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

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Annexes

SECTION A. General description of the project

A.1. Title of the project:

Viru-Nigula Wind Farm

PDD v5
23rd November 2009

A.2. Description of the project:

The Viru-Nigula 24 MW wind farm project has been under development for more than three years and it will be one of the large-scale wind power plants in the Baltic States. The project consists of 8 wind turbines with a total production capacity of 24,0 MW. The wind turbines will be WinWinD, WWD-3 (model NH90-RD100) of 3,0 MW. The wind farm will be connected to the 110 kV net of the Estonian Energy supplier through its own power station.

The local Viru-Nigula municipality has agreed on the establishment of the wind farm and the Detailed Land Use Plan is valid since August 1, 2004. The detailed Technical Design of the project has been completed. The remaining agreements including Grid Connection Agreement (January 2005), Operation Agreement (August 2005) and Power Purchase Agreement (PPA, August 2005) have been signed.

A.3. Project participants:

Party involved	**Legal entity project participant (as applicable)**	**Please indicate if the Party involved wishes to be considered as project participant (Yes/No)**
Republic of Estonia (host Party)	• Viru-Nigula Tuulepark OÜ	No
Kingdom of Sweden	• Swedish Energy Agency • Nordic Environment Finance Corporation NEFCO in its capacity as Fund Manager to the Baltic Sea Region Testing Ground Facility (TGF)	No

Project Entity
Viru-Nigula Tuulepark OÜ has been established with the sole intention of implementing, operating and owning the wind farm. Viru-Nigula Tuulepark OÜ is 100% owned by Vardar Eurus AS.

Vardar AS is a holding company with hydropower, renewable energy and real estate as its core businesses. The Nordic Environment Finance Corporation (NEFCO) has a 30 % ownership in Vardar Eurus AS.

OÜ Nelja Energia has a management agreement with Viru-Nigula Tuulepark OÜ, whereby OÜ Nelja Energia operates the Viru-Nigula wind park.

The purchasers of the emission reductions from the project

In the Viru Nigula project there are two project participants acquiring Emission Reduction Units: the Kingdom of Sweden through the Swedish Energy Agency, which runs the Swedish International Climate Investment Programme, and the Nordic Environment Finance Corporation NEFCO in its capacity as Fund Manager to the Baltic Sea Region Testing Ground Facility (TGF).

Swedish Energy Agency (STEM)

The Swedish Energy Agency, STEM, is a Swedish Government Authority, financed over the state budget, which was established in 1998 (organisation No. SE 2021005000-01). The Agency's main task is to implement the national energy policy decided by Government and Parliament. It is also assigned to administer the Swedish International Climate Investment Programme (SICLIP) aiming at implementing projects under the project-based mechanisms, Joint Implementation (JI) and the Clean Development Mechanism (CDM), under the Kyoto Protocol. The Swedish JI and CDM programme gives priority to projects based on renewable energy and energy efficiency measures.

Testing Ground Facility (TGF)

NEFCO, the Nordic Environment Finance Corporation, is a multilateral risk capital institution financing environmental projects in Central and Eastern Europe, increasingly with an emphasis on the Russian Federation and Ukraine. Its purpose is to facilitate the implementation of environmentally beneficial projects in the neighbouring region, with transboundary effects that also benefit the Nordic region. Today, NEFCO manages funds in an aggregate of approximately €300 million. NEFCO is located in Helsinki, in conjunction with the Nordic Investment Bank (NIB).

The Baltic Sea Region Testing Ground Facility (TGF) was established at the end of December 2003, to provide financial assistance to concrete projects by purchasing emission reduction credits. The TGF was initially set up by the governments of Denmark, Finland, Germany, Iceland, Norway and Sweden. The TGF is now a Public Private Partnership which acts as a compliance vehicle for its investors' Kyoto and EU Emissions Trading Scheme commitments. From June 2006, it includes the following Nordic and German companies from the energy sector as well as energy intensive industrial consumers: DONG Naturgas A/S (Denmark), Fortum Power and Heat Oy (Finland), Gasum Oy (Finland), Keravan Energia Oy (Finland), Kymppivoima Tuotanto Oy (Finland), Outokumpu Oyj (Finland), Vapo Oy (Finland), Vattenfall Europe Berlin AG & Co. KG (Germany) and Vattenfall Europe Generation AG & Co. KG (Germany). The TGF is currently capitalised at €35 million.

NEFCO is the Fund Manager of the TGF, and has been authorised by the governments investing in the TGF to participate on their behalf in actions leading to the generation, transfer and acquisition of ERUs under Article 6 of the Kyoto Protocol.

WSP Environmental Oy

The PDD and Monitoring Plan were prepared by a Finnish company WSP Environmental Oy, represented by Hans Vadbäck.

A.4. Technical description of the project:

A.4.1. Location of the project:

The wind farm “Viru-Nigula” will be located at the north coast of Estonia, some 125 km east of Tallinn.

A.4.1.1. Host Party(ies):

Estonia

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

Lääne Virumaa County

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

Viru-Nigula

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

The proposed JI-project is located at the north coast of Estonia, some 90 km east of Tallinn, at the municipality of Viru-Nigula. The distance to the sea border is about 7 km and the height above sea level is about 60 m. The location is suitable for wind power due to its verified good wind conditions, presence of an electrical grid and absence of enviromental or other constraints.

The wind power plant is located about 3,5 km from Viru-Nigula city to the east and total wind farm area is approx.. 270 ha. The distance to the sea border is about 6 km and the height above sea level is about 60 m. A detailed geological study has proved existence of good soil conditions for the establishment of foundations, access roads and other necessary infrastructure. Neither ecological nor archeologically restrictions are known based on discussions with the local authorities. The site has good access from the national road Nr. 1 (Tallinn – Narva). Possible noise and shadow problems have been avoided with an appropriate micrositing of the Wind Turbine Generators (WTGs).

Figure 1. Location of the Viru-Nigula Wind Farm

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

The project includes establishment of a wind power plant in the municipality of Viru-Nigula in the county of Lääne-Virumaa in Estonia.

The project consists of 8 wind turbines with a total production capacity of 24,0 MW. The wind turbines are new WinWinD, WWD-3 (type NH90-RD100) of 3,0 MW, supplied by the Finnish manufacturer Winwind Oy. The WWD-3 has a single stage planetary gear directly connected to a permanent magnet synchronous generator and is therewith one of the most effective and innovative turbines on the market. The wind turbines have a 90 m hub height steel tower and a 100 m rotor diameter. For further information on the supplier, visit www.winwind.fi.

The chosen wind turbine is well suited for the site's wind conditions as they enable to maximise the green electricity output from the site.

From the 1st June 2003 till the 31st Oktober 2004 the wind speed was measured by an international attested German wind expert company Enveco-Steinfurt GmbH&Co KG. The measurements was performed directly on site at three heights (30 m, 55 m, 70 m). Moreover, data from the Estonian Meteorological Institute from the five last years are available for comparison. The wind expertise has been prepared and indicates an average of 6,7 m/s at hub hight can be expected. In order to determine the best possible location for the wind turbines within the site, the internationally used computer program WindPRO has been used to optimise the location, taking determinants such as wind speed distribution, wind turbine characteristics, terrain characteristics as well as noise and shadow limits into consideration.

An energy production estimate has been completed based on long-term wind measurements at site and detailed modelling using computer software WindPRO. Wind conditions of the site can be compared with the wind conditions of good wind sites in other European countries. Based on the measured wind data and an independent professional wind analysis, the net annual energy production of the project is estimated at 60 570 MWh. This energy yield calculation, considering the results of the independent wind analysis made by the authorized company Enveco-Steinfurt GmbH&Co is considered to contain sufficient information in order for the principals to make their final investment decision.

According to Tartu University's specialists calculations, the estimated long term production with a 97 m rotor would be 65 650 MWh annually. In order to be conservative we have used the lower production estimation of 60 570 MWh / year as the base for CO_2 saving calculations.

The wind farm has been connected to the 110 kV national grid of Estonian Energy through an own power station. According to law Eesti Energia is obliged to provide grid interconnection if adequate capacity exists on the grid. The company has also adopted a company standard: Technical Requirements for Connecting Wind Turbine Installations to the Power Network.

Rights to grid interconnection and sales of electricity are secured in accordance with legislation and by conclusion of the following agreements with Eesti Energia: Grid Connection Agreement and Power Purchase Agreement. Please see Annex 4 for a foreseen single line diagram for grid connection. Possible impacts of the WTGs on the national grid and on the substation have been evaluated as part of the grid connection application to the utility.

All necessary permissions and agreements for construction, connection and operation have been signed by the end of August 2005. Construction of the wind farm started in October 2005. The erection of wind turbines 1-4 was finished in the October 2006 and erection of wind turbines 5-8 is planned to be finished i February 2007. The grid connection was finished and available 18th December 2006. Trial drive of WTGs 1-4 started the 22nd February 2007 and the trial drive of WTGs 5-8 started at March 2007. The full operation started during April 2007.

Technical operation and maintenance of the wind farm during at least first 5 years will be taken care of by WinWind. WinWind will also provide a 97% availability guarantee. The expected technical lifetime of the wind turbines is 20 years.

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 project will generate electricity from a renewable source and will reduce anthropogenic GHG emissions by displacing electricity generated by combustion fossil fuels. With the proposed Wind Farm emission of GHG (CO_2eq) will be avoided because the electricity otherwise will have to be produced by power stations using fossil fuels which are mainly used in the Estonian power sector (please see description in Annex 2).

The wind power project has been under development for several years. The project supports Estonia's goals under the Long Term Development Plan for Estonian Fuel and Energy Sector for the promotion of the renewable energy sector. In line with the EU RES directive Estonia's goal is to reach a 5,1% share of renewable electricity in final electricity consumption (RES-E) by year 2010. Furthermore, Estonia's goal under the National Electricity Sector Development Plan 2005-15 is to reach a 8% share of RES-E by year 2015.

This is assisted by the Electricity Market Act, adopted in early 2003, which sets out the framework for further harmonisation with EU market such as ongoing liberalisation and wider use of renewables incl. an obligatory purchase of electricity generated from renewable sources.

