JOINT IMPLEMENTATION PROJECT DESIGN DOCUMENT FORM
FOR SMALL-SCALE PROJECTS
Version 01.1 - in effect as of: 27 October 2006

CONTENTS

SECTION A. General description of the small-scale project

A.1. Title of the small-scale project:

Vanaküla Wind Power Joint Implementation Project, Estonia

Ver. no. 4, Nov. 7 2006

A.2. Description of the small-scale project:

The proposed project activity is the development of a wind power project at the north-west coast of Estonia, some 110 km west of Tallinn, at the municipality of Noarootsi, Vanaküla village. The wind farm will consist of three 3.0 MW wind turbines and thus have a total installed capacity of 9.0 MW. The expected net output of this project is 23,055 MWh per year. The renewable electricity produced by the wind power plant will displace carbon intensive electricity produced from fossil fuel sources in the Estonian grid.

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)	• OÜ Intercon Energy - an Estonian private wind power development company	No
One of the investor countries participating in the TGF, tbc. The investor countries in the TGF are: Kingdom of Denmark, Republic of Finland, Federal Republic of Germany, Republic of Iceland, Kingdom of Norway and Kingdom of Sweden.	• Nordic Environment Finance Corporation (NEFCO) in its capacity as Fund Manager to the Baltic Sea Region 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.

The PDD was prepared by an Estonian company LHCarbon OÜ, represented by Hannu Lamp. Tel: +372 51 41 800.

A.4. Technical description of the small-scale project:

A.4.1. Location of the small-scale project:

A.4.1.1. Host Party(ies):

Republic of Estonia

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

Lääne County

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

Noarootsi, Vanaküla

A.4.1.4. Detail of physical location, including information allowing the unique identification of the small-scale project:

The proposed JI Project project is located at the north-west coast of Estonia, some 110 km west of Tallinn, at the municipality of Noarootsi, at Vanaküla village.

The site is open non-active agroland with a total of 41 hectars. Three sites of each 0.5 hectars have been separated for the three turbines to be used as production land. The distance to the Sea is about 2.5 km. The height above sea level is about 5-10 m. The location is suitable for wind power due to its verified good wind conditions (more than one year on-site wind measurements), presence of an electrical grid and absence of enviromental or other constraints. A detailed geological study has proved an existence of good soil conditions for the establishment of foundations, access roads and other necessary infrastructure. The land-units at the wind farm territory have been leased on a long term basis (building title) for a period of 36 years to the project company.

Figure 1. Location of the project

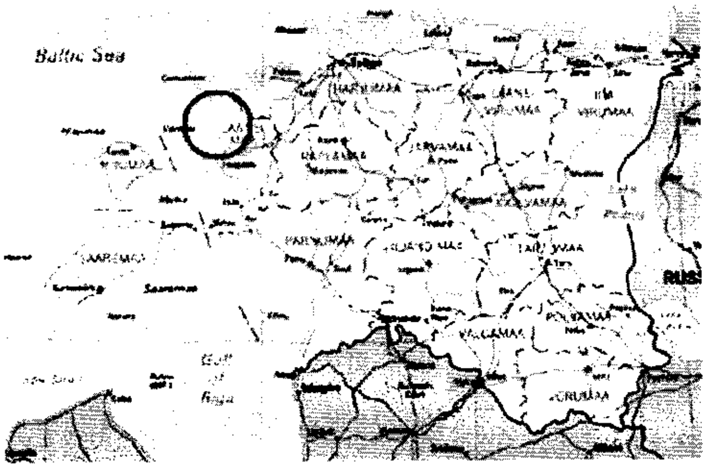

Figure 2. Location of the wind farm and wind measurement masts

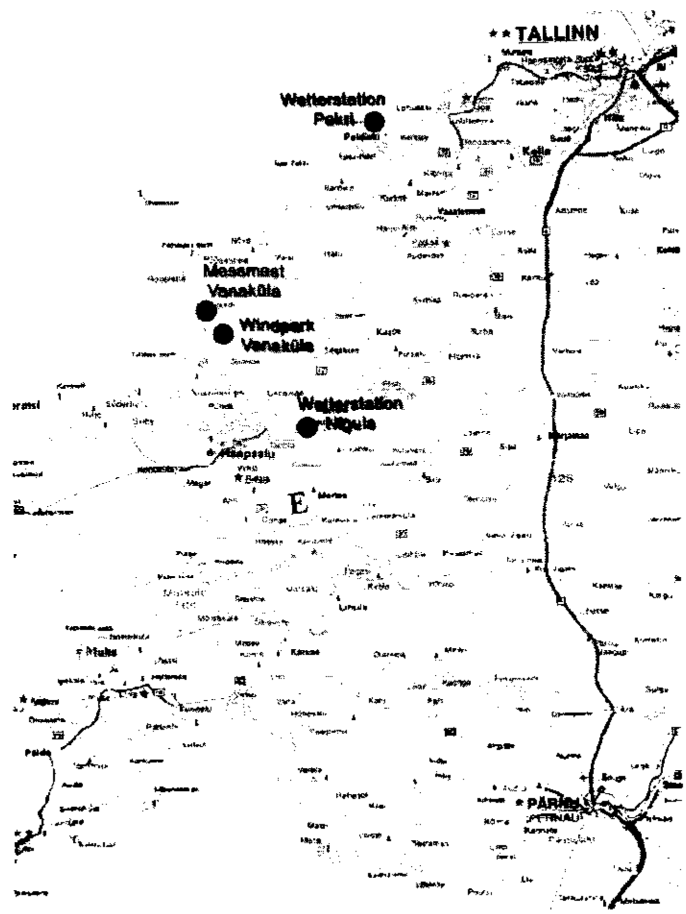

Figure 3. Location of the project - micrositing

A.4.2. Small-scale project type(s) and category(ies):

Type I JI SSC project: Renewable energy project with a maximum output capacity of less than 15 MW(e).

A.4.3. Technology(ies) to be employed, or measures, operations or actions to be implemented by the small-scale project:

The purpose of the project is the development and construction of a wind power project in Estonia. Emission reductions will be generated by the operation of the wind power facility as described in this PDD. The power generation will displace carbon-intensive generation from the Estonian grid.

The project consists of 3 wind turbines with a total production capacity of 9.0 MW. The wind turbines will be new WinWinD, WWD-3 (type NH90-RD100) of 3.0 MW, supplied by the Finnish manufacturer WinWind. 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 100m 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 and to benefit from economies of scale as WinWind is currently constructing and will service 8 wind turbines at Viru-Nigula wind farm that is located in NE Estonia.

The wind farm will be connected to the 110 kV national grid of Estonian Energy through an own power station. The project is neighbouring the future 39MW "Aulepa Tuulepark", planned to be implemented some 3 km south of Vanaküla village. A common substation is an optional possibility to reduce the costs for the implementation. In case of a common substation, separate meters will be installed at the 20 kV side of transformer in order to distinguish between the electricity and emission reduction generation of the two projects, taking also the transformer losses relative to the wind power plants' electricity generation into account. The metering equipment will be sealed and calibrated and checked periodically for accuracy.

Wind measurements have been performed by the accredited German company Enveco Steinfurt GmbH from summer 2004 till autumn 2005. The technical equipment was installed on the nearby EMT mast in Tuksi. The wind expertise has been prepared and indicates an average wind speed of more than 7.25 m/s at hub height can be expected. In order to determine the best possible location for the wind turbines within the site, the internationally used computer programme 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 (at 63 and 44m) 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, net annual energy production of the project is conservatively estimated at 23,055 MWh.

Negotiations with WinWind for the delivery of wind turbines are still ongoing but expected to be finalized by November. The wind turbine supplier will be contracted to construct the wind turbine generators on a fixed-priced basis, according to an EPC contract. Local civil construction companies will be sub-contracted for construction of project infrastructure. 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.

The detailed technical design of the project has been completed and the building permit was issued by the municipality of Noarootsi on August 8, 2006 (document number 210). All necessary agreements for construction and operation of the wind farm are expected to be signed by Q1 2007. The implementation of the wind farm will start in 2007 and full operation will be achieved by latest January 1 2008.

A.4.4. Brief explanation of how the anthropogenic emissions of greenhouse gases by sources are to be reduced by the proposed small-scale project, including why the emission reductions would not occur in the absence of the proposed small-scale project, taking into account national and/or sectoral policies and circumstances:

The renewable electricity produced by the wind power plant will displace carbon intensive electricity produced from fossil fuel sources in the Estonian grid.

