.4. Estimated baseline emissions:

$E_B = P_{WPP} \times EF_{LE}$ (variables explained in D.1.1.4) [7]

P_{WPP} - 58 800 MWh
EF_{LE} - 0.626 tCO_2/MWh

E_B - annual baseline emissions = 36 809 t CO2.

Calculation of EF_{LE} is presented in B1 and monitoring is contained in D.1.1.4.

Total baseline emissions for 2011-2012 are 36 809 t CO_2 x 2 = 73 618 tCO_2.

E.5. Difference between E.4. and E.3. representing the emission reductions of the project:

Annual emission reductions - 36 809 t CO_2. Total emission reductions for crediting period - 73 618 tCO_2.

E.6. Table providing values obtained when applying formulae above:

Table 18 Project emission reductions

Year	Estimated project emissions (tonnes of CO_2equivalent)	Estimated leakage (tonnes of CO_2equivalent)	Estimated baseline emissions (tonnes of CO_2equivalent)	Estimated emission reductions (tonnes of CO_2equivalent)
2011	0	0	36 809	36 809
2012	0	0	36 809	36 809
Total	0	0	73 618	73 618

SECTION F. Environmental impacts

F.1. Documentation on the analysis of the environmental impacts of the project, including transboundary impacts, in accordance with procedures as determined by the host Party:

According to the Klaipeda Regional Department of Environment conclusion No. 9.14.5 - LV4 - 7365 and No. 9.14.5 - LV4 - 7364 of December 4, 2008, the environmental impact assessment (EIA) of the planned economic activity is not required.

According to the Environmental Impact Assessment program and reports preparation guidelines, Health Impact Assessment screening was prepared. Decision No. E4-46 on the planned economic activity issued by Klaipeda Public Health Centre on March 24, 2009 stated the necessity of Health Impact Assessment. It has been performed and approved.

Potential environmental impacts are described below.

Atmosphere

The project is considered to result not only in the reduction of GHG but also in the reduction of other pollutants such as SO_2 and NO_x. These pollutants are released to the atmosphere while generating electricity at Lietuvos elektrine. To calculate reductions of SO_2 and NO_x, the following formulas are used:

$$\mathbf{E_{SO2} = P_{MWh} \times EF_{SO2}} \quad [8]$$

Where:
P_{MWh} - is the annual electricity production in the wind park, MWh;
EF_{SO2} – is the emissions factor, defining the atmospheric emission of SO_2 in tons while producing 1 MWh of electricity.

$$\mathbf{E_{NOx} = P_{MWh} \times EF_{Nox}} \quad [9]$$

Where:
P_{MWh} - is the annual production of electricity in the wind park, MWh;
EF_{NOx} - is the emissions factor, defining the atmospheric emission of NO_x in toms while producing 1 MWh of electricity.

The results of the projected SO_2 and NO_x reductions are given in Table 19.

Table 19 SO2 and NOx emission reductions

Pollutant	kg of pollutant/MWh	Amount of pollutant saved during one year
SO_2	0.45	26.46 t
NO_x	0.95	55.86 t

Water

There are no open water pools/bodies within the project area. There is no risk to pollute the surface and/or ground water during the maintenance of the wind power park project. Water is not used for technological purposes in the wind power park so no production of wastewater will take place.

Soil

No significant impact on soil will be witnessed. The project area mainly consists of farmlands. During the construction process the upper layer of the soil which is 0.2-0.3 m thick, will be removed from the power plant foundation areas, road construction areas and cable laying areas, and stored apart from other soil layers. After construction works are finalised, the loam will be re-cultivated and planted according to the project plans in order to avoid soil erosion.

Flora / Fauna

Based on the data of the operating wind power plants, there is no evidence of the impact of wind power plants on biological diversity. Hence, measures to recreate environmental biodiversity are not necessary.

There are no envisaged tree cuttings or relocation in the project area. A grass-plot will be set in the area.

There are no wild animal accumulation, feeding, mating, wintering of migration points in the project area that should be protected.

Impacts on birds

The Didsiliai wind power park is far away from bird migration routes. The probability of birds colliding with the wind power plants is very low. Therefore the impacts on birds are considered negligible.