The wind energy sector in Estonia is yet small but showing signs of growth. However, large financing barriers exist, and therefore only a few modern wind farms financed under the Joint Implementation schemes with the JI/CDM programme have been constructed. The principal barrier is the low rate of return due to the low feed-in tariff. The tariff was fixed at level of EEK 0,81 or ca. € 0,052 / kWh until May 2007. New regulations in the Electricity Market Act starting from 1st May 2007 will change the feed-in tariff valid for RES-E production from facility with capacity less than 100 MW. The new regulations are as following:

1. option:
- The right to sell to Eesti Energia with feed-in tariff 7,35 €cnt/kWh;
- Available for 12 years from the start of operations
- For windpower available until within the calendar year the total production from wind power exceeds 200 GWh

2. option:
- To sell electricity to the market with market price (currently up to 2,6 €cnt/kWh) and to get a premium of 5,4 €cnt/kWh) from the TSO
- Available for 12 years from the start of operations
- For windpower available until within the calendar year the total production from wind power exceeds 400 GWh

A recent report of the European Commission concludes that the supported price level for onshore wind power is clearly insufficient and below marginal abatement costs [1].

Greenhouse gases are reduced through the displacement of CO_2 emissions from the carbon intensive Estonian electricity grid by carbon free renewable energy. See Section B1 for further information.

The project faces prohibitive financial barriers, namely a low financial rate of rate of return. Without the inclusion of carbon credits, the project would have not have proceeded. See Section B.2 for further information.

The development of the Viru Nigula project as a JI project started already since 2004. Assuming only CO_2 emissions and the annual production of the Viru-Nigula Wind Farm of 60 570 MWh, the baseline emissions in the absence of the Project would amount to 66 025 tCO_2 annually. As the project will be fully operational already before the start of the Kyoto crediting period (2008-2012), the total avoidance over this 5-yeas period will amount to 330 127 tCO_2. Additionally early emission reductions will be generated in 2007 and will amount to 49 661 tCO_2. Hence, as the baseline emissions are higher than the Project emissions (which are zero), the Project is additional and reduces anthropogenic emissions of GHG below the levels that would have occurred in the absence of the registered Project activity.

A.4.3.1. Estimated amount of emission reductions over the crediting period:	
Length of the crediting period	Years 5 years 11 months when including the early credits 5 years when considering only ERU issuance
Year	Estimate of annual emission reductions in
	tonnes of CO2 equivalent
*Year 2007**	*49 661**
Year 2008	66 025
Year 2009	66 025
Year 2010	66 025
Year 2011	66 025
Year 2012	66 025
Total estimated emission reductions in 2007-2012 (tonnes of CO2 equivalent)	**379 789**
Total estimated emissions reductions in 2008-2012 (tones of CO2 equivalent)	**330 127**
Annual average of estimated emission reductions over 2007-2012 (tonnes of CO2 equivalent)	**63 298**
Annual average of estimated emission reductions during the first Commitment Period of the Kyoto Protocol 2008-2012 (tones of CO2 equivalent)	**66 025**

* Early emission reductions will be generated in the year 2007 in the quantity of 49 661 [tCO2].

1. *Commission of the EC. P. 28, Communication from the Commission. The support of electricity from renewable energy sources. Brussels 7.12.2005*

A.5. Project approval by the Parties involved:

Written approvals by the Parties involved, the Republic of Estonia and the Kingdom of Sweden will be attached to the final PDD, including the necessary authorisations of the legal entity project participants.

The first determination report of the JI-project "Viru-Nigula Wind Farm" (Report No. 691 367 version 03) has been available since 10th January 2006.

SECTION B. Baseline

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

Approved CDM methodology ACM0002 / version 6 (19 May 2006) has been applied to the project which is a consolidated baseline methodology for grid-connected electricity generation from renewable sources.

Justification of the choice of the methodology and why it is applicable to the project activity :

The relevant applicability conditions of ACM0002 are as follows:

- "Applies to electricity capacity additions from…Wind sources…"
- "This methodology is not applicable to project activities that involve switching from fossil fuels to renewable energy at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site;"
- "The geographic and system boundaries for the relevant electricity grid can be clearly identified and information on the characteristics of the grid is available."

All of these conditions are met in the case of the Viru-Nigula Wind Power Development.

Description of how the methodology is applied in the context of the project activity :

The consolidated baseline methodology for grid-connected electricity generation from renewable sources describes step by step how to apply the methodology to the project. This section described how the emissions factor (EFy) of the Viru-Nigula wind power project has been determined based on the instructions on how to calculate the emissions factors of the operating margin and build margin.

Step 1. Calculate the operating margin emissions factor

The consolidated methodology ACM0002 provides four options for calculating the operating margin, and guidance for how to choose which options to use for a given project. For this proposed project activity, option (a) (Simple operating margin) has been chosen. The methodology relies on dispatch data analysis as its preferred option; this, however, is not possible due to a lack of hourly dispatch data available to the project developers, and high cost and time requirements of analysing the data if it was possible to procure it from the relevant authorities. The simple operating margin can be used for the proposed project activity because low-cost/must-run resources constitute less than 50% of total

generation. The simple operating margin emissions factor has been calculated using a 3 year vintage period, 2003-2005.
The simple operating margin emissions factor is the generation-weighted average emissions factor that excludes plants that must be run or have very low or no running costs (“low-cost/must-run” plants). In other words, it excludes base-load plants or plants with no operating costs whose operation would not likely be displaced by a new power project. In most cases, this is renewable energy production, which typically has no or minimal operating costs.

For combined heat and power plants, where the data is available, only the fossil fuel used for electricity production, as opposed to heat production, should be used to calculate the emissions factor. This data was provided directly from the utility, Eesti Energia, based on the heat and power characteristics of each CHP plant.

The operating margin emissions factor for the grid would then be given by:

$$EF_{OM,simple,y} = \frac{\sum F_{i,j,y} \times COEF_{i,j}}{\sum GEN_{j,y}}$$

Where:

$F_{i,j,y}$	=	quantity of fuel *i* (tonne) used in plant *j* (tonne/yr) in year *y* for power production (as opposed to fuel used for heat generation)
$COEF_{i,j}$	=	carbon emissions factor for fuel i in plant j (tCO2/t fuel), taking into account the carbon content of the fuels by power sources and the percent oxidation of the fuel
$GEN_{j,y}$	=	total annual generation from plant *j* (MWh/yr) in year *y*

The CO_2 emissions coefficient $COEF_{i,j}$ is obtained as

$$COEF_{i,j} = NCV_i \times EF_{CO2,i} \times OXID_i$$

Where:

NCV_i	=	net calorific value (energy content) per tonne of fuel *i* (GJ/t)
$EF_{CO2,i}$	=	CO2 emissions factor per unit of energy of fuel *i* (tCO2/TJ)
$OXID_i$	=	oxidation factor for the fuel *i (%)*

For the Estonian power system, the three year vintage operating margin was calculated using operational data from all 19 Estonia’s oil shale, natural gas and other fossil fuels consumption power plants from the years 2003-2005. All plant data and parameters used for the calculation are summarized and presented in below table, (Table 1). The below table provides an overview of the aggregate generation and fuel consumption data for these plants.

Table 1. *Estonia'a Power Plants' Aggregate Data for Combined Margin*

	Capacity	Generation			Fuel consumption for electricity production		
	(MW)	*Net output (GWh)*			*(TJ)*		
	2006	**2003**	**2004**	**2005**	**2003**	**2004**	**2005**
Total fossil fuel based plants	2 699,2	9 076,4	9 193,6	9 025,8	101 866	101 283	97 682
Total RES plants	54,0	25,0	38,0	88,0	0	0	0
Imports		93,0	347,0	345,0			
Total net output	**2 753,2**	**9 101**	**9 232**	**9 114**	**101 866**	**101 283**	**97 682**
Gross output from plants		**10 159**	**10 304**	**10 205**			
Exports		1989	2141	1953			
Total domestic consumption (incl. PP self consumption)		**8077**	**7816**	**7907**			

Step 2. Calculation of the build margin

ACM0002 allows project participants to choose between two options for calculating the Build Margin. For the proposed project activity, option 1 has been chosen (calculate build margin emissions factor ex ante based on the most recent information available on plants already built).

The sample group of *m* power plants should be for the 5 most recent plants or the most recent 20%, whichever is larger. Because construction dates for the small CHP plants, which make up only 2% of net generation, was not available, these were not included in the build margin. The larger power stations are actually composed of separate units, which were built over a period of time (see Annex 2).

If we used all five of these stations (e.g. Balti, Eesti, Iru, Ahtme, and Kohtla-Jarve), the build margin would include plants built in 1955, which is hardly representative of "recent" technology. Even if we use the most recently built 20% of generation, this would include the Iru power station, built in 1982, and the Eesti power station, which was built in 1973.

Following the decision made with regard to ACM0002 at the EB23 meeting **("**The Board agreed to - *Clarify that even if a part of the plant capacity enables meeting the requirement of 20% (of the generation capacity in the systems) for estimating the build margin emission factor, the total plant capacity should be considered in estimating the build margin emission factor...)* and taken the fact that Iru PP power generation depends on heat demand and as no detailed data is available on either output or fuel consumption for different power generation units of Eesti power plant, all output of the Eesti power plant has been included in the build margin calculation.

The build margin is calculated for the group of *m* plants as:

$$EF_{BM,y} = \frac{\sum F_{i,m,y} \times COEF_{i,m}}{\sum GEN_{m,y}}$$

Where,

$F_{i,m,y}$ = quantity of fuel *i* used in plant *m* (kt/yr) in year *y*

$COEF_{i,m}$ = carbon emissions factor for fuel *i* in plant *m* (tCO_2/kt), taking into account the carbon content of the fuels by power sources and the percent oxidation of the fuel

GEN_m = annual generation from plant *j* (MWh/yr) in year *y*

The calculation of COEF is the same as for the Operating Margin.

Step 3. Calculation of the baseline emissions factor

The baseline emissions factor is the weighted average of the Operating Margin emissions factor ($EF_{OM,y}$)and the Build Margin emissions factor ($EF_{BM,y}$).

$$EF_y = w_{OM} \times EF_{OM,y} + w_{BM} \times EF_{BM,y}$$

Where,

$EF_{OM,y}$ = Operating margin for year *y*

$EF_{BM,y}$ = Build margin for year *y*

w_{BM} = Weighting for build margin

w_{OM} = Weighting for operating margin

The default weightings are 50% in ACM0002, as for wind farms allowed, weighting 75% OM and 25% BM has been used in for this project.