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 (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.
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]
As Estonia has a favourable investment climate and a support mechanism (albeit insufficient for a commercial return) there has been some interest in developing wind project. However, it is very unlikely that future project will proceed without further financial interventions such as Joint Implementation (JI).

A.4.4.1. Estimated amount of emission reductions over the crediting period:	
Length of the crediting period	5 years
Year	**Estimate of annual emission reductions in tonnes of CO2 equivalent**
Year 2008	25.396,6
Year 2009	25.396,6
Year 2010	25.396,6
Year 2011	25.396,6
Year 2012	25.396,6
Total estimated emission reductions over the crediting period (tonnes of CO2 equivalent)	126.983

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

Annual average of estimated emission reductions over the crediting period (tonnes of CO2 equivalent)	25.396,6

A.4.5 Confirmation that the proposed small-scale project is not a debundled component of a larger project:

The Vanaküla Wind Power JI Project with a capacity of 9.0 MW(e) is not a debundled component of a larger project. There is a near-by wind farm development project (Aulepa wind farm), but
- the project participants are different.
- the project boundary is at ca. 3 km distance of the project boundary of the other project at the closest point.

A.5. Project approval by the Parties involved:

Written approvals by the Parties involved, including the necessary authorisations, will be attached to the final PDD.

Once the draft determination report is available, the necessary request to issue a host country Letter of Approval will be made to the relevant Estonian authorities. A request for a Letter of Endorsement has already been made.

The investor country approval will be issued by one of the investor countries to the TGF prior to submission of the PDD and Determination Report to the JI Supervisory Committee.

SECTION B. Baseline

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

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

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 proposed Vanaküla wind power JI project.

More specifically, the Operating and Build Margins have been calculated on the basis of detailed electricity generation and fuel consumption data from years 2003-2005 of 19 Estonia's oil shale, natural gas and other fossil fuels consuming as well as renewable energy plants supplying power to the grid. The below table provides an overview of the aggregate generation and fuel consumption data for these plants.

Table. 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		**10159**	**10304**	**10205**			
Exports		1989	2141	1953			
Total domestic consumption (incl PP self consumption)		**8077**	**7816**	**7907**			

The average Operating Margin was calculated to be 1,081 tCO_2/MWh and average Build Margin was calculated to be 1,164 tCO_2/MWh. Applying default weights of the methodology of 0,75 (Operating Margin) and 0,25 (Build Margin) the Combined Margin was calculated to be 1,102 tCO_2/MWh. Please refer to the enclosed Baseline Study for more information.

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 small-scale 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. Please refer to the Baseline Study for the detailed application of the additionality tool.
Additionality of the proposed project is further supported by recent determinations of wind power JI projects in Estonia, namely the Esivere/Virtsull Wind Power JI Project and Viru-Nigula 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. 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.[2]

[2] P. 28, Communication from the Commission. The support of electricity from renewable energy sources. Commission of the EC. Brussels 7.12.2005

The financial modelling and sensitivity analysis show that the financial income from sale of emission reduction units during 2008-12 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 sulphur dioxide (10-20 g/KWh), CO2 (1350 –1400 g /kWh) and a large amount of fly ash (12-20 g/kWh).
The baseline analysis presented in more detail in Annex 2 shows that the only credible future scenario is Scenario 2 (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.

This scenario includes the refurbishing of 200MW units at Eesti and Balti power stations from pulverized bed to circulating fluidized bed combustion (CFBC) technology and closing down of units 1-8 at Balti power station. At the Balti power station, the renovated units 11 and 12 will be used for normal operation, while units 9 and 10 will be used for standby. This 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 will allow the plants to meet necessary environmental targets.

b) Project scenario

The project scenario foresees an establishment of a 9.0 MW wind power plant at Vanaküla, Noarootsi 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 will occur due to the simple fact that the Baseline scenario represents a higher emission factor than the Project scenario. Please refer to the Baseline Study in annex 2 for a more detailed analysis.

B.3. Description of how the definition of the project boundary is applied to the small-scale 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.

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 A of the Baseline Study. 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 emission factor of 0 (zero), as per ACM0002 requirements.

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

Baseline Study date: November 6 2006
Conducted by: Valdur Lahtvee and Dr Tiit Kallaste, Stockholm Environment Institute Tallinn Centre.
Tel: + 372 6276100
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 Esivere/Virtsu II Wind Power JI Project under the Austrian JI/CDM Programme. The study that obtained a positive determination opinion in March 2005 by TÜV SÜD Group indicated a similar carbon emission factor for the Estonian power sector over the crediting period 2005-2012.

Stockholm Environmental Institute is not considered as a project participant.

SECTION C. Duration of the small-scale project / crediting period

C.1. Starting date of the small-scale project:

The wind farm construction will start on June 1 2007.

C.2. Expected operational lifetime of the small-scale project:

20 years, 0 months

C.3. Length of the crediting period:

Total crediting period: 5 years, 0 months (2008-12)
Starting date. January 1, 2008

SECTION D. Monitoring plan

D.1. Description of monitoring plan chosen:

1. ACM0002/Version 6: Consolidated monitoring methodology for zero-emissions grid-connected electricity generation from renewable sources"
The applicability conditions for this methodology are:

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.2. Data to be monitored:

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 the grid	Project proponent	kWh	Measurement. Directly measured with electricity meter, and checked with sales data	Constant recording	100%	Electronic and in paper form	See below.*.

* Data will be aggregated monthly and yearly and double checked with receipt of sales, with the SCADA system as a back-up.
In case of a common substation with the planned Aulepa wind power plant, in addition to one common meter at the 110 kV side, separate meters will be installed at the 20 kV side of transformer in order to distinguish between the electricity and emission reduction generation of the two projects, taking also the transformer losses relative to the wind power plants' electricity generation into account. The metering equipment will be sealed and calibrated and checked periodically for accuracy.

D.3. 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 at the connection point to the Eesti Energia's grid at the 110 kV side of the transformer. This equipment will be sealed, 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. In case of common substation with Aulepa wind power plant, the metering equipment on the 20 kV side will also be sealed and calibrated and checked periodically for accuracy.
2. all other data	Low	This data is all either default data (e.g. IPCC) or from official statistics and publicly available utility and government data that has already been gathered and checked for quality. All data sources are well known and reputable.

D.4. Brief description 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 only the net electricity* output of the plant. All other data has been collected at the beginning of the project, and presented in the Baseline Study and this PDD.

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 Intercon Energy 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 Intercon Energy 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.

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

Quality assurance:
OÜ Intercon Energy's competent manager 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. RR 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.

Reporting:
OÜ Intercon Energy will prepare reports as needed for audit and verification purposes.
OÜ Intercon Energy will prepare a 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 verifiers and to the Estonian JI focal point.

Training:
It is OÜ Intercon Energy'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.

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.

Corrective Actions
OÜ Intercon Energy 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.

Data collection

ID number	Data variable	Responsible person	
		Name	**Position and department**
MP1	EGy – Net electricity supplied to the grid (kWh)	Markku Tarkiainen	Member of the Management Board

D.5. Name of person(s)/entity(ies) establishing the monitoring plan:

Markku Tarkiainen, OÜ Intercon Energy. OÜ Intercon Energy is a project participant as listed in annex 1.

SECTION E. Estimation of greenhouse gas emission reductions

E.1. Estimated project emissions and formulae used in the estimation:

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

E.2. Estimated leakage and formulae used in the estimation, if applicable:

No leakage estimate is required in ACM0002 for wind power.

E.3. Sum of E.1. and E.2.:

Since there are no leakages: E.1 + E.2 = E.1 (0)

E.4. Estimated baseline emissions and formulae used in the estimation:

Baseline emissions (BE) are calculated as following:

BE_y (tCO_2) = EG_y (MWh) x EF_y (tCO_2/MWh)
EG_y – Net electricity supplied to the grid
EF_y – Emission factor of the Estonian grid

Please refer to the enclosed Baseline Study using ACM0002 methodology for detail on how the emission factor is calculated for the Estonian grid.