According to the results of the studies performed by the Danish and German scientists wind power plants have no impact on migration routes of birds. The studies in the EU show that the risk of bird collisions with wind power plants is much smaller compared to the risks of bird collision with high voltage air power lines, cars, skyscrapers or glazed facades of buildings. After long term observations, the conclusions were drawn that birds have changed their migration routes according to new obstructions evolved on their way. The research also shows that wind power parks have smaller impacts on birds than the tall single buildings (source: www.iblumweltplanung.de)

Impacts on animals

Noise, shadow and blinking effects and landscape fragmentation effect made by the wind power park can disturb natural wildlife. However, the Didsiliai wind power park is surrounded by farmlands and rural areas situated away from wild animal habitats. Hence, the impact on wild animals is considered negligible.

Protected areas

There are no protected areas within or nearby the project site. There are no protected species of flora or fauna within or close to the project site.
The nearest protected areas are within sufficient range away from the project site:

The Nemunas Delta regional park (6.1 km);
Norkaiciai reservation (5.7 km)

Cultural heritage

There is no historically important cultural heritage in the planned territory. The nearest cultural heritage is: old Evangelical Lutheran Cemetery in Didsiliai village (200m) and the first Evangelical Lutheran Cemetery in Kalininkai village (2300m).

Waste

Waste in the wind power park is minimal. Waste in the wind power park can only be produced during the wind power plant maintenance, which occurs once in 20 years, i.e. waste of used oil lubricants and spare parts to be substituted with new spare parts during the maintenance period of the wind power park. The produced waste will be handled according to the Laws and Regulations in force in the Republic of Lithuania.

Physical impact

Electromagnetic field

According to the technical data, the wind power plants generators produce low voltage power and operate under low frequency mode (60 Hz). In accordance with the data, the power produced in the wind power plant will be transported to the transformer substation by underground cables thus electromagnetic field will not be formed on the surface of the ground. The power from transformer substation will be transported by overhead lines.

Electromagnetic field is formed around high voltage overhead power lines, at the transformer substations and other open power installations. Electromagnetic field is measured by the intensity of electric field (E, V/m) and by the intensity of magnetic field (H, A/m). Permissible intensity of electric field in residential (building) areas is up to 10kV/m without limitations for allowed exposure time and up to 0,5 kV/m in "green" zones (parks, gardens etc.) without limitation for exposure time (HN 104: 2000).

The intensity of electric and magnetic fields are lower than the permissible level set for residential areas (1kV/m). Electro-technical equipment of wind power plants are mounted in 90 m height from the surface in the ground-connected metal baskets, which serve as electromagnetic shields. Zone of electromagnetic impact is not present in the wind power park territory or in the neighbouring areas.

Noise

According to the performed calculations, the wind power plant noise level will not exceed the allowed level (55 dBA) already at the distance of 80 - 150 m from the noise source. The noise zones of all wind power plants remain within the planned site border. The proposed Sanitary Protection Zone borders: wind power plant No. 1, 2, 8, 12 - 80 m, No. 3, 4 - 150 m, No. 5, 7, 9, 10, 11 - 100 m, No. 6 - 120 m. (Figure 2)

Visual impact

The relief of the territory is conditionally and notionally plain with faintly expressed hills. According to the Lithuanian natural frame landscape formation direction, the Didsiliai village surrounding areas landscape disengagement should not be protected.
The planned wind power plant will change the landscape, but will not deface it. The towers of wind power plants are painted bright grey colour which will fade them on the sky background.
The combination of nature and tower construction will create a new landscape quality. The more defacing landscape is high voltage overhead line pylons, which are a common element.
Like all tall buildings the wind power plants also cast shadow on the neighbouring areas when the sun is visible. It also causes a blinking effect due to rotation of wind turbine wings. The shadowing effect is not relevant for the project. According to the preliminary calculations the shadows will be cast not more than 420 m away from the wind power plants. Bearing in mind that the closest living areas are at a distance of 540-600 meters, the shading effect is not considered as an impact.

F.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to supporting documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

The environmental impacts are not considered as significant.

SECTION G. Stakeholders' comments

G.1. Information on stakeholders' comments on the project, as appropriate:

In the detailed plan preparation compulsory public consideration procedures were undertaken with possible participation of all stakeholders. No objections have been expressed from the stakeholders' part .