The average Operating Margin (2003-2005) was calculated to be 1,081 tCO2/MWh and average Build Margin (2005) was calculated to be 1,12 tCO2/MWh. Applying default weights of the methodology of 0,75 (Operating Margin) and 0,25 (Build Margin) the Combined Margin was calculated to be **1,09 tCO2/MWh**.

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:

Additionality of the project is shown using the CDM Tool for the Demonstration and Assessment of Additionality as approved by the CDM Executive Board, and as used in ACM0002.

The following steps from the "Tool for the demonstration and assessment of additionality" are completed below:

Step 0 – Preliminary screening based on starting date of the project activity
Step 1 - Identification of alternatives to the project activity consistent with current laws and regulations
Step 2 - Investment Analysis
Step 3 - Barrier Analysis
Step 4 - Common Practice Analysis
Step 5 - Impact of JI

STEP 0 – Preliminary screening based on the starting date of the project activity
The Project will start operation in February 2007. The Project fulfils the Estonian environmental and power generation sector development polices and is supported by local authorities an accepted by stakeholders. The revenues from early emission reductions (from 1st February 2007) and ERUs (from 1st January 2008) have been considered, and they are an integral part of the financial package of the Project and indispensable source of revenue for the Project to make it economically viable.

STEP 1 – Identification of alternatives to the project activity consistent with current laws and regulations
Additionality of the proposed project is further supported by recent determinations of wind power JI projects in Estonia, namely the Esivere/VirtsuII Wind Power JI Project and Vanaküla Wind Power JI Project.

The wind energy sector in Estonia is yet small (currently ca. 35 MW installed) but showing signs of growth. However, large financing barriers exist, and therefore only a few modern wind farms financed under the Joint Implementation schemes with the Finnish and Austrian JI/CDM programme have been constructed. The principal barrier is the low rate of return due to the low feed-in tariff. The tariff is fixed at level of EEK 0,81 or ca. € 0,052 / kWh, (see section A.4.3). Further to this there exists a risk for further deterioration of the investment climate due to proposed amendments to the Estonian Electricity Market Act that would establish an annual quantitative market limitation to the wind power purchase obligation. Given investor requirements and the risks associated with this project, a higher tariff would be required to make the project financially viable if it were not an approved JI project. This tariff is substantially higher than the feed-in tariff available during the first 12 years of operation, and the gap is even greater compared to potential prices post the 12 year period after which wind power would have to compete at the free market. Also a recent report of the European Commission concludes that the supported price level for onshore wind power is clearly insufficient and below marginal abatement costs.

The financial modelling and sensitivity analysis show that the financial income from sale of emission reduction units during 2007-2012 improves the project IRR by over 1 percentage points and makes the project thus more attractive for the investors to undertake. Furthermore, it is important to point out that following a rapid reorganisation of the Estonian economy, opportunities for short-term profitable business are diminishing in Estonia. Therefore, local and foreign investors are increasingly interested in projects offering lower but at the same time stable income in the longer term, a.o. wind power projects.

a) Baseline scenario

In the current situation, over 93% of electricity is produced in thermal power plants at Narva using pulverised oil shale combustion technology. This is highly polluting energy generation due to high sulphurdioxide (10-20 g/kWh), CO2 (1350 –1400 g /kWh) and a large amount of fly ash (12-20 g/kWh).

Narva power plants in Eastern part of Estonia were constructed 1960's to supply electricity to Northeast region in the Soviet Union and heat for Narva town. The fuel oil shale comes from the mines in the Narva region. It is quite difficult fuel with ash content sometimes even more than 50 %, chlorine more than 0,2 % and heating value of 8,2 MJ/kg.

The Eesti Power Plant is the world's largest oil shale fired thermal power station. The plant is located 25 km South-West of Narva, close to the border with Russia. Before repowering in the 21st century the plant consisted of eight power-generating blocks of about 200 MWe each (Blocks 1 to 8), total 1610 MWe and 84 MWth commissioned between 1969 and 1973. Each of the power blocks consists of one condensing steam turbine with reheating steam type K200 – 130 manufactured by LMZ of St. Petersburg and two pulverized-fired boilers (Models TP-101) manufactured by Taganrog of Russia. The current flue gas cleaning system for each boiler consists of hot cyclones and an electrostatic precipitators. The flue gases from the plant are discharged to the atmosphere through two 250-meter stacks. Eesti Block 8 was commissioned in 1973.

The Balti Power Plant located 5 km outside Narva city. It consists of an older and newer part. The older part of Balti power station, built between 1959 and 1963, consisted of originally eight 100 MWe steam turbines. Steam wa supplied to the turbines from eighteen pulverised fuel fired boilers with a capacity of 53 kg/s each, feeding to a common header. The newer part of the power plant, built between 1963 and 1966, consists of four blocks (Blocks 9, 10, 11, and 12) each with two pulverised fuel fired boilers manufactured by Taganrog with a total capacity of 78 kg/s.
The flue gas from the four newer blocks is discharged to the atmosphere in two 180 m stacks. Oil shale is received via rail and stored onsite.

Based on the description of the Estonia power sector in Section B and text above, particularly the fact that Estonia has sufficient power generation capacity, this section describes the alternatives considered, and whether they are realistic and credible.

<u>*Scenario 1:*</u> *Continuation of current production and operation of Balti and Eesti power plants:* This scenario continues full operation of units at Balti and Eesti power plants as they ran without an upgrade of units or closing down any units.

This scenario is not credible because it would not comply with pending EU environmental regulations and the Estonian government's goal of reducing SO_2 emissions, and because the upgrade of the Eesti power plant is complete and that of Balti is underway.

<u>*Scenario 2:*</u> *Upgrade and partial closure of Narva power plants***:** This scenario includes the refurbishment of the 200MW units at Eesti and Balti power stations from pulverized bed to circulating fluidized bed combustion (CFBC) technology and the closing down of units 1-8 at Balti power station, i.e. this scenario corresponds to a development that has actually happened. At the Balti power station, the renovated units 11 and 12 are used for normal operation, while units 9 and 10 are used for standby.

In year 2000, Narva Power Plants decided to re-power two 200 MW power plant blocks, Eesti Block 8 and Balti Block 11 by constructing new boilers and balance of plant systems, rehabilitating existing turbines and using old cooling water connections, common fuel feeding and ash deposit systems.

The new Circulating Fluidized Bed (CFB) boilers, commissioned in 2004 and 2005 in Eesti and Balti Power Plants have better environmental performance. In Estonia, power is generated primarily in the oil shale-fired condensing power plants.

Refurbishment of block 11 at Balti has been completed in the end of 2004. The 200 MWe block with a pulverized combustion boiler was replaced with a new circulating fluidised bed (CFB) boiler with 215 MW capacity while the turbine, control panel and electrostatic precipitators were also upgraded. After commissioning the CFB block in the Balti power station, the 8 TP-17-type boilers (blocks 1-8) were removed and not replaced, (see Figure 1.).
For the Eesti power station, block 8 was renovated to CFB technology by the spring 2005, resulting in capacity of 215MW for that unit instead of old 200MW. Eesti Power Plant consists of 8 power generating blocks, block 1 - 8. Blocks 1 - 7 are old power generating units commissioned between 1969 and 1973. Each of the old blocks consists of two pulverized fuel boilers manufactured by Taganrog, model TP-101. The new block 8, consists of 2 circulating fluidized bed boilers manufactured by Foster Wheeler.

The ongoing refurbishment follows the plan stated in the Position Paper "Acceptance of Acquis 2001, Chapter 22, Environment" as part of Estonia's accession to the EU. These upgrades are also contained in the National Fuel and Energy Development Plan, and have already commenced construction, and allow the plants to meet necessary environmental targets.

<u>*Scenario 3:*</u> *Closure of Balti power plant and replace with wind power project that is not a JI project*. This scenario would include the shutdown of all units at the Balti power station, and the replacement of this capacity with a wind power project similar to the proposed project activity, but without the benefits of JI for the project.

Estonia's "Long-term National Development Plan for Fuel and Energy Sector to the year 2015" (including the vision to 2030) has as one of its main priorities to expand the use of renewables for the production of electricity. Balti power station, however, currently provide heat supply to the district heating network of the city of Narva, as well as some industrial enterprises. Closing the station would mean breaking a long term agreement with the Municipality and would require additional sources of heat to be supplied. More importantly, even with a feed-in tariff of EEK 0,81/kWh, the cost of wind power generation is much higher than for oil shale fired power. This scenario is therefore not credible.

<u>*Scenario 4:*</u> *Close part of Balti power plant and replace with gas fired power:* This scenario would include the shutdown of Balti units 1-8 as scheduled and the replacement of this power generation with a new gas fired power station or a retrofit of the Balti plant for gas fired turbines.

Currently, around 7% of power generation in Estonia is from natural gas. The main challenge with natural gas is uncertainty towards its long-term price, because it is a fuel imported from one source (i.e. Russia), and is much more expensive than oil shale. Converting part of the Balti power station to gas would also require significant capital expenditure. Given the large oil shale resources, the government forecasts that this will continue to be the main fuel used in power production, and political risk with importing gas from Russia, this scenario is not considered credible.

<u>The baseline analysis above shows that the only credible future scenario is Scenario 2.</u>
(Upgrade and partial closure of Narva power plants), as it is the only one able to meet environmental targets set out in local and EU accession legislation, is economically viable, and reflects current renovation projects underway.

b) Project scenario
The project scenario foresees an establishment of a 24,0 MW wind power plant at Viru-Nigula, municipality. The renewable electricity produced by the wind power plant will displace carbon intensive electricity produced from fossil fuel sources in the Estonian grid.

c) Emission reductions in the project scenario
Emission reductions will occur due to the simple fact that the Baseline scenario represents a higher emission factor than the Project scenario. Please see the Baseline Study in Annex 2 for a more detailed analysis.

Step 2. Investment analysis
Determine whether the proposed project activity is economically or financially less attractive than other alternatives without the revenue from the sale of ERUs.

Sub-step 2a. Determine appropriate analysis method
Because the alternative sources of power supply are different scales, and have different lifetimes, the appropriate analysis method is Option II (Apply investment comparison analysis), as specified in ACM0002.