	2008	2009	2010	2011	2012	∑ 2008-2012
Baseline emissions (in t CO_{2e})	25.396,6	25.396,6	25.396,6	25.396,6	25.396,6	126.983

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

	2008	2009	2010	2011	2012	∑ 2008-2012
Baseline emissions = Project emissions (in t CO_{2e})	25.396,6	25.396,6	25.396,6	25.396,6	25.396,6	126.983

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

Year	Estimated project emissions (tonnes of CO2 equivalent)	Estimated leakage (tonnes of CO2 equivalent)	Estimated baseline emissions (tonnes of CO2 equivalent)	Estimated emission reductions (tonnes of CO2 equivalent)
Year 2008	0	0	25.396,6	25.396,6
Year 2009	0	0	25.396,6	25.396,6
Year 2010	0	0	25.396,6	25.396,6
Year 2011	0	0	25.396,6	25.396,6
Year 2012	0	0	25.396,6	25.396,6
Total (tonnes of CO2 equivalent)	0	0	126.983	126.983

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.

F.2. If environmental impacts are considered significant by the project participants or the host Party, provision of 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 impact assessment for the project was carried out by an independent expert company Entec AS (experts Mihkel Vaarik (EIA activity license no. KMH 0001) and Ain Kull) and approved by authorities together with the Detailed Land Use Plan in August 2004.

Below a summary and main conclusions of the environmental impact assessment report are presented.

Project "Vanaküla Wind Farm" aims to implement 3 wind turbines with a nominal capacity of 3 MW each on Matsi (26,76 ha) and Kraavi (14,25 ha) real estates, located on the western coast of Estonia at Noarootsi municipality, Vanaküla village. The real estates and the surrounding land plot are former agricultural land that is today not cultivated. On one side the land plots are bordering to the sand-covered Höbringi-Aulepa road, which later can be used as the access road to the turbines. In the south the river Riguldi is bordering to the land plots. A 110 kV line, belonging to the national grid company, is crossing the area. The wind farm will be connected to this line. There are no buildings on the real estates. The topography is flat and the total area is forming an open plain sloping slightly towards the river Riguldi. No objects under nature protection can be found at the area. The complete land plot is specified in the General Plan of the municipality as a potential production area for wind energy. The nearest housing is more than 600m away.

The EIA aimed to study especially the essential environmental impacts caused by the implementation of the project including impact on fauna and flora, visual impact, safety of wind turbines, electromagnetic impact, noise, wind turbines' life-time and decommissioning and social-environmental impacts. All environmental impacts were considered to be insignificant and the local area plan of the wind farm is thus not in conflict with the Estonian Planning Act or other legislation. The implementation of the Vanaküla Wind Farm would not cause any negative environmental impacts provided that in the further development and during the construction period the environmental regulations and good manners as well as the conditions defined in the municipal resolution for the planning process of the project will be followed.

SECTION G. Stakeholders' comments

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

Stakeholder comments have been invited and compiled in accordance with all local planning legislation as outlined below.

According to the Planning Act (effective since January 2003), the planning system in Estonia is four levels – National planning, County planning, (Municipal) Comprehensive planning and 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 organises 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. That is common practice and this is also the case with the Vanaküla wind farm where Noarootsi Municipal Government has authorized and entered into a contract with OÜ Intercon Energy to prepare a Detailed Land Use Plan for the establishment of the wind farm at the chosen site.

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 organise 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:

29.1.2003	Environmental impact assessment was approved by the Ministry of Environment local office (Lääne Keskkonnateenistus)
27.11.2003	Resolution no. 296 by municipal government fixed requirements for the local planning
04.12.2003	Announcement in the newspaper "Läänne-Elu" and on the municipal web-page about start of local planning of the wind farm
02.12.2003	Agreement between municipality and developer concerning the planning and cost overtaking by the developer
16.03.2004	Announcement in the local news paper "Lääne-Elu" and municipal web-page concerning the public hearing for the Detailed plan on 25.3.2004
25.03.2004	Public hearing, 10 persons participated

Approvals to the Detailed plan:

16.06.2004	Mayor of Noarootsi
15.06.2004	Municipal specialist for land use and development
30.06.2004	Municipal building inspector
04.05.2004	Public health inspectorate
09.05.2004	Land development office
12.05.2004	Inspectorate for air pollution and emissions (Päästeteenistus)
24.05.2004	Ministry of Environment local office - Lääne Keskkonnateenistus
08.06.2006	Civil aviation inspectorate
03.06.2004	Fortum (local Grid operator)

22.06.2004	Municipal resolution nr. 108: Detailed planning received and open for public comments during 12.-25.7.2004, corresponding announcement in the news paper "Lääne-Elu"
26.06.2004	Above announcement in the newspaper published
28.07.2004	Announcement by the municipality: Detailed plan was open for public comments. No comments or proposals where given. The Detailed plan can be presented to the municipal council meeting for approval.
26.08.2004	The Detailed plan is approved at the meeting of the municipal council, resolution nr. 38
Sept.2004	Announcement in the news paper "Lääne-Elu" and on the municipal web-page concerning the approval of the Detailed plan

Annex 1

CONTACT INFORMATION ON PROJECT PARTICIPANTS

Organisation:	OÜ Intercon Energy
Street/P.O.Box:	L. Koidula
Building:	22-6
City:	Tallinn
State/Region:	
Postal code:	10125
Country:	Estonia
Phone:	+372 601 5031
Fax:	+372 601 5037
E-mail:	m.tarkiainen@intercon-energy.com
URL:	www.intercon-energy.com
Represented by:	Markku Tarkiainen
Title:	Member of the Management Board
Salutation:	Mr.
Last name:	Tarkiainen
Middle name:	
First name:	Markku
Department:	
Phone (direct):	+372 601 5031
Fax (direct):	+372 601 5037
Mobile:	+372 56 207 157
Personal e-mail:	m.tarkiainen@intercon-energy.com

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, P.O. Box 249
Building:	34
City:	Helsinki
State/Region:	
Postal code:	FI-00171
Country:	Finland
Phone:	+358 9 18 001
Fax:	+358 9 630 976
E-mail:	
URL:	www.nefco.org
Represented by:	*Ash Sharma*
Title:	Programme Manager, Testing Ground Facility
Salutation:	Mr.
Last name:	Sharma
Middle name:	
First name:	Ash
Department:	
Phone (direct):	+358 40 08 11 327
Fax (direct):	+358 9 630 976
Mobile:	+358 40 08 11 327
Personal e-mail:	ash.sharma@nefco.fi

Annex 2

BASELINE STUDY

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

Estonian
JI Project Development
Baseline Study

Stockholm Environment Institute

Tallinn Centre

Tallinn, November 2006

Estonian

JI Project Development Baseline Study

Commissioned by
Stockholm Environment Institute
Tallinn Centre

November 2006

P.O.Box 160, 10502 Tallinn, Estonia. Phone: + 372 6276100, Fax: + 372 6276102, http://www.seit.ee

Table of Contents

Abbreviations

BM	Build Margin
CDM	Clean Development Mechanism
CH_4	Methane
CHP	Combined Heat and Power
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
ERU	Emission Reduction Unit
EU	European Union
GHG	Greenhouse Gas
GWh	Giga-watt hour
IPCC	Intergovernmental Panel on Climate Change
IRR	Internal Rate of Return
JI	Joint Implementation
kt	Kilo-tonne (thousand tonne)
kWh	Kilowatt hour
MWh	Megawatt hour
N_2O	Nitrous Oxide
ODA	Overseas Development Assistance
OM	Operating Margin
PV	Present Value
TWh	Terawatt hour

1 Introduction and Terms of Use

Current study was carried out by the Stockholm Environment Institute Tallinn Centre at the order of LHCarbon OÜ in order to provide overview of the JI project development in Estonia as well to assess carbon emissions baseline for calculation of the CO2 emission reductions of the Joint Implementation Development Projects in Power Production Sector in Estonia. The study includes the information required for the preparation of a Project Design Document for submission to the donors/JI project partners. The study begins with an overview of the Estonian power section, and developments that are relevant to the selection of a baseline for new power plants. The regulatory and economic factors that influence the baseline scenario are described, as well as the current status of wind power development in Estonia, as there is assumed that Estonian JI potential lays largely on utilisation of wind resources.

For current study SEI Tallinn Centre has applied UNFCC/CCNUCC CDM Executive Board revised methodology for consolidated baseline calculations ("Consolidated baseline methodology for grid-connected electricity generation from renewable sources" Doc. ACM0002/version 06; Sectoral Scope: 01; 19 May 2006[1]). Calculations are based on production and fuel use data obtained from power producers and authorities during the preparation of Estonian National Allocation Plan 2008-2012 of CO2 emission allowances for Estonian enterprises participating in EU Emission Trading Scheme. For the study several publicly available JI project specific studies were reviewed and assumptions used, like baseline of Econ Analyses (Esivere and Virtsu II Wind Power Development Baseline Study, Econ Analysis AS, March 2005).

