Deliverable Number 3

LEGAL AND REGULATORY FRAMEWORK
FOR WIND POWER IN RUSSIA

Global Environment Facility and International Finance Corporation (GEF/IFC)
Activity 1

GRID INTERCONNECTION AND OPERATION
FOR WIND POWER PLANTS

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This Report forms part of the Medium Size Project for Developing the Legal and Regulatory Framework for Wind Power in Russia under a Grant from the International Finance Corporation (IFC) in its capacity as Implementing Agent for the Global Environment Facility (GEF). The content reflects the views and judgements of the Contractors and does not necessarily represent those of IFC or GEF.
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Grid Interconnection and Operations

Much of the activity in regard to the Grid Interconnection and Operations Agreement had to do with the specific pursuit of Goal 1 and related to the achievement of the actual pilot project in the Leningrad Oblast. However, this specific activity also led to the creation of a Model Agreement, which defined related engineering and technical activities and the sequential process. In addition, in pursuit of Goal 3, the educational and outreach process, numerous meetings were held with the regional utility and, on the federal level, with the United Energy Systems (UES), the Ministry of Industry and Energy, and federal grid authorities.

Connecting a Wind Power Plant to the existing grid in Leningrad Oblast in Russia will follow a well defined process that has been done successfully in many other countries. There are rigorous steps and procedures that must be followed to insure safe and compatible operation. The result will be improved power system reliability in addition to using a clean and sustainable energy source that is available locally. To connect to the grid it is necessary to work cooperatively with the major utility company operating in the Leningrad Oblast to assure that the utility will allow necessary hook-ups of the wind power plant to its grid and deliver the electricity generated by the wind plant to various customers. In the Leningrad Oblast there are two utility companies, a small one organized by the St. Petersburg municipality and serving a limited city network and the Oblast wide utility, Lenenergo, which serves as the Transmission System Operator and is part of the UES system. (See Appendix A for Abbreviations.)

There are a series of grid-related studies and agreements that are required and are being completed as the project moves toward operation. It is the intent of LenWind to pay for such studies and to pay for the necessary upgrades and reinforcement of the grid to accommodate the project. The scope and content of these studies are described later in this report.

1.0 System Benefits

System benefits will result from construction of the wind plant project. A new power line will be built to connect to the grid at a level that can accept the full 75 MW output at all times. Approximately 40 km of new 110kV lines will be added as part of the wind power plant project. These new lines will strengthen the grid in an area that can use additional load carrying capacity. Figure 3.1 shows the regional connection to the Lenenergo-UES grid.
power system where the new Wind Power Plant will be connected. The new wind power plant will be connected to the grid in the vicinity of Saint Petersburg. Overall grid system reliability will be improved as a result of new power lines that are part of the wind plant project, having connection to the grid at two points and providing double feed to the area. These benefits are in addition to the normal added value using an indigenous and sustainable energy source with generation located near to an area with growing industrial and residential demand for electricity.

Another aspect of using wind power in the Lenenergo system is that the windiest period is during winter months when hydropower production is limited. Wind and hydro resource data was collected in the Leningrad Oblast and the area surrounding Saint Petersburg as part of the Feasibility Study for the 75 MW commercial wind power plant project. Results showed that wind could provide needed support during the winter when the peak load occurred and help to smooth large year-to-year variations in hydropower production.

Hydropower system is about 6% of the generating capacity in the Lenenergo system. There are six major reservoirs that total 655 MW. Plants identified as GES-10 and GES-11, Svetogorsk Hydropower Plant (HPP) are on the Vuoksa River north of Vyborg. GES-13 is on the river Narva near Estonia and GES-9 is on the river Svir. These plants were built primarily for power generation and also to help with flood control. Hydropower production is important in the overall power system because the largest source of electricity, large Combined Heat and Power (CHP) thermal plants, are most