In order to determine whether the proposed project is economically or financially less attractive than the other alternatives without the revenue from the sale of ERUs, Option III "Apply benchmark analysis" is completed below.

Sub-step 2b – Option III. Apply benchmark analysis
A suitable financial indicator IRR (Internal Rate of Return) has been identified to demonstrate the investment barriers faced by the project. The IRR of the project has been compared with the Weighted Average Cost of Capital (WACC) established by the Estonian Competition Authority.

Sub-step 2c. Calculation and comparison of financial indicators (only applicable to options II and III)
A summary of costs and the results of the financial analysis undertaken are included in table below. Only results for the first total crediting period (2007-2012) are shown in this PDD, however the IRR shown is calculated over the whole 20-year period.

All the data have been provided by Intercon-Energy OÜ (Mr. Michael Hegner, 2005 and 2007) and the results for the identified scenarios are presented in a confidential Annex 6.

Adapted amendments on Electricity Market Act, on the 16th of February 2007 the Estonian Parliament adopted several amendments on Electricity Market Act. Among them the changes in feed-intariff and market cap are the most profound.

- Starting from 1st of May 2007 the wind energy tariff is 115 Estonian cents per kWh (7,35 Euro cents per kWh).
- However, the new act introduce the volume cap for predefined fixed feed-in tariff: the tariff of 115 Estonian cents is valid till market cap of 200 GWh annually (approximately 75MW of installed capacity) and after the named boundary the 2 tier system will be applied: market price of 35 - 45 Estonian cents per kWh (2,2 - 2,9 Euro cents) plus subsidy of 84 Estonian cents per kWh (5,37 Euro cents per kWh).
- The second scheme system will be terminated when 400 GWh wind electricity is annually produced (approximately 150 MW of installed capacity) and then only market price will be valid (subsidy is phased out).

- First and second scheme system starts again from beginning of each year till caps are met.
- Named limitation starts 1st of January 2009.
- The new amendment in the Electricity Market Act gives an opportunity for trading with Green Certificates, but on expense of the subsidy - trader must give up the subsidy in return for the on behalf of GC. Currently the market price plus subsidy give a larger sum than market price plus Green Certificates. Therefore the system is not operational in practice (GC system is not solidly in place).
- Besides, the operators of wind parks have to provide ahead forecasts for their production. The balancing requirements will be applied for wind parks that are erected before 31st of December 2007 after 1st of January 2009. For the wind parks that are installed after 31st of December 2007 the balancing requirements shall be applied instantly.

1) Project IRR

The changes in Electricity Market Act (16th of February 2007) led to a "new" support structure as described above starting from the 1st May 2007. The new changes in feed-in tariff and market cap are the most profound and there for both the "old" and the "new" support structures IRR calculations and sensitivity analysis will be presented separately below , (Table 2-4).

The table below represents the main data used in the IRR calculation for the project. The calculation was conducted in a conservative manner and all assumptions are listed below in order to maintain a transparent approach.

Table 2. *Summary of cost and revenue assumptions*

Financial details	***"Old" support structure***	***"New" support structure***
Costs of equipment and plant	*25 639 997 €*	*25 639 997 €*
Electricity tariff	*0,05192 €/kWh*	*0,05265* €/kWh*
Project lifetime	*20 year*	*20 year*
Q&M costs	*15 000 €/MW*	*15 000 €/MW*
Project IRR	*8,52*	*9,81*

** average 2007-2027 (see appendix 6).*

Table 3. *Internal Rate of Return of the Project over 20-year lifetime*

Internal Rate of Return of the Project over 20-year lifetime	***CO2 emission trading includes.***	***CO2 emission trading exclude.***
*IRR **"old"** support structure*	*8,52 %*	*6,23 %*
*IRR **"new"** support structure*	*9,81 %*	*6,75 %*

Using the assumptions shown above the IRR of the project without carbon dioxide finance is calculated as 6,23 % for the "old" support structure and 6,75 % for the "new" support structure. Low IRR indicates that the project is not financially attractive without CO_2-sales.

The expected IRR of the JI project can be compared to the weighted average cost of capital (WACC) established by the Estonian Competition Authority when approving the price calculation methodology for Estonian energy sector companies. The WACC today stands at around 8,7% (also for state power utility Eesti Energia) and is a relevant benchmark to compare the profitability of the wind power JI projects. According to the Competition Authority the WACC is likely to increase in 2009 due to the changes in financial environment. The IRR of Viru-Nigula Wind Power JI project together and without the revenue from sale of carbon credits is below this indicated benchmark and thus it would be more attractive for the investors to undertake investments in other energy sectors when compared to wind power.

It is clearly evident that the project returns are below the WACC benchmark and thus additional support through revenue from sale of carbon credits is required for the project.

Contact information of Michael Henger, Intercon-Energy OÜ, who prepared the financial analysis:
Michael Hegner
Hafendamm 38a
D-24937 Flensberg
Ph:+49 461 1689797
Fax: +49 461 1689807
Email: m.hegner@intercon-energy.com
Email2: michael hegner@t-online.de

Sub-step 2d. Sensitivity analysis
The following assumptions are established to examine whether the conclusion regarding the financial attractiveness of the project is robust:

Project IRR
The "new" support structure as described above starting from the 1st May 2007 and the "old" represent the support structure before 1st May 2007.

Table 4. *Sensitivity analysis including emission trade*

Factor	***Base scenario***	***± %***	***Project IRR "old"***	***Project IRR "new"***
Investment cost	*25 639 997*	*+ 5 %*	*6,75*	*5,82*
		- 5 %	*10,32*	*11,77*
Net Energy yield	*60 569 870 kWh*	*+ 10 %*	*13,10*	*15,22*
		- 10 %	*3,65*	*3,76*
Energy price "old"	*0,05192 €/kWh*	*+ 5 %*	*10,41*	*-*
		- 5 %	*6,69*	*-*
Energy price "new"	*0,05265 €/kWh**	*+ 5 %*	*-*	*12,43*
		- 5 %	*-*	*7,02*
O&M cost	*15 000 €/MW*	*+ 10 %*	*7,84*	*9,03*
		- 10 %	*9,17*	*10,55*
Availability	*97 %*	*+ 3 %*	*10,00*	*11,53*
		- 3 %	*7,10*	*8,01*
IRR			***8,52 %***	***9,81 %***

** average 2007-2027, (see appendix 6).*

Explanation: *In the column "Base scenario" all values are listed which are subject to the variation. If the value is changed with ± X % then the IRR changes to the value is given in the cell on the right.*

The sensitivity analysis confirms the fact that the project is not enough financially attractive without successful implementation of CO2 sale. IRR without emission trading will be only 6,23 % based on the "old" support structure and for the "new" support structure (starting 1st May 2007) the IRR without emission trading will be 6,75 %..

Step 3. Barrier analysis

Sub-step 3a. Identify barriers that would prevent the implementation of type of the proposed project activity:
One of the key barriers listed in the tool for additionality assessment is, "investment barriers…Debt funding is not available for this type of innovative project activities."

This is the case with this wind project in Estonia, as neither debt funding not other grant funding would be available if the project did not have JI status. JI revenue has been considered since the early stages of development of this project and is an integral part of financing the project.

Sub-step 3b. Show that the identified barriers would not prevent the implementation of at least one of the alternatives (except the proposed project activity):
Fossil fuel based power does not face the same limitations on availability of finance. More importantly, Scenario 2 does not require external funding, but can be financed internally by Eesti Energia.

Step 4. Common practice analysis

Sub-step 4a. Analyze other activities similar to the proposed project activity:
As identified in Section B, all of the existing modern wind farms and planned wind farms in Estonia have only been implemented with either JI support or some other form of donor grants. The only exceptions are very small and/or demonstration plants. The JI projects would be excluded from the common practice analysis.

Sub-step 4b. Discuss any similar options that are occurring:
The only remaining wind farms that are not JI projects had either other donor grant support (e.g. Swedish technology grant, which is not yet implemented, and German government support) or are demonstration and research facilities (e.g. Ruhnu island) rather than commercial businesses (see The profit and liquidity analysis, confidential Annex).

Step 5. Impact of approval under JI

"Explain how the [approval of the JI project activity]…, and the attendant benefits and incentives derived from the project activity, will alleviate the economic and financial hurdles (Step 2) or other identified barriers (Step 3) and thus enable the project activity to be undertaken."

As explained in Step 2, the fixed price offered for wind power is not high enough to make the project activity financial viable. If the project developer is able to sell the emissions reduction credits from the project activity, the additional revenue from these sales would improve the financial viability and make the project more attractive compared to other scenarios.

In addition, the example of other JI wind projects in Estonia show that, with JI status, this project will be able to attract equity and debt financing, and overcome the barrier described in step 3.

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

The project boundary is drawn simply around the physical boundary of the wind power plant (i.e. the wind turbines and generators). The project activity will reduce the equivalent electricity production on the grid.

For **emissions sources**, only CO_2 emissions from electricity generation in fossil fuel fired power that is displaced due to the project activity.

The **spatial extent** of the project boundary includes the project site and all power plants connected physically to the electricity system that the project power plant is connected to. The **project electricity system** is the Estonian National Grid, because the power plants on that system can be dispatched without significant transmission constraints. The plants and their characteristics are presented in Annex 2. In addition, the electricity system in neighbouring Russia and Latvia are considered **connected electricity systems**. Imports from connected electricity systems in other countries are taken as having an emissions factor of 0 (zero), as per ACM0002 requirements.

No GHG emissions will result from the project. The wind farm project does not have any net GHG emission sources or sinks. The power generated by the 24 MW wind farm has been added to the existing system, shown in Figure 2.