Current study and parts of it can be used for reproduction only for educational purposes, if proper reference made, without prior agreement. For commercial use and particularly for use of study and/or it's parts of for preparation of PDD-s for JI project, prior consent from SEI Tallinn Centre is required.

2 Background of Estonian Power Sector

This section describes the structure and development of the Estonian power sector, and relevant factors that influence the baseline for the JI projects.

[1] Available at http://cdm.unfccc.int/Panels/meth/Meth20_repan09_ACM0002_ver06.pdf

2.1 Description of the Estonian Power Sector

The state organises the Estonian fuel and energy market analogously with other EU Member States and the fuel and energy supply, as a whole, meets the essential needs of consumers. In order to implement the strategic objectives and principles of the fuel and energy sector, the state may use the following measures:

- regulative or legislative measures (including price formation mechanisms),
- the tax system,
- investment support,
- national programmes (including of education, research and technology development).

Regulation, which affects power engineering, is prepared in several ministries. The Ministry of Economic Affairs and Communications is responsible for providing for the regulation of and technical requirements for the energy market. Regulations, which significantly affect power engineering, are also developed by the Ministry of the Environment (use of mineral resources, pollution charges, environmental requirements etc) and by the Minister of Finance (excise duties, principles of value added tax, use of state budget funds etc). The Energy Market Inspectorate exercises supervision over the energy market. Supervision of the liquid fuel market is done by the Tax and Customs Board. The Technical Inspectorate checks the technical condition of the equipment used. The Consumer Protection Board represents the interests of consumers in relations with energy undertakings.

The main regulation of the fuel and energy sector is provided for in the following Acts:

1. the Electricity Market Act (RT I 2003, 25, 153; 2004, 18, 131; 30, 208),
2. the Natural Gas Act (RT I 2003, 21, 128; 2004, 18,131),
3. the Liquid Fuel Act (RT I 2003, 21, 127; 88, 591; 2004, 18, 131, 53, 365),
4. the District Heating Act (RT I 2003, 25, 154; 2004, 18, 131),
5. the Energy Efficiency of Equipment Act (RT I 2003, 78, 525).

The efficiency of primary energy consumption (the ratio of the final energy consumption to the primary energy consumed) in Estonia is approximately 51 %, which is a relatively low indicator. This is mainly caused by the facts that there are no large hydro-electric stations and more than 90 % of the electric energy is produced in condensation power stations the efficiency of which is about 30 %. Losses in a power or district heating network and the export of conversed energy (electricity, shale oil and oil shale coke, peat briquette, wood chips) also reduce the efficiency indicator of the energy sector.

The volume of energy demand in the gross domestic product (GDP) (the ratio of the primary energy supply to the GDP) has significantly decreased in Estonia. According to the International Energy Agency (IEA), the sustainable development indicator of Estonia is still lower than generally in the EU or in the neighbouring state of Finland with a climate comparable to the climate of Estonia – in 2000, 2.1 and 1.5 times respectively (the parity of the buying power is taken into account upon calculation of the GDP). Particularly, this is caused by the low level of Estonia's GDP. At the same time, the energy conservation potential of Estonia is deemed to be quite high, e.g. in Tallinn 25–30 % more heat is used per one m^3 of building volume than in Helsinki.

The proportion of domestic energy resources in the Estonian energy resources and in the balance of primary energy is high and mostly based on oil shale. It offers a considerable strategic independence as regards electricity supply (the proportion of imported energy sources is ~1/3 in Estonia and, on average, ~ 2/3 in EU Member States). The main positive sides of the large-scale use of oil shale are the security of supply for the state energy sector and the relative price independence from the world market. The negative side is the great environmental damage arising from the mining and use of oil shale and the low calorific value of oil shale. The export volume of electric energy significantly affects the proportion of oil shale in the balance of primary energy – the greater the export of electricity, the greater the proportion of oil shale in the balance of primary energy.

In 2004, the supplies of primary energy were 216,895 PJ, oil shale formed 63 % and wood and peat together 11 per cent of the supplies.

Estonian Energy Sector depends mostly on use of fossil energy sources. Oil shale is the most important mineral resource of Estonia. In 2005, about 14 mln. t of oil shale was mined and 85 % of the oil shale was used for power production. Narva power stations. Ahtme and Kohtla-Järve power stations are producing electric energy and heat from oil shale. In addition to combustion in power stations, oil shale is also used for the production of oil and in chemical industry (in 2005 about 2.0 mln t oil shale was used in oil shale chemical industry).

As oil shale is the strategic energy source of Estonia, economic and environmental and also social policy and security aspects must be taken into account when its use (power industry and chemical industry) and volumes are planned. At the moment, the conclusions of the oil shale resource adequacy assessment are the following.

- At the current volume of consumption (12-14 mln t/a), the active supplies of the operating mines and quarries will last until 2025. If the volume of consumption does not decrease, in approximately 20 years new mines must be opened and, if the volume of consumption increases, new mines must be opened already sooner.
- At the current volume of consumption, the total active supplies of oil shale will last for 60 years calculated on the basis of the technical-economic conditions of power stations.

In the Estonian power industry, natural gas is a considerable alternative to oil shale, as it is the most environment-friendly of the fossil fuels. All the gas is supplied from one country – Russia. The competitiveness of natural gas upon energy production is affected by environmental taxes and the state security aspect. By 2010, the use of natural gas is expected to be double in the whole Europe and the consumption of gas will increase also in Estonia.

In Estonia, an enterprise in private law *AS Eesti Gaas* imports, transmits and sells natural gas. The Estonian gas pipeline is a downstream gas distribution network of local importance i.e. there are no compression stations. Pipelines and border metering stations now enable the transportation of 8–10 mln m^3 gas in a twenty-four hour period depending on the supply regime. Currently, the maximum of 5–5.5 mln m^3 in a twenty-four hour period is used in winter months (at -20 C). If the consumption of gas increases to a significant extent, the state shall have to interfere more in the gas industry and analyse the risks of ensuring the security of supply of natural gas. The long-term price risk of natural gas is also of significant importance.

Estonia may increase the stability of gas supply if it participates in the development of the underground storage facilities of Latvia and establishes stocks into the facilities. The supply risks of natural gas would also be reduced by the construction of another gas pipeline from Russia to Europe and connecting the Estonian gas system to the gas pipeline. According to the assessments, the possible implementation of the project takes 10 years and does not depend directly on Estonian interests. Additionally, connection of the gas networks of Estonia and Finland has been discussed. The most important development project of the recent years is connecting the city of Pärnu to the natural gas network.

Peat is a competitive local fuel particularly in small-scale power industry (in boiler plants and small combined heat and power production stations), but it is possible to burn peat together with oil shale also in the renovated energy blocks of the Narva power station. At the moment, the supply of peat, which can be used is estimated to be 775 mln t. For agricultural and forestry purposes and for the extraction of peat on drained areas, every year the peat supply decreases by 2.5-3 million tonnes due to the decay process and at the same time it proportionally increases the amount of CO_2 in the atmosphere. Restrictions arising from nature protection significantly affect the use of peat, natural moors are protected in the European Union in the framework of Natura 2000. Thus, upon peat mining, it must be taken into account that only the peat of drained swamp areas is used and new areas are not drained until 2025. The use of peat in the Estonian power industry slowly increases.

The consumption of the coal has been reduced in Estonia. The greatest consumers are industrial enterprises, households (for heating) and small boiler plants (for the production of heat). Coal is not used for the production of electricity in Estonia. Due to large coal resources in the world, in the long-term, depending on the development of different factors (e.g. environmental taxes), the production of electricity on the basis of coal might become feasible. But according to current government plans it will not happen before 2015 and then already on the basis of new clean technologies. Technically, it is possible to use coal together with oil shale also in the renovated energy blocks of the Narva power station.

Liquid fuels which, in 2004, formed 13,7 per cent of the primary energy supply of the state, are divided into fuel oils and motor fuels.

In the future, the proportion of heavy fuel oil in the Estonian fuel balance decreases. Due to high prices, the use of light heating oil is expected to decrease. As an alternative to fuel oils, shale oil the viscosity of which is lower than that of heavy fuel oil (the preheating temperature decreases) and the sulphur content of which is smaller, is used in small boilers (in addition to natural gas).