The following steps were made during the stakeholder process:

Table 19 Stakeholders process

11-12-2009	Beginning of preparation of the project detailed plan was announced on Silute District Municipality website.
15-12-2008	Beginning of preparation of the project detailed plan was announced in newspaper „Silutes naujienos".
27-01-2009	Information letters about beginning of preparation of the project detailed plan was sent to 27 land owners having property in the neighbouring territories.
12-02-2009	Announcement of the last stage of public consideration of the project detailed plan was published in the newspaper „Silutes naujienos".
12-02-2009	Information letters about the last stage of public consideration of the project detailed plan was sent to 27 land owners having property in the neighbouring territories.
17-02-2009	Announcement of the last stage of public consideration of the project detailed plan was published on Silute District Municipality website.
From 16-03-2009 to 31-03-2009	Public exposition of the project detailed plan was performed
31-03-2009	Public consideration of the project Detailed plan at Silute District Municipality. Minutes and public consideration report are prepared.

Annex 1

CONTACT INFORMATION ON PROJECT PARTICIPANTS

Organisation:	UAB Veju spektras
Street/P.O.Box:	Razes
Building:	15
City:	Vydmantai, Kretinga
State/Region:	
Postal code:	LT-97011
Country:	Lithuania
Phone:	+370 373 21583
Fax:	+370 445 55558
E-mail:	vejuspektras@takas.lt
URL:	
Represented by:	Vidmantas Kniuksta
Title:	Project Manager
Salutation:	Mr.
Last name:	Kniuksta
Middle name:	
First name:	Vidmantas
Department:	
Phone (direct):	
Fax (direct):	+370 445 55558
Mobile:	+370687 81120
Personal e-mail:	vidmantas.kniuksta@gmail.com

Organisation:	SIA E kvotas
Street/P.O.Box:	Atbrivosanas av.
Building:	98
City:	Rezekne
State/Region:	
Postal code:	LV-4600
Country:	Latvia
Phone:	+370 5 268 59 89
Fax:	+370 5 268 59 88
E-mail:	a.strolia@e-energija.lt
URL:	
Represented by:	Arturas Strolia
Title:	Chairman
Salutation:	Mr.
Last name:	Strolia
Middle name:	
First name:	Arturas
Department:	
Phone (direct):	
Fax (direct):	
Mobile:	+370 612 603 68
Personal e-mail:	a.strolia@e-energija.lt

Annex 2

BASELINE INFORMATION

Table 20 Fuel consumption, energy production and CO_2 emission data for Lietuvos elektrine

Year	Power production, MWh	Heat production, MWh	Natural gas, nm3	Fuel oil, t	Orimulsion,t	CO2 emissions, using fossil fuel	CO2 emissions, resulting from heat production	CO2 emissions, resulting from power production	Emissions factortCO2/MWhe
2002	736 604	202 060	199 104 000	7355	52 534	517318.01	52796.436	464521.57	0.631
2003	723 858	195 553	225 813 000	5241	21 238	491709.09	48884.851	442824.24	0.612
2004	745 372	212 399	207 690 000	2750	55 501	525915.94	55203.746	470712.19	0.632
2005	1 072 814	199 383	280 559 000	1815	86 160	729450.95	52160.995	677289.96	0.631
						566098.5	**52261.507**	**513836.99**	**0.626**

Annex 3

MONITORING PLAN

Emission reductions achieved due to the project will be calculated by multiplying the annual amount of electricity dispatched to the grid by the emissions factor:

$$\mathbf{E_R = P_{WPP} \times EF_{LE}} \quad \mathbf{[10]}$$

Where:
E_R – annual emission reductions, tCO_2
P_{WPP} – Net annual power production at Didsiliai wind power park. P_{WPP} is the difference between the produced and consumed electricity at Didsiliai wind power park in MWh.
EF_{LE} – emission factor for electricity production at Lietuvos elektrine, 0.626 tCO_2/MWh

E_R will be calculated for a previous year, starting since 2010 (using the annual electricity dispatch data from the previous year). The following monitoring form will be used to monitor the dispatched electricity. Monitoring procedures are described in D3.

Year ______________

Month	Electricity dispatch confirmation document No.	Date of signature of electricity dispatch confirmation document	ID of the electricity metering device	Indication of the produced electricity by the metering device, MWh	Indication of the consumed electricity by the metering device, MWh	Amount of electricity dispatched to the grid, MWh	Date of the entry	Name of the person in charge	Signature
January									
February									
March									
April									
May									
June									
July									
August									
September									
October									
November									
December									
TOTAL									