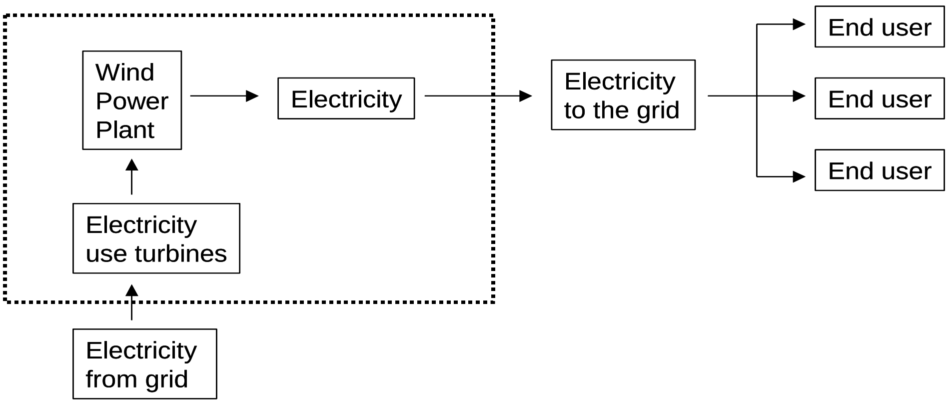

***Figure 2**. Flow chart of the wind farm project, dashed line indicates project boundary*

Emissions related to transportation and construction of the wind farm is not taken into account in the GHG emission calculations. These emissions are small and it is not possible to neither control nor measure them. Electrical losses and electricity are included in the GHG emission calculations.

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

Estonian JI Project Development Baseline Study,
7 November 2006
Conducted by:
Valdur Lahtvee and Dr. Tiit Kallaste,
Stockholm Environment Institute Tallinn Centre
P.O.Box 160
10502 Tallinn, Estonia

Several other baseline studies have been undertaken due to the development of other wind power JI projects in Estonia. Also these studies have been used for this PDD and namely the baseline study for the Vanaküla Wind Power Project which has received successful determination report by TÜV SÜD Group.

Stockholm Environment Institute Tallinn Centre is not considered a project participant.

SECTION C. Duration of the project / crediting period

C.1. Starting date of the project:

The wind farm construction started 27th October 2005. The grid connection was finalized 18th December 2006 and the trial drive started 22nd January 2007. The starting date of the wind farm is 1st February 2007.

Table 5. *Preliminary timetable for when wind turbines (1-8) are going to start the electricity production.*

Wind turbine	Planned start for electricity production to the grid
W1	February 2007
W2	February 2007
W3	March 2007
W4	March 2007
W5	March 2007
W6	April 2007
W7	April 2007
W8	April 2007

C.2. Expected operational lifetime of the project:

20 years, 0 months

C.3. Length of the crediting period:

Total crediting period:

- 5 years and 11 months (1st February 2007 – 31st December 2012) when including the early emission reduction credits. Early emission reduction credits are claimed for 2007 and ERUs are claimed for 2008-2012.
- 5 years when considering only ERU issuance (1st January 2008 – 31st December 2012).

Starting date:	For early emission reduction credits:	1st February 2007
	ERUs:	1st January 2008

SECTION D. Monitoring plan

D.1. Description of monitoring plan chosen:

The methodology chosen is the approved CDM methodology ACM0002 "Consolidated monitoring methodology for zero-emissions grid-connected electricity generation from renewable sources"

The applicability conditions for this methodology are:

1. Applies to electricity capacity additions from:

Run-of-river hydro power plants; hydro power projects with existing reservoirs where the volume of the reservoir is not increased;

- Wind sources;
- Geothermal sources;
- Solar sources;
- Wave and tidal sources.

2. This methodology is not applicable to project activities that involve switching from fossil fuels to renewable energy at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site;

3. The geographic and system boundaries for the relevant electricity grid can be clearly identified and information on the characteristics of the grid is available;" All of these applicability criteria are met by the proposed project activity.

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

Wind power does not produce any greenhouse gas emissions in operation, so project emissions are zero. 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 project emission reductions. Some CO2 will be released to the atmosphere while performing the maintenance (transportation, etc.) of the wind turbines, however the amounts will be minute. Hence, according to BASREC Regional Handbook these GHG sources can be considered as insignificant and should not be taken into consideration.

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

There are no project emissions.

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

Wind power does not produce any greenhouse gas emissions in operation, so project emissions are zero

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
1. EG_y	EG_y – Net electricity supplied to te grid	Project proponent	MWh	Directly measured with electricity meter, and checked with sales data	Constant recording during the total crediting period (1st February 2007 – 31st December 2012)	100% hourly measurement and monthly recording	Electronic and in paper form	Data will be aggregated monthly and yearly and double checked with receipt of sales, with the SCADA system as back-up.
2. EF_y	Emission factor	CO2 emission factor of the Estonian grid	tCO2 / MWh	c	Calculated once in the beginning of the project	100%	Electronic and in paper form	Calculated as a weighted sum of the OM (75%) and BM (25%) emission factors
3.$EF_{OM,y}$	Emission factor	CO2 Operating Margin emission factor of the Estonian grid	tCO2 / MWh	c	Calculated once in the beginning of the project	100%	Electronic and in paper form	Calculated as indicated in the relevant OM baseline method above
4. $EF_{BM,y}$	Emission factor	CO2 Build Margin emission factor of the grid	tCO2 / MWh	c	Calculated once in the beginning of the project	100%	Electronic and in paper form	Calculated as [Σi Fi,y*COEFi] / [Σm GENm,y] over recently built power plants defined in the baseline methodology

5. $F_{i,y}$	Fuel quantity	Amount of each fossil fuel consumed by each power source / plant	Mass or volume	m	Calculated once in the beginning of the project	100%	Electronic and in paper form	Obtained from the power producers, dispatch centres' or latest local statistics.
6. $COEF_i$	Emission factor coefficient	CO2 emission coefficient of each fuel type i	tCO2 / mass or volum e unit	m	Calculated once in the beginning of the project	100%	Electronic and in paper form	Plant or country-specific values to calculate COEF are preferred to IPCC default values.
7. GENj/k/n,,y	Electricity quantity	Electricity generation of each power source / plant j, k or n	MWh/ a	m	Calculated once in the beginning of the project	100%	Electronic and in paper form	Obtained from the power producers, dispatch centers or latest local statistics.
8a. $GEN_{j/k/ll,y}$ IMPORTS	Electricity quantity	Electricity imports to the project electricity system	kWh	c	Calculated once in the beginning of the project	100%	Electronic and in paper form	Obtained from the latest local statistics. If local statistics are not available, IEA statistics are used to determine imports.
Data with ID 2 – 12 from monitoring methodology ACM0002 "Consolidated monitoring methodology for zero-emissions grid-connected electricity generation from renewable sources" will be monitored during the Crediting Period.								

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 (BE) are given as,

$BE_y (tCO_2) = EG_y (MWh) \times EF_y (tCO_2/MWh)$

See baseline study and methodology for detail on how EF_y is calculated

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
1.	EG_y – Net electricity supplied to te grid	Project proponent	MWh	Directly measured with electricity meter, and checked with sales data	Constant recording	100% hourly measurement and monthly recording	Electronic and in paper form	Data will be aggregated monthly and yearly and double checked with receipt of sales, with the SCADA system as back-up.
2. EF_y	Emission factor	CO2 emission factor of the Estonian grid	tCO2 / MWh	c	yearly	100%	Electronic and in paper form	Calculated as a weighted sum of the OM (75%) and BM (25%) emission factors

3.$EF_{OM,y}$	Emission factor	CO2 Operating Margin emission factor of the Estonian grid	tCO2 / MWh	c	yearly	100%	Electronic and in paper form	Calculated as indicated in the relevant OM baseline method above
4. $EF_{BM,y}$	Emission factor	CO2 Build Margin emission factor of the grid	tCO2 / MWh	c	yearly	100%	Electronic and in paper form	Calculated as [Σi Fi,y*COEFi] / [Σm GENm,y] over recently built power plants defined in the baseline methodology
5. $F_{i,y}$	Fuel quantity	Amount of each fossil fuel consumed by each power source / plant	Mass or volume	m	yearly	100%	Electronic and in paper form	Obtained from the power producers, dispatch centers or latest local statistics.
6. $COEF_i$	Emission factor coefficient	CO2 emission coefficient of each fuel type i	tCO2 / mass or volum e unit	m	yearly	100%	Electronic and in paper form	Plant or country-specific values to calculate COEF are preferred to IPCC default values.
7. GENj/k/n,,y	Electricity quantity	Electricity generation of each power source / plant j, k or n	MWh/ a	m	yearly	100%	Electronic and in paper form	Obtained from the power producers, dispatch centers or latest local statistics.

8a. $GEN_{j/k/ll,y}$ IMPORTS	Electricity quantity	Electricity imports to the project electricity system	kWh	c	yearly	100%	Electronic and in paper form	Obtained from the latest local statistics. If local statistics are not available, IEA statistics are used to determine imports.
Data with ID 2 – 12 from monitoring methodology ACM0002 "Consolidated monitoring methodology for zero-emissions grid-connected electricity generation from renewable sources" will be monitored during the Crediting Period.								

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:

n/a – ACM0002 does not require measurement of leakage

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):

No leakage.

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):

Because there are no project emissions and no leakage, the emissions reductions are the same as the baseline emissions. Therefore Emissions Reductions (ER) are given as,

$ER_y (tCO_2) = EG_y (MWh) \times EF_y (tCO_2/MWh)$

See Section E.5.

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:

No monitoring of major ecological, socio-economic and development effects of the project is proposed.

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.
1. EG_y	The maximum allowed deviation of the meters is 0,5% (at 110 kV) and their verifications has to be carried out at minimum every eight years.	Data will be directly measured with metering equipment. This equipment will be calibrated and checked periodically for accuracy. In addition, all metered data will be double checked by receipts of electricity sales, with SCADA system as back-up.

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

The basic guidelines of the Monitoring Plan to be established in more detail at a later stage are as following:

The project proponent will measure the electricity output of the plant. All other data is collected at the beginning of the project, and presented in this PDD and baseline study. The following management and operational system is proposed for internal audits of GHG project compliance with operational requirements, for project performance and corrective actions.

In order to ensure a successful operation of the project and the credibility and verifiability of the ERs achieved, **OÜ Nelja Energia** recognises that the project must have a well defined management and operational system. The management and operation of the project is the responsibility of **OÜ Nelja Energia** i.e. ensuring the environmental credibility of the project through accurate and systematic monitoring of the project's implementation and operation for the purpose of achieving trustworthy ERs. Independent verifiers will audit the operator and his management systems to ensure credibility and transparency of the projects reported ERs and other performance indicators.

D.3.1 Data handling:

The establishment of a transparent system for the collection, computation and storage of data, including adequate record keeping and data monitoring systems.