In connection with the increasing number of motor vehicles, the consumption of motor fuel in Estonia increases. According to the prognosis of the Ministry of Economic Affairs and Communications, the consumption of motor vehicle petrol and diesel fuel increases 1-3 per cent per year, and the increase decelerates in the long term. By 2010, the consumption of motor vehicle petrol increases to up to 328 000 tonnes and the consumption of diesel fuel increases to up to 208 000 tonnes per year.

2.1.1 Power Production

The main source of Estonian power production is electricity generation based on small number of large fossil-fuel power plants. The primary fuel for power production is oil shale, although natural gas, oil-shale gas, landfill gas, shale oil, diesel oil and peat are used as fuels as well micro hydro-power plants and growing volume of wind turbines are in operation. There was total installed electrical capacity of thermal power plants 3051 MW from which 2680 MW was usable as well 4,4 MW hydro-plants (usable 4,1 MW) and 22,8 MW (usable 6,7 MW) of wind turbines in 2004. In 2004, 92,3% of electricity was produced from oil shale fired power plants (in 2003 92,1%) and 4,7% from natural gas, 0.3% from shale oil, 0,1% from peat, 1,9% from generator gas and about rest 0,3 % from hydro and wind.[2] Pulverised oil shale combustion creates highly polluting energy generation due to high sulphur dioxide content (10-20 g/KWh), large CO_2 (1350 –1400 g /kWh) emissions, and large amounts of fly ash (12-20 g/kWh). New Circulating Fluidized Bed (CFB) boilers, commissioned on 2004 and 2005 in Eesti and Balti Power Plants of Narva Power Ltd have better environmental performance.

In 2004, 10,087 TWh of electricity was produced from power stations and about 11 532 thousand tonnes of CO_2 was emitted into the atmosphere by AS Estonian Energy power plants. Estonia's total aggregate anthropogenic equivalent CO_2 emissions in 2003 was 21387 Gg (2001 – 19436; 2002- 195249) showing trend of growth.[3] In Estonia, power is generated primarily in the oil shale-fired condensing power plants. The Eesti and Balti power stations are the largest, with 2004 installed power production capacity of the 1610 MW and 1390 MW usable. Other than the Iru combined heat and power station (190MW), all of the other 15 power stations are relatively small combined heat and power stations, ranging from 0.2MW to 27 MW.

The age of the Balti power station units is over 35 years (commissioned in 1959-1966). The old TP-17-type boilers are, however, in extremely bad condition (units 1-8, but according to management, the newer TP-67-type boilers can be kept running for another 10-15 years (or 50 000 -70 000 running hours).

The old pulverised combustion oil shale boilers at Balti and Eesti PP-s will not comply with future environmental requirements as Estonia's regulation is harmonized with EU regulation. In addition, the fly ash and SO_2 emissions from the Balti power station do not meet required emission rates in flue gases for the existing combustion equipment, which came into effect January 1, 2008. By the end of 2010 old oil-shale based capacities have to be phased out at Ahtme PP and by the end of 215 at Balti and Eesti PP-s. Eesti Energia, the national utility, has found that the only way to increase the thermal efficiency of the boiler units and reduce environmental impact of the emissions is to employ a new, more effective technology.

[2] Energy balance 2004. Statistical Office of Estonia. Tallinn 2005.

[3] UNFCCC National greenhouse gas inventory data for the period 1990-2003 and status reporting. October 2005

Refurbishment of unit 11 at Balti has been completed in the end of 2004. The 200 MWe unit 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 unit in the Balti power station, the 8 TP-17-type boilers (units 1-8) will be removed and not replaced. For the Eesti power station, unit 8 was renovated to CFB technology by the spring 2005, resulting in capacity of 215MW for that unit instead of old 200MW. Further renovations are foreseen at major oil-shale powered plants into CFB technology according to the investment plans of Eesti Energia as well indicated within National Electricity Sector Development Plan 2005-2015.

2.1.2 Renewable power production and potential

The Renewed National Environmental Strategy identified reduction of negative effects from the energy sector (i.e., air pollution) and improvement of air quality as a priority. In addition, the Long Term Development Plan for the Fuel and Energy Sector up to Year 2015[4] (hereafter called referred to as the Long Term Development Plan), identified as one of the main strategic goals of the Estonian Government as promoting wider use of renewable energy and to reach a share of 5.1% of renewable power in gross electricity consumption by 2010 and at least 8% by the 2015[5]. This would be part of compliance with the EU Directive (RES-E; Directive 2001/77/EC). While the environment for renewable energy has latest years improved and progress of renewables deployment is noticeable, the share of renewable electricity from domestic consumption is still low - only 0.27 % of Estonia's electricity consumption on 2003 and this share has grown to 1,04% on 2005. This means that only a small fraction of the potential for renewable power (see Table 1) has been utilised so far. Current installed capacity includes a number of small-scale hydro power plants and a few wind turbines. As of December 2005 3 modern wind farms are operational and several are under construction in Estonia The 1.8 MW Virtsu I wind farm was put in operation in autumn 2002, with German donor support for implementation. The Pakri 18.4 MW wind farm commissioned in summer 2005, and was part of the Finnish JI/CDM Pilot Programme as well as the EU Fifth Framework Programme for research and demonstration. 8,0 MW Esivere wind farm on western coast, north from Virtsu, was also commissioned in October 2005. Currently there are in coming years under different phases of development about 20 wind-farm projects with total planned capacity of 537 MW. The Long Term Development Plan calls for the use of the Kyoto Protocol Joint Implementation mechanism for development of Estonia's renewable electricity sector. This is necessary due to the much higher costs of wind power production compared to other sources (see Table 1).

[4] Long-Term National Development Plan for the Fuel and Energy Sector until 2015. Ministry of Economic Affairs and Communication. Tallinn 2004

[5] National Electricity Sector Development Plan 2005-2015, https://www.riigiteataja.ee/ert/act.jsp?id=979263

Table 1. Costs and potential of renewable and fossil fuel power in Estonia

	Potential capacity	Potential electricity production	Production cost EEK (Euro)/kWh
Oil shale (CHP or condensing)			<0.41 (<0.026)*
Combined Heat and Power:	105 MW	0.75 TWh	
- natural gas			0.45 (0.029)
- waste			0.65-1 .00 (0.04-0.06)
- waste			1.00-1.50 (0.06-0.10)
Wind	560 MW	1,28 TWh	0.80-1.50 (0.05-0.10)
Hydroelectric	40 MW	0.2 TWh	0.60-1.10 (0.04-0.07)
Solar	~500 MW	0.2 TWh	5.00-10.00 (0.32-0.64)
Technical potential	1205 MW	**2.53 TWh**	

*the sales price of oil shale power from the Narva PP is 0.41 EEK/kWh, so the production cost is lower than this.

Source: Eesti Energia AS

According to the Long Term Development Plan Estonia's renewable energy potential mainly lies in combined heat and electricity production and wind energy, and to a smaller extent in hydropower. The wider use of biomass-based CHP electricity production is limited by lack of additional heat demand and the fact that heat-only generating equipment has already been installed in regions with high heat demand. Also, large-scale export of biofuels prevents the wider use. Still Government is foreseeing strengthening of the policy instruments[6] for promoting use of biomass and biomass-based efficient co-generation

2.1.3 Electricity production sector development in the period 2005 –2015

The Long Term Development Plan for the Fuel and Energy Sector was adopted by the Parliament (Riigikogu) on December 16, 2004. This development plan is based on the Sustainable Development Act (RTI 1995, 31, 384; 1997, 48, 772; 1999, 29, 398; 2000, 54, 348) and directs the development of the Estonian fuel and energy sector until 2015. The document defines the current situation in the sector, presents issues set out in the EU accession treaty, prognoses developments in the energy consumption, states the

[6] National Strategy for Ecological Tax Reform, http://www.fin.ee/index.php?id=14278

strategic development objectives for the energy sector, the development principles and the extent of the necessary investments. The plan describes the problems that require further analysis and the functions of the state relating to supervision and regulation. The strategic environmental assessment of the document is presented in the strategic environmental assessment statement of the long-term public fuel and energy sector development plan, which has been prepared at the same time as the development plan. The development plan and the statement are both disclosed on the website of the Ministry of Economic Affairs and Communications (www.mkm.ee).

The fuel and energy sector is a strategic infrastructure of the state, which must ensure that Estonia has an uninterrupted supply of high-quality fuel, electric energy and heat at optimal prices. At the same time the fuel and energy sector must be as efficient as possible and comply with the safety and environmental requirements. The sustainable fuel and energy sector is one of the bases for national security.

The strategic objectives of the Estonian fuel and energy sector are to:

- ensure fuel and energy supply with the required quality and at optimal prices;
- ensure the existence of local generating power to cover the domestic electricity consumption needs and the supply of liquid fuel in compliance with law;
- ensure that by 2010 renewable electricity forms 5.1 per cent of the gross consumption;
- ensure that by 2020 electricity produced in combined heat and power production stations forms 20 per cent of the gross consumption;
- ensure that the power network is completely modernised in approximately every thirty years;
- ensure that, in the open market conditions, the competitiveness of the domestic market of oil shale production is preserved and its efficiency is increased, and apply modern technologies which reduce harmful environmental impact;
- ensure compliance with the environmental requirements established by the state;
- increase the efficiency of the energy consumption in the heat, energy and fuel sector;
- until 2010, maintain the volume of primary energy consumption at the level of the year 2003;
- develop measures which enable the use of renewable liquid fuels, particularly biodiesel, in the transport sector;
- ensure that modern know-how and specialists are constantly available in all fields of the fuel and energy sector to promote technology development within the state and enable transfer of the modern energy technology;
- establish preconditions for the establishment of connections with the energy systems of the Nordic countries and Central European countries.

Brand new National Electricity Sector Development plan 2005-2015[7], which was adopted by the Government on January 3rd, 2006 foresees rise of the share of electricity produced from renewable sources at least to 8% (wind 4,5%, Biomass 3,0% and others 0,5% respectively) from domestic electricity consumption by 2015.

2.2 Key factors influencing the development of the power sector

2.2.1 Legal Factors

The main regulation of the fuel and energy sector is provided for in the following Acts:

1. the Electricity Market Act (RT I 2003, 25, 153; 2004, 18, 131; 30, 208),

2. the Natural Gas Act (RT I 2003, 21, 128; 2004, 18,131),

3. the Liquid Fuel Act (RT I 2003, 21, 127; 88, 591; 2004, 18, 131, 53, 365),

4. the District Heating Act (RT I 2003, 25, 154; 2004, 18, 131),

5. the Energy Efficiency of Equipment Act (RT I 2003, 78, 525).

Changes introduced to the Estonia Energy Act in 1998 first established a fixed price, at which, electricity from renewable electricity sources (RES) should be purchased by the system operator or grid operator where producer is connected. The *Electricity Market Act*[8] (enacted 1 July 2003) stipulates the liability for network operators to purchase electricity produced from renewable energy sources[9].

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

- The Act notes that any incentives to RES producers will end in December 2015, which means that renewable energy plants that start commercial operation soon will maximize their income from the governmental support scheme. Until today the price paid to RES producers (the "feed-in tariff") was tied to the sales price of electrical energy from the Balti and Eesti power plants. It was set at 1.8 times the average 'Narva price'[10], approved by the Energy Market Inspectorate, and adjusted periodically.

- An unexpected significant fall of the 'Narva price' in October 2004 resulted in a decline of the feed-in tariff to a 0.74 Estonian Crown (EEK) /kWh (€0.047 / kWh). In response, the Parliament of Estonia adopted an amendment to the Electricity Market Act in December 2004 that unties the feed-in tariff from the 'Narva price'

[7] https://www.riigiteataja.ee/ert/get-attachment.jsp?id=984718

[8] Electricity Market Act (2003). *Riigi Teataja* (State Herald) I 2003, 25, 153

[9] Renewable energy sources are wind, hydropower, solar, wave, tidal, geothermal energy, landfill gas, wastewater treatment gas, biogas and biomass.

[10] "The Narva Plants" is the name for the Balti and Eesti power stations together

and establishes a fixed feed-in tariff at a level of 0,81 EEK/kWh (€0.051/kWh), effective from 1 January 2005.

New proposals for amendment of Electricity Market Act (as proposed by Ministry of Economy and Communications, from August 2006) foresee maintaining of feed-in tariff on the level of 0,81 EEK/KWh valid for electricity produced from renewable sources valid from 12 years of commissioning but limits provision of such feed-in tariff to wind parks until 200 GWh annual production volume is reached. Between 200 GWh and 400GWh production volume, wind-power producers will be granted extra premium 0,5 EEK/kWh by system operator additionally to market price. Beyond 400 GWh production volume of wind-generated electricity only support measure will remain tradable Certificate of Origin. Additional to support to renewable electricity producers new proposal foresees support to efficient go-generators using peat and waste fuel and for small boiler operators (below 10MW) converting to co-generation like fixed price of 0,47 EEK/ kWh for electricity purchase or payment of premium of 0,16 EEK/kWh beyond market price both for 12 year from commissioning.

Estonian Power sector is influenced by several environmental acts like Environment Use Fees Act. New *Environment Use Fees Act* valid from 1. January 2006 replaced *Pollution Charge Act* from February 1999. The Act unites and unifies the charges to be paid both for the use of natural resources (incl oil-shale, peat, water) and for the release of pollutants or waste into the environment and a procedure for the calculation and payment of the charges.

Compared to the previous provisions targeting electricity production sector major changes are the expansion of obligation to pay the CO_2 charge to all electricity and heat producers instead the enterprises with boiler capacities over 50 MW (excluding those firing renewable energy sources). The new Environment Use Fees Act provides higher rates of pollution charges up to the year 2009 Pollutions charges on CO_2 doubled as doubled the fees to other major air emissions and natural resources. From 1.01.2006 fee for CO2 emission is 15,65 EEK/t (1 EUR/t) from 1.01.2008 fee is 1,5 EUR/t and from 1.01.2009 fee will be 2 EUR/t. Penalties for companies participating in EU Emission Trading Scheme for CO2 emission beyond allowances will be as set by EU Emission Trading Directive.

2.2.2 Economic Factors

Fuel availability

Estonian oil shale reserves are large with proved reserve of 728 million of tons; in 2003, 14.9 million tons of oil shale was mined.[11] These reserves will provide primary energy supply for the energy industry for about 25 years or more.[12]

The biggest oil shale consumers are power plants. In 2004, the demand by power plants was 12.8 Mt, shale oil industry was 0.92 Mt, and cement industry was 0,366 Mt[13]. Industry forecasts indicate that from 2004-2012 the power sector will use 9.2 Mt

[11] Statistical Yearbook of Estonia 2004. Statistical Office of Estonia. Tallinn 2004, p 345.

[12] Kattai. V., Saarde. T., Savitski. L. Eesti Põlevkivi – geoloogia, ressurss, kaevandamistingi-mused. Tallinn 2000, p 120.

[13] Statistical Yearbook 2004. Statistical Office of Estonia. Tallinn, 2004.

annually. This means fuel availability is not a constraint to the use of additional oil shale-fired power in the future.

Market price for oil shale

The average oil shale price for producers of electricity and heat was 116 EEK (7.41 EUR)[14] per ton of oil shale in 2004, and has stabilised at this level over the past few years. This means that oil shale will continue to be the least expensive fuel for power generation. Slight increase in oil-shale price is foreseen due to the increased resource emission fees in coming years.

Change in electricity consumption

According to the Long Term Development Plan, electricity demand is expected to increase 2–3.75% per year until year 2015, but EU Accession driven economic growth has geared up the electricity consumption both by economic sectors as well households. In 2003 total production of electricity increased with 19 % compared to 2002, next year growth was 5,2% and in 2005 compared to 2004 there was again increase of electricity consumption by 1,2 %. This demand can be met through renovation of existing power stations and increased load factors until 2008, but then the remaining older power stations will only be available for limited operation due to their condition. This means that in the medium term, new capacity is required to meet demand, as well as renewable capacity being required to meet EU targets.

2.2.3 Political Factors

In order to provide uninterrupted performance and sustainable development of the national energy system, the Long Term Development Plan stipulates the following key targets in energy production during the considered period:

- Provide the fuel and energy supply with required quality and optimal prices.
- Provide local generating capacity to cover peak domestic load having a minimal liquid fuel reserve.
- Achieve the share of renewable electricity of 5.1% of total consumption by 2010.
- Achieve by 2020 the share of electricity produced at the plants of electricity and heat cogeneration by 20% of total electricity production.
- Ensure competitive conditions in the open market to increase of efficiency of the oil shale energy, while applying up-to-date environmental management.
- Ensure the fulfilment of nationally accepted environmental requirements.
- Further develop the energy conservation strategic program to improve the energy utilisation in the heat, electricity and heating sectors by composition and implementation of detailed plans in every sector.
- Ensure steady presence of up-to-date technology and experts in all domains of the fuel and energy sector.