D.3.2 Quality assurance:

OÜ Nelja Energia / Technical Manager – Andrus Zavadskis who will be in charge of and accountable for the generation of ERs including monitoring, record keeping, computation of ERs, audits and verification. He will officially sign-off on all GHG Emission worksheets.

Well-defined protocols and routine procedures as outlined in the MP.

Proper management processes and systems records must be kept by the operator as the auditors will request copies of such records to judge compliance with the required management systems. **OÜ Nelja Energia** recognises that auditors will accept only one set of official information, and any discrepancies between the official, signed records and on-site records will be questioned.

D.3.3 Reporting:

OÜ Nelja Energia will prepare reports as needed for audit and verification purposes. **OÜ Nelja Energia** will prepare an brief annual report which should include: information on overall project performance, emission reductions generated and verified and comparison with targets. The report will be combined with the periodic verification report. Reporting will be provided to the auditors and to the Estonian JI focal point.

D.3.4 Training:

It is **OÜ Nelja Energia's** responsibility to ensure that the required capacity and internal training is made available to its operational staff to enable them to undertake the tasks required by the MP. Initial staff training will be provided before the project starts operating and generating ERs.

D.3.5 Verification and commissioning:

The management and operational system and the capacity to implement this MP will be put in place before the project can start generating ERs.

D.3.6 Corrective Actions:

OÜ Nelja Energia will periodically undertake performance reviews as part of its ongoing operation and management

Where corrective actions are required by the Estonian authorities or the verifiers, these will be acted upon within a reasonable timescale as dictated by relevant authorities.

D.3.7 Monitoring data adjustment procedures

Data will be collected on daily and monthly basis and consolidated on a monthly basis where the data will be checked for quality control purposes against an independently measured value as indicated in 2.3 above. Should there be any discrepancies in the data the source of the variation will be identified, be it the main measured value or the quality control value. The incorrect value will be deleted and the measured data compared to historical and predicted values before being finally recorded.

D.3.8 Data and reports review procedures

Data will be reviewed by **Technical Manager – Andrus Zavadskis** and signed off by the **Managing Director – Martin Kruus** on a monthly basis again predicted and historical values. Should there be discrepancies in the data the procedure indicated in Point 8 above will be followed to adjust the data.

D.3.9 Internal GHG audit procedures

There are no requirements for internal audits of GHG project compliance with the plants operational requirements

D.3.10 Project performance review before verification

Data and project performance will be reviewed by the **Technical Manager – Andrus Zavadskis** on a monthly basis against predicted and historical values. The consolidated annual project emission reduction reports will be reviewed by auditors for compliance before being submitted for verification.

D.3.11 Procedures for improving quality of project monitoring

The main procedure for improving the accuracy of the monitoring is the quality control procedures described in sections 5.1.7-5.1.10 of the Monitoring Plan. The data collection and reporting formats are checked on a monthly basis for accuracy and the monitoring procedures will be adjusted as required for improved integration with plan operations and to minimise faulty measurement or meter reading errors.

Responsibilities :

Technical Manager Technical responsibility Commercial responsibility Responsibility for data acquisition Responsibility for calculation of emission reductions Responsibility for Monitoring supervision Responsibility for corrective actions	**Andrus Zavadskis** OÜ Nelja Energia Estonia pst 1/3 10143 Tallinn Estonia Reg. no: 11200305 Tel: +372 6409090 Fax: +372 6409093 Email: andrus@4energia.ee mailto:m.tarkiainen@intercon-energy.com
Managing Director	**Martin Kruus** OÜ Nelja Energia Estonia pst 1/3 10143 Tallinn Estonia Reg. no: 11200305 Tel: +372 6409090 Fax: +372 6409093 Email: martin@4energia.ee mailto:m.tarkiainen@intercon-energy.com

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

Hans Vadbäck
WSP Environmental Oy
Wolffintie 36 M10
FI-65200 Vaasa

30th April 2007.

WSP Environmental Oy is not considered a project participant.

SECTION E. Estimation of greenhouse gas emission reductions

This analysis has shown that the only credible scenario is Scenario 2, as it is the only one able to meet environmental targets set out in local and EU accession legislation, is economically viable, and reflects current renovation projects underway.

E.1. Estimated project emissions:

Wind power does not create any anthropogenic greenhouse gas emissions in operation, therefore project emissions are zero.

E.2. Estimated leakage:

No leakage estimate is required in ACM0002 for wind power.

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

Total project emissions, including leakage, are zero for the project activity.

E.4. Estimated baseline emissions:

Baseline emissions (BE) are calculated as following:

$$BE_y = EG_y \times EF_y$$

Where,

BEy = Baseline emissions in year *y* (tCO2)

EGy = Net Electricity supplied to the grid by the project in year *y* (MWh)

EFy = Combined margin emissions factor for the year *y* (tCO2/MWh)

Baseline emissions are given by:

The formula for combined margin, operating margin and build margin are explained in section B.1.

For the Estonian power section, the average Operating Margin for years 2003-2005 was calculated to be 1.081 tCO2/MWh and the Build Margin (2005) was calculated to be 1.12 tCO2/MWh. The combined margin was calculated to be 1.09 tCO2/MWh.

Estimated baseline emissions:

	2007	**2008**	**2009**	**2010**	**2011**	**2012**	**Sum: 2007-2012**
Baseline emissions = Project emission reductions (in t CO2e)	49 661	66 025	66 025	66 025	66 025	66 025	**379 789**

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

Because project emissions are zero, the emissions reductions are the same as the baseline emissions.

Estimated baseline emissions:

	2007	2008	2009	2010	2011	2012	Sum: 2007-2012
Baseline emissions = Project emission reductions (in t CO2e)	49 661*	66 025	66 025	66 025	66 025	66 025	**379 789**

*Early emission reductions will be generated in the year 2007 in the quantity of 49 661 [tCO2].

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

Year	Estimated project emissions (tonnes of CO_2 equivalent)	Estimated leakage (tonnes of CO_2 equivalent)	Estimated baseline emissions (tonnes of CO_2 equivalent)	Estimated emission reductions (tonnes of CO_2 equivalent)
Year 2007	0	0	49 661*	49 661*
Year 2008	0	0	66 025	66 025
Year 2009	0	0	66 025	66 025
Year 2010	0	0	66 025	66 025
Year 2011	0	0	66 025	66 025
Year 2012	0	0	66 025	66 025
Total (tonnes of CO_2 equivalent)	**0**	**0**	**379 789**	**379 789**

* Early emission reductions will be generated in the year 2007 in the quantity of 49 661[tCO2].

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:

In accordance with the Estonian legislation for environmental impact assessment the project developer carried out an assessment as part of the Detailed Land Use Planning of the wind farm. Please find below a summary of the environmental impact assessment.

The Marrakech Accords and the Swedish Pilot Programme require sufficient information concerning environmental impacts. NEFCO requires projects to meet and include information as follows:

- Environmental benefits and positive impacts of the project on local and Nordic environment, e.g. energy savings/environmental improvements
- Anticipated main negative impacts of the project and proposed environmental controls/technology to mitigate negative impacts
- Potential environmental liabilities/concerns associated with the project or the property and
- Available environmental information, such as environmental audits or environmental impact assessments.

In accordance with national and EU norms, a full Environmental Impact Assessment (EIA) was undertaken by Hendrikson & Ko, Tallinn in March 2004 and supplemented in August 2004. Date of issuance of the second supplementary 18.08.2004.

In case of Viru-Nigula most attention has been paid to the influence of noise on the surroundings, (see Annex 5). Micrositing of the wind turbines has been chosen to minimize possible noise and shadow problems.

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:

Not applicable.

SECTION G. Stakeholders' comments

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

According to the Planning Act (effective since January 2003), the planning system in Estonia is four levels:

1) National planning,
2) County planning,
3) (Municipal) Comprehensive planning and
4) Detailed planning.

On the one hand the planning system is hierarchical, i.e. the more detailed plan has to observe the more general plan. On the other – it is interactive, i.e. in case a more detailed plan requires modification of a more general plan, the necessary change comes into effect with enforcement of the more detailed plan.

A Detailed Land Use plan is a plan that is prepared for a smaller part of a town municipality and is the basis for building activities in the short term. The local municipality organizes the production of the plan and communication with the public during the planning process. The municipality can transfer organisation and financing of detailed planning to the owner of the land under planning or to a person interested in plan preparation with conclusion of a contract.

The preparation of the Detailed Land Use Plan is public. It has to be produced in cooperation with the owners of immovable property and inhabitants of the area as well as other stakeholders. Preparation of the plan includes minimum one public discussion and a two-week public display after the adoption of the plan by the local government. In addition, the plan requires approval of corresponding sectoral authorities. Any written suggestions and comments during the public display will be answered by the local municipality, which in this case will also organize a new public discussion. Possible planning disputes will be settled by the county governor. If no objections to the plan arise during the public display, the plan will be enforced by the municipal council.

Arrangement of public discussions has to be pre-announced in the newspaper selected for official announcements by local municipality. Public meetings related to EIA and detailed land use planning can be held at the same time.

Below a summary of the stakeholder consultations and approvals to the Detailed plan is given:

- 30.10.2003 the municipal decision nr. 57 for starting the detail planning in the selected area, announced in the official paper on 08.11.2003.
- 20.02.2004 municipal announcement concerning the beginning of EIA (KMH) including a public hearing. Announced in the official paper 06.02.2004. 21 persons were present (including the municipal and environmental authorities, planners, developers) in the discussion concerning the principals of a wind farm like visual impact, noise level, and layout.
- 12.03.2004 public hearing for the EIA (KMH). 9 persons participated (2 persons as publicum, rest authorities and developers).
- 22.07.2004 municipal resolution nr. 11. concerning the programme to be followed in the EIA (KMH).
- 25.08.2004 a further public hearing due to the changements in the layout (now 8 x 3MW) of the wind farm. A new layout an environmental statement were presented and discussed. Conclusion: an improvement in all aspects. This hearing was announced in the public press on 06.09.2004, participated by 11 persons, mainly authorities, planners and developers. The changement was approved.
- 27.01.2005 the municipal resolution for starting the detail planning for the new land plots Kopli, announced officially.
- 07.02.2005 municipal announcement for the conditions for the new detail plan Kopli.
- 03.03.2005 an environmental statement according to the planning code.
- 25.04.2005 Intercon Energy announcing an alteration in the location of 1 turbine, this has been removed on a new land plot (Kopli) inside the wind farm area but not included in the earlier detail planning (another person as owner). Intercon Energy applying for annulation of the present detail planning and releasing a new detail plan only for 7 turbines and the substation.
- 26.04.2005 a public hearing for the Kopli - detail plan, no public present.
- 27.04.2005 the new detail plan for Kopli (1 x 3MW) hanged out for public comments.
- 28.04.2005 municipal resolution nr. 11. annulates the previous detail plan
- 28.04.2005 municipal resolutin nr. 12, new detail plan (7 x 3MW + substation) received and hanged out for public comments.
- 20.05.2005 public hearing for the 2 detail plans, announced in official press 29.04.2005. No objections, no public.
- The county governor accepted the detail plans with resolutions 9-7/3782 (06.05.2005) and 9-7/4074 (25.05.2005). After this the municipality approves the detail plans.