[14] Energy Balance 2004. Statistical Office of Estonia. Tallinn, 2004.

- Develop preconditions for building connections with power systems of the Nordic Countries and Central Europe.

Long term Development Plan foresaw drafting of the development Plan for Oil-Shale use by the end of 2005. As process of drafting of mentioned Development Plan has been delayed (started in June, 2006) then there is too early to predict possible additional restrictions to oil-shale mining and use as well the impact of development plan to electricity sector.

2.2.4 Influence of EU directives and policies

Major impact to Estonian Power Sector has EU Directive on reduction of emissions from large combustion plants (Directive 2001/80/EC) setting limit values to air emissions from plants beyond 50 MW thermal capacity. Estonia has been granted transitional period for oil-shale powered plants, but according to Accession agreement, old oil-shale capacities have to be phased out by the end of 2015 (Ahtme PP by 2010).

In addition to the EU Directive on renewable electricity mentioned earlier, a declaration on oil shale and the Electricity Directive has been agreed in which the EU recognises the unique situation related to the restructuring of the oil shale sector in Estonia, and that this will not be fully implemented before the end of 2012.

The issue of gas market opening (Directive 98/30/EC) cannot be considered at present, as there is only one supplier of natural gas to Estonia – Russia – and there are no gas pipelines connecting Estonia with other countries supplying natural gas. The pipelines connecting Estonia with Latvia are used for supplying Russian gas as well giving also a possibility of using large underground gas storage in Latvia. This means that there are unlikely to be any gas fired power stations in the near future.

One of strong driving force for changes in Estonian power sector turned out to be the EU Directive establishing Europeanwide scheme for GHG allowances trading (Directive 2003/87/EC), as attractive price in emerging market for allowances is strong incentive for fuel replacement, production efficiency rise and technology shift within power sector.

3 Application of baseline methodology

The structure of this chapter follows section B and section E of the JI PDD form, VERSION 01 – IN EFFECT AS OF 15 JUNE 2006, as applied to this particular study.

3.1 Description and justification of the baseline chosen:

ACM0002/Version 6 (May 2006) Consolidated baseline methodology for grid-connected electricity generation from renewable sources has been applied for current study.

The relevant applicability conditions of ACM0002 are as follows:

- Applies when " The project activity is grid-connected electricity generation from renewable energy 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."

JI project developers, which will use current baseline, should ensure that all of these conditions are met in the case of planned JI project.

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 example wind power projects 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 utilities, based on the heat and power characteristics of each CHP plant and actual use of fuels for electricity production.

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

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

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 (tCO_2/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 $COEF_{ij}$ 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)

$EF_{CO2,i}$ = CO_2 emissions factor per unit of energy of fuel *i* (tCO_2/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 plants for the years 2003-2005. All plant data and parameters used for the calculation are presented in Annex A, and the calculations and results are shown in section 3.5.

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 Table A.1). 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. 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.

The details of the calculation are presented in section 3.5 below.

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-parks allowed, weighting 75% OM and 25% BM has been used in for this study.

3.2 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

ACM0002 incorporates the "Tool for demonstration and assessment of additionality"[15] This consolidated tool includes the following steps, which have been applied to the proposed project activity:

Step 0. Preliminary screening based on the starting date of the project activity

Because usually proposed JI project activity will not apply for crediting before registration, this screen is not applicable.

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

Define realistic and credible alternatives to the project activity(s) that can be (part of) the baseline scenario through the following sub-steps:

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

Based on the description of the Estonia power sector in Section 2, particularly the fact that Estonia has sufficient power generation capacity, this section describes the alternatives considered, and whether they are realistic and credible.

Scenario 1: 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 and Balti power plant is completed and also foreseen further both in Government plans and company investment plans.

Scenario 2: Upgrade and partial closure of Narva power plants: This scenario includes the refurbishing of 200MW units at Eesti and Balti power stations from pulverized bed to circulating fluidized bed combustion (CFBC) technology by 2005/2006, and closing down of units 1-8 at Balti power station. At the Balti power station, the renovated units 11 and 12 will be used for normal operation, while units 9 and 10 will be used for standby. The net output of the plant will be 1481 GWh/year, as opposed to current production of 2134 GWh/year.

This is 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 will allow the plants to meet necessary environmental targets.

[15] EB16 Report, Annex 1

Scenario 3: 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 EEK0.81/kWh, the cost of wind power generation is much higher than for oil shale fired power (see step 2). This scenario is therefore not credible.

Scenario 4: 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 (see Table 1). 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.

This analysis has shown that the only credible alternative scenario is Scenario 2.

Sub-step 1b. Enforcement of applicable laws and regulations:

"The alternative(s) shall be in compliance with all applicable legal and regulatory requirements, even if these laws and regulations have objectives other than GHG reductions, e.g. to mitigate local air pollution"

The remaining scenario 2 would meet relevant laws and regulations, including EU pollution regulations.

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 III (benchmark analysis), as specified in ACM0002.

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

The appropriate indicator for power production is the unit cost of power production – in this case EEK/kWh.

Sub-step 2c. Calculation and comparison of financial indicators (only applicable to options II and III)

With the amendment to the Electricity Market Act in December 2004 and also with changes currently proposed and not valid yet, the fixed price for wind power supplied to the grid is 0.81 EEK/kWh. This price is fixed until 2015 (or for 12 years from commissioning if new proposal becomes valid), which is beyond the end of the proposed JI project activity if started 2006. The question, then, is whether the production cost of the proposed project activity is less than this fixed price.

The usual wind-power project Business Plan have demonstrated that, given investor requirements and the risks associated with this project, a tariff of around 0.90 EEK/kWh would be required to make the project financially viable if it were not an accredited JI project. This is substantially higher than the feed-in tariff available during first 12 years of operation, and the gap is even greater compared to potential prices post that 12-year period.

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 2, 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 plants where second-hand generators are installed. 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. German government support) or are demonstration and research facilities rather than commercial businesses.

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 with current investment costs of new modern wind turbines is not high enough to make the wind project activity financially 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, wind project will be able to attract equity and debt financing, and overcome the barrier described in step 3.

3.3 Description of how the definition of the project boundary is applied to the project

ACM0002 specifies that the project boundary will be:

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 A. 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.

3.4 Further baseline information, including the date of baseline setting and the name(s) of the person(s)/entity(ies) setting the baseline

Baseline study date: 07.november 2006

Conducted by: Valdur Lahtvee and Dr. Tiit Kallaste, Stockholm Environment Institute Tallinn Centre.

3.5 Estimation of greenhouse gas emissions reductions

3.5.1 Estimated project emissions:

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

3.5.2 Estimated leakage:

No leakage estimate is required in ACM0002 for wind power.

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

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

3.5.4 Estimated baseline emissions:

Baseline emissions are given by:

$$BE_y = EG_y \times EF_y$$

Where

BE_y = Baseline emissions in year y (tCO2)

EG_y = Electricity generation by the project in year y (MWh)

EF_y = Combined margin emissions factor for the year y (tCO_2/MWh)

The formula for combined margin, operating margin and build margin are explained in section 3.2.

For the Estonian power section, the operating margin for 2003, 2004, and 2005, are 1.13, 1.07 and 1.04 tCO_2/MWh, respectively. The average operating margin is 1.08 tCO_2/MWh. The build margin is 1.16 tCO_2/MWh. The combined margin is 1.102 tCO_2/MWh. Total annual baseline emissions are shown in Table 2.

3.5.5 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.

3.5.6 Table providing values obtained when applying formulae above:

The table below summarises the emissions reductions, assuming a project output of MWh/year.

Table 2. Summary of emissions factors and emissions reductions

Emissions Reductions	Per Year	Total crediting period (2008-2012) 5 years
Operating margin emissions factor (EF_{OM}, tCO_2/MWh, 2003)	1.13	
Operating margin emissions factor (EF_{OM}, tCO_2/MWh, 2004)	1.07	
Operating margin emissions factor (EF_{OM}, tCO_2/MWh, 2005)	1.04	
Build margin emissions factor (EF_{BM}, tCO_2/MWh, 2001)	1.16	
Baseline emissions factor (EF, tCO_2/MWh)	1.102	
Baseline emissions (tCO_2)	A*	B*
Project Emissions (tCO_2)	0	0
Emissions Reductions (tCO_2)	x*	y*

*to be calculated according to project performance

Annex A: Baseline information

Table A.1. Power plant characteristics of the Estonian grid

Name	Year Built	Fuel type	Capa-city	Generation			Fuel consumption for electricity production		
			(MW)	Net output (GWh)			(TJ)		
			2006	2003	2004	2005	2003	2004	2005
Balti CHP	1965	Oil shale	800	1913,6	1397,0	1620,0			
		Shale oil							
Eesti PP	1973	Oil shale	1610	6550,0	7212,0	6734,0			
		Shale oil							
		Oil shale gas							
Iru CHP	1982	Natural gas	190	387,2	365,0	399,0			
		HFO							
Ahtme CHP	1958	Oil shale	20	30,2	29,8	32,3			
		Shale oil							
Kohtla -Järve North CHP	1955	Oil shale	27	14,2	20,0	32,0			
		Shale oil							
KohtlaJärve South CHP	1997	Oil shale gas	8,0	10,0	12,0	36,0			
Prangli DE	1989	Diesel oil	0,2	0,3	0,3	0,3			
Saarte DE	1994	Diesel oil	0,2	0,3	0,3	0,3			
Silmet CHP	1954	Oil shale	12	6,5	21,1	60,7			
Tootsi CHP	?	Peat	5	10,2	10,2	10,2			
Sangla CHP	1998 renov	Peat	2,5	9,9	9,9	10,0			
Horizon CHP		Natural gas	8,5	30,0	30,0	30,0			
Kiviõli CHP		Oil shale gas	8,0	32,0	32,0	46,0			
Kunda CHP	1998	Natural gas	3,1	25,2	25,2	22,5			
Grüne Fee CHP	1997	Natural gas	2,0	10,5	10,5	10,5			
Põlva CHP	1999	Natural gas	0,9	0,0	0,0	0,0			
Narva Vesi CHP	1999	Natural gas	0,5	3,5	3,5	3,5			
Kristiine CHP	2000	Natural gas	0,5	2,5	2,5	2,5			
Terts Ltd. CHP	2001	Landfill gas	0,8	0,4	0,4	0,4			
RES Plants		Hydro, Wind	54	25,0	38,0	88,0			
Imports				93,0	347,0	345,0			
Total net output			2753,2	9101	9232	9114	101866	101283	97682

Source: SEI Tallinn (confidential, obtained from enterprises) and BASE Project: "National Electricity Sector Baseline Analyses", AS Estivo, 2003.

Table A. 2. Plant emissions factors

Name	Fuel consumption for electricity production			Carbon emissions			Plant Emissions Factor		
	(kt or Mm3)			(ktCO2)			(tCO2/MWh)		
	2003	2004	2005	2003	2004	2005	2003	2004	2005
Balti CHP				2176,5	1557,4	1737,7			
				6.4	18,5	7,4			
Total Balti				**2182,9**	**1575,5**	**1745,1**	1,14	1,13	1,08
Eesti PP				7948,1	8404,9	7730,4			
				19.9	80,3	89,3			
				33.6	32.1	33.6			
Total Eesti				**8001,6**	**8506,5**	**7838,2**	1,22	1,18	1,16
Iru CHP				152,4	138,4	180,9			
				0.0	0,0	0,0			
Total Iru				**152,4**	**138,4**	**180,9**	0,39	0,38	0,45
Ahtme PP				17,5	17,3	18,7			
				0,3	0,3	0,3			
Total Ahtme				**17,8**	**17,6**	**19,0**	0,59	0,59	0,59
Kohtla - Järve North CHP				13,8	16,8	13,4			
				1,6	1.6	1,6			
Total K-J				**15,4**	**18,4**	**15,0**	1,09	0,92	0,47
Prangli DE				0,2	0,2	0,2	0,88	0,88	0,92
Saarte DE				0,4	0,4	0,4	1,31	1,30	1,31
Kohtla-Järve SDouth CHP				9,3	11,2	11,6	0,26	1,12	0,99
Silmet CHP				0,2	0,7	1,9	0,03	0,03	0,03
Tootsi CHP				0,7	0,7	0,7	0,07	0,07	0,07
Sangla CHP				0,88	0,8	0,8	0,08	0,08	0,08
Horizon CHP				9,22	9,2	9,2	0,31	0,31	0,31
Kiviõli CHP				17,3	17,3	17,3	0,38	0,38	0,38
Kunda CHP				0,2	0,2	0,2	0,01	0,01	0,01
Grüne Fee CHP				0,1	0.1	0.1	0,01	0,01	0,01
Põlva CHP				0,0	0,0	0,0			
Narva Vesi CHP				0,0	0,0	0,0	0,01	0,01	0,01
Kristiine CHP				0,0	0,0	0,0	0,02	0,02	0,02
Terts Ltd. CHP				0,0	0,0	0,0	0,00	0,00	0,00
RES plants				0,0	0,0	0,0	0,00	0,00	0,00
Imports							0,00	0,00	0,00
Total				10 408,4	10 297,6	9840,7			

Source: Fuel consumption - enterprises data not shown (confidential)

Table A. 3. Fuel specifications

Type	Unit	Net Calorific Value	Carbon Content	Conversion	Emission Factor	Oxidation Factor	Emission Coeff
		(GJ/unit)	(tC/TJ)	(tCO2/tC)	(tCO2/TJ)	(%)	(tCO2/t fuel)
Oil Shale	t	8.39	29.1	3.667	107	98.0%	0.877
Natural Gas	Mm3	33.5	15.3	3.667	56	99.5%	1.870
Peat	t	9.2	28.9	3.667	106	97.0%	0.946
Kerosene	t	42.5	21.1	3.667	77	99.0%	3.255
Shale oil	t	39.5	21.1	3.667	77	99.0%	3.025
Oil shale gas	Mm3	46.1	15.3	3.667	56	99.5%	2.573
Diesel oil	t	42.3	20.1	3.667	74	99.0%	3.086

Sources: Net Calorific Value- *Energy Balance 2003*. Estonian Statistical Office, Tallinn, 2004; *Energy Balance 2004*. Estonian Statistical Office, Tallinn, 2005.

Carbon Content and Oxidation factors– IPCC Greenhouse Gas Inventory Reporting Instructions. Edited by J. T. Houghton, L. G. Meira Filho, B. Lim, K. Treanton, I. Mamaty, Y. Bonduki, D. J. Griggs, and B. A. Callander. Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories. 1996 (Vol. 1-3).

References

ACM0002. Consolidated baseline methodology for grid-connected electricity generation from renewable sources. Available at http://cdm.unfccc.int/Panels/meth/Meth20_repan09_ACM0002_ver06.pdf

BASE Project: "National Electricity Sector Baseline Analyses", AS Estivo, 2003

CDM Project Design Document (version 2, 1 July 2004), UNFCCC. Available at http://cdm.unfccc.int/Reference/Documents

Joint Implementation Project Design Document Form. Version 01 - in effect as of: 15 June 2006. Available at http://ji.unfccc.int/Ref/Documents/JI_PDD_form.doc

Esivere and Virtsu II Wind Power Development Baseline Study, Econ Analysis AS, March 2005

Eesti Energia aastaaruanne 2005/6. Tallinn 2006. Available at http://www.energia.ee/documents/c7137d580c754d6.pdf

IPCC Greenhouse Gas Inventory Reporting Instructions. Edited by J. T. Houghton, L. G. Meira Filho, B. Lim, K. Treanton, I. Mamaty, Y. Bonduki, D. J. Griggs, and B. A. Callander. Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories. 1996 (Vol. 1-3).

Energy Balance 2002. Estonian Statistical Office, Tallinn, 2003;

Energy Balance 2003. Estonian Statistical Office, Tallinn, 2004.

Energy Balance 2004. Estonian Statistical Office, Tallinn, 2004

J. T. Houghton, L. G. Meira Filho, B. Lim, K. Treanton, I. Mamaty, Y. Bonduki, D. J. Griggs, and B. A. Callander (Eds). IPCC Greenhouse Gas Inventory Reporting Instructions. Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories. 1996 (Vol. 1-3).