Finally the building permits were issued by the municipality on 28.06.2005.

All land use agreements have been notarially authorised, all building permits are legally valid. The final alternative for the 110kV line to the main grid has been decided in cooperation with Eesti Energia/Põhivork and Empower. The grid connection becomes available 18.12.2006.

Annex 1

CONTACT INFORMATION ON PROJECT PARTICIPANTS

Organisation:	Viru-Nigula Tuulepark OÜ
Street/P.O.Box:	Estonia pst 1/3
Building:	
City:	Tallinn
State/Region:	
Postal code:	10143
Country:	Estonia
Phone:	+372 640 9090
Fax:	+372 640 9093
E-mail:	
URL:	
Represented by:	
Title:	Managing Director
Salutation:	Mr.
Last name:	Kruus
Middle name:	
First name:	Martin
Department:	
Phone (direct):	+372 50 19866
Fax (direct):	
Mobile:	
Personal e-mail:	martin@4eneriga.ee

Organisation:	Nordic Environment Finance Corporation, NEFCO in its capacity as Fund Manager to the Baltic Sea Region Testing Ground Facility
Street/P.O.Box:	Fabianinkatu 34, P.O. Box 249
Building:	
City:	
State/Region:	Helsinki
Postal code:	FI-00171
Country:	Finland
Phone:	+358 9 18 001
Fax:	+358 9 630 976
E-mail:	
URL:	
Represented by:	Ash SHARMA
Title:	Programme Manager, Testing Ground Facility
Salutation:	Mr
Last name:	Sharma
Middle name:	
First name:	Ash
Department:	Baltic Sea Region Testing Ground Facility
Phone (direct):	+358 400 811 327
Fax (direct):	+358 9 630 976
Mobile:	
Personal e-mail:	ash.sharma@nefco.fi

Organisation:	Swedish Energy Agency
Street/P.O.Box:	P.O. Box 310,
Building:	
City:	Eskilstuna,
State/Region:	
Postal code:	SE-631 04
Country:	Sweden
Phone:	
Fax:	
E-mail:	
URL:	www.stem.se
Represented by:	Ola Hansén
Title:	Programme Manager
Salutation:	Mr
Last name:	Hansén
Middle name:	
First name:	Ola
Department:	Climate Change Section
Phone (direct):	+46 16 544 22 12
Fax (direct):	+46 16 544 20 99
Mobile:	+46 702 80 80 33
Personal e-mail:	ola.hansen@energimyndigheten.se

Annex 2

BASELINE STUDY

Please see enclosed document “Estonian JI Project Development Baseline Study”, Stockholm Environment Institute Tallinn Centre, Tallinn, November 2006.

<u>Annex 3:</u> MONITORING PROTOCOL FORM

SPECIMEN OF VIRU-NIGULA WIND FARM ELECTRICITY PRODUCTION AND EMISSION REDUCTION UNITS GENERATED BY THE PROJECT IN YEAR <u>2007</u>

RE: Emission Reduction Purchase Agreement (ERPA) between Viru-Nigula Tuulepark OÜ and NEFCO & STEM.

GENERAL INFORMATION

Project name:	Viru-Nigula Wind Farm
Project location:	Viru-Nigula, Estonia
Project owner.	Viru-Nigula Tuulepark OÜ Estonia pst 1/3, Tallinn, 10143 Estonia
Project description:	Wind park consists of 8 WinWinD, WWD-3 (model NH90-RD100) of 3,0 MW. Total capacity 24,0 MW. GHG emission reduction is achieved via replacement of fossil fuels, mainly oil shale, used for electricity production in Estonia. Crediting period for emission reductions is 1st April 2007 – 31st December 31, 2012.
Operation on monitoring period:	The grid connection was finished 18th December 2006. The full operation started _________ 2007.

MONITORING PROCEDURE

Description:	Monitoring is based on the procedures defined in the document "Monitoring plan of emission reductions in Viru-Nigula Wind Farm, Annex 3 in PDD"
Measuring meters:	The commercial metering system is connected with power transformer C2T feeders Voltage Transformer (1PT2T) and Current Transformer (1PVT2). The VT and CT commercial metering winding is at least with accuracy class 0,5. The meter is metering both directions (WP generation and consumption) separately. Meter is via phone line connected to NG-s commercial metering system located in NG Dispatch Centre from where automatically daily and monthly reports of WP net generation and consumption are sent to 4E (Andrus Zavadskis). Metering system is built by Siemens and meters in substations are made by Landis and Gyr. Metering systems are ready built and operating from December 2006. There is no separate low voltage line in order to back up the grid failure from 110 kV side. Wind park is feeded with two 110 kV lines (see figure 1 below), both connected to the same busbar with transformer C2T feeder. The metering system for both lines is the same as described above. Calibration is processed according to Estonian legislation and standards. The main grid meter is connected to Main Grid SCADA and monitored remotely. The backup meter is read once per year.

Annex 3: MONITORING PROTOCOL FORM

SPECIMEN OF VIRU-NIGULA WIND FARM ELECTRICITY PRODUCTION AND EMISSION REDUCTION UNITS GENERATED BY THE PROJECT IN YEAR 2007

MONITORING RESULTS

Year	**2007**
EG, Net electricity production (MWh)	
EF, Emission Factor (t CO2/MWh):	**1,09007**
ER, Emission reduction in 2007 (tCO2):	
Remarks:	

Emission reductions from the project will be calculated by multiplying annual amount of power dispatched to the grid by emissions factor:

$$ER_y = EG_y \times EF_y$$

Where:

ER_y = Annual Emission Reductions in year *y* (tCO2)
EG_y = Net Electricity supplied to the grid by Viru-Nigula wind park in year *y* (MWh)
EF_y = Combined margin emissions factor for the year *y* (1,09 $tCO2/MWh_{2005}$)

Electricity production annual report of Viru-Nigula Wind Farm	
Net production delivered to Main Grid (MWh)*	
Month	**MWh**
January	
February	
March	
April	
May	
June	
July	
August	
September	
October	
November	
December	
Sum:	
Own consumption via Distribution Grid (OÜ Jaotusvõrk)	
Net electricity production	
* According to OÜ Põhivõrk (Main Grid) monthly reports (kuu raport).	
See: ´´Aktiiv saldo kokku MWh-summa´´	

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Annex 3: MONITORING PROTOCOL FORM

SPECIMEN OF VIRU-NIGULA WIND FARM ELECTRICITY PRODUCTION AND EMISSION REDUCTION UNITS GENERATED BY THE PROJECT IN YEAR 2007

MEASURING METERS OF CLIENT

Name of client:	Viru-Nigula Tuulepark OÜ
No of contract:	

EXISTING ENERGY METERS

Measurement point:	Viru-Nigula 110/20kV substation
Sign of measuring point:	

Meter type	No	Origin reading		Measuring unit	Date and time	Register
		Active from grid (+A)		MWh		
		Active to grid (-A)		MWh		
		Reactive from grid (+R)		Mvarh		
		Reactive to grid (-R)		Mvarh		
Meter type	**No**	**Origin reading**		**Measuring unit**	**Date and time**	**Register**
		Active from grid (+A)		MWh		
		Active to grid (-A)		MWh		
		Reactive from grid (+R)		Mvarh		
		Reactive to grid (-R)		Mvarh		

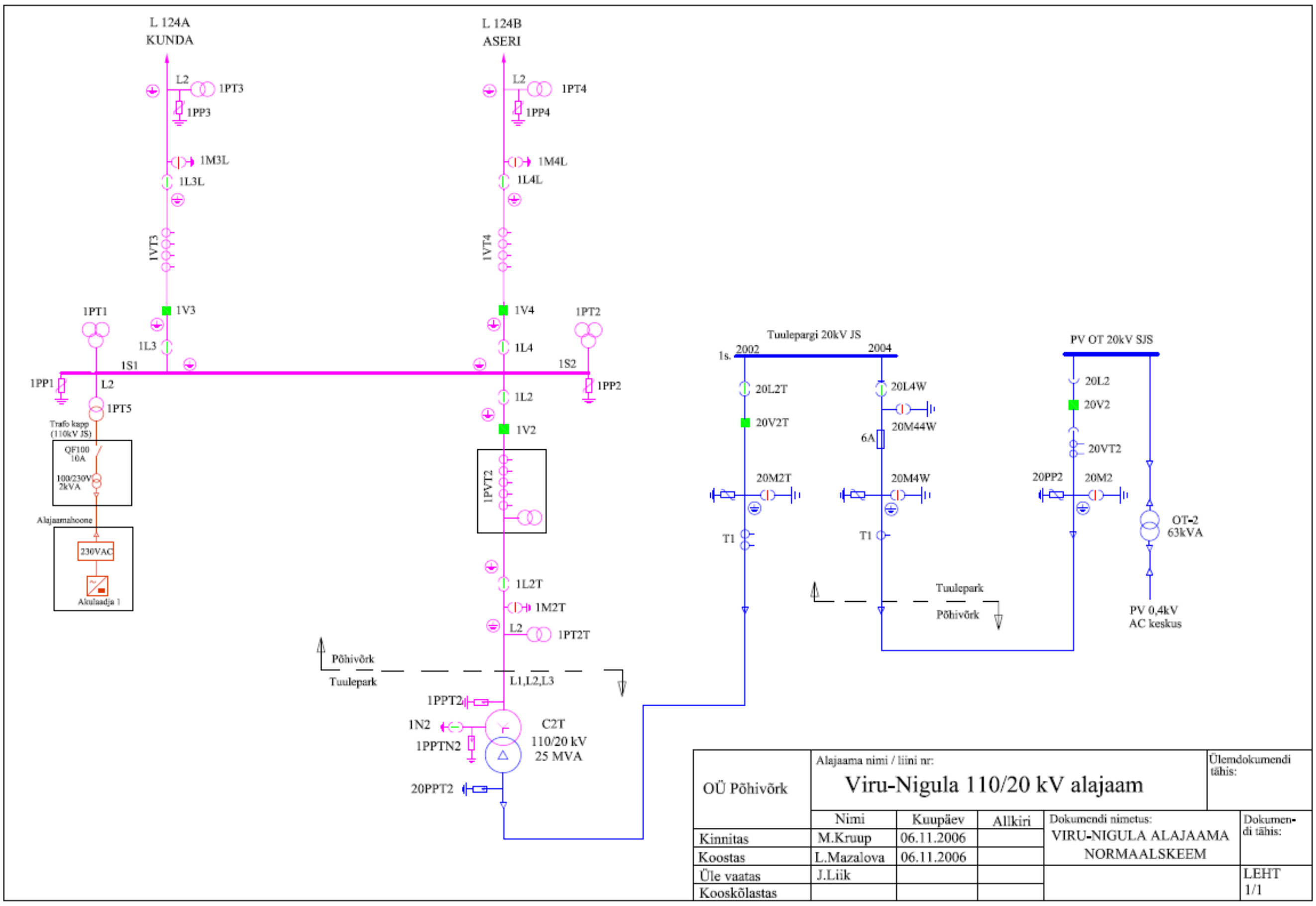


Figure 3. SINGLE LINE DIAGRAM FOR GRID CONNECTION

Annex 3: MONITORING PROTOCOL FORM

SPECIMEN OF VIRU-NIGULA WIND FARM ELECTRICITY PRODUCTION AND EMISSION REDUCTION UNITS GENERATED BY THE PROJECT IN YEAR 2007

ANNEXES

1. (1- 12) Monthly production reports in 2007 issued by Main Grid.
2. (1- 2) Bills of January and December from Distribution Network

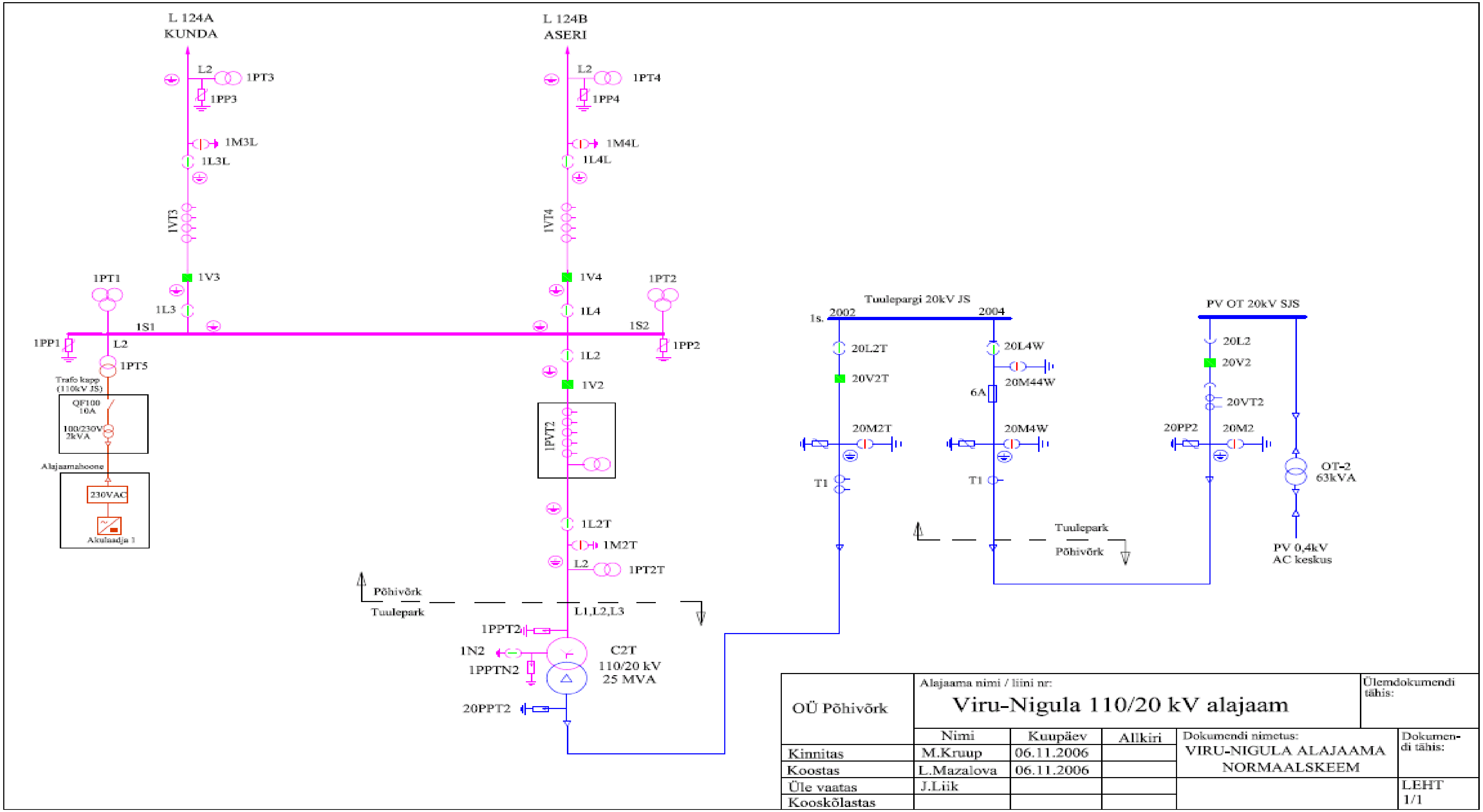
Date: ___.____.__________

Martin Kruus
Managing director

Andrus Zavadskis
Technical Manager

Annex 4:

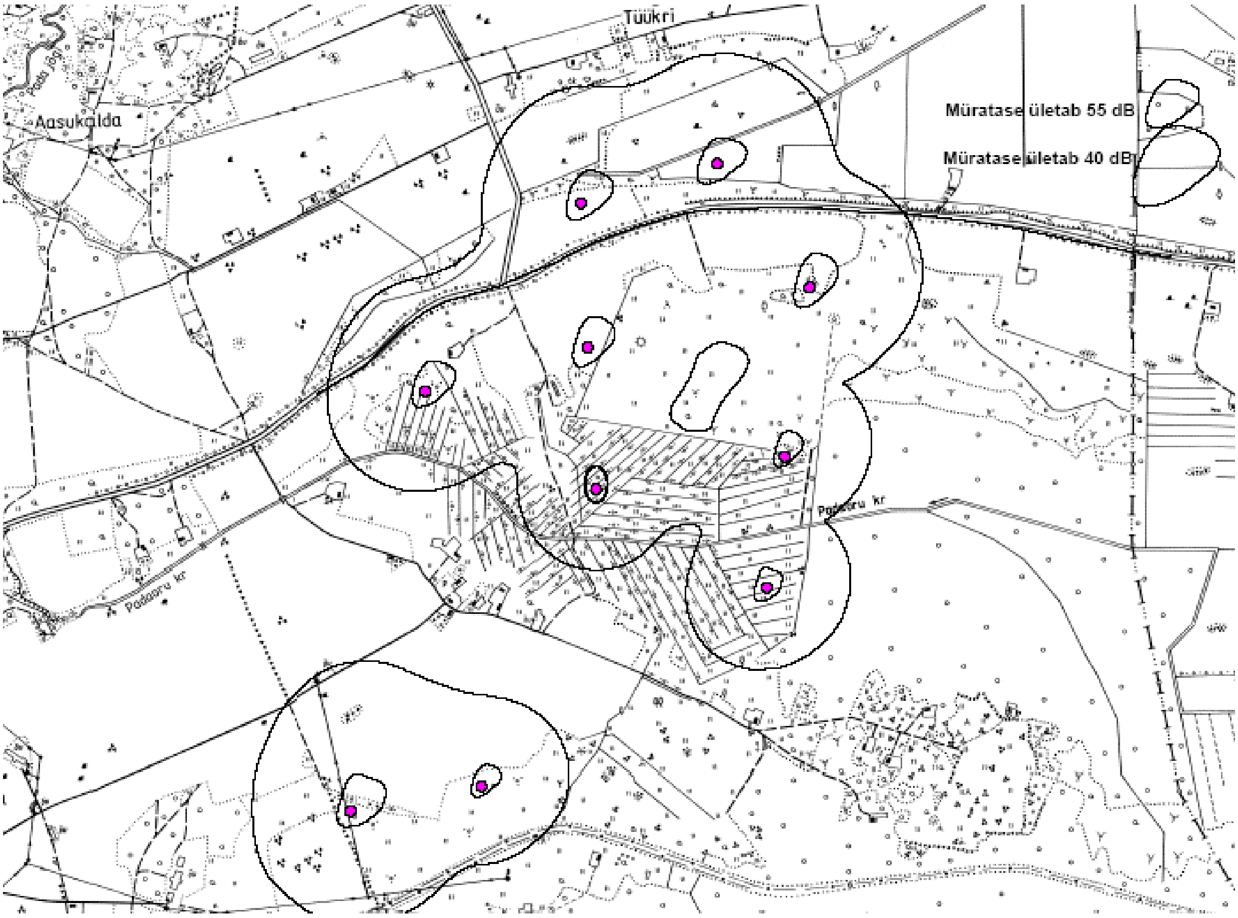
SINGLE LINE DIAGRAM FOR GRID CONNECTION



Annex 5

NOISE CALCULATIONS

The map shows the noise level for an old alternative (A1) for the locations of the windmills. The final placement of the windmills will cover a smaller area and thus this change will not increase the noise caused by windmills.



Annex 6: Financial calculations (Investment costs, Profit and Liquidity analysis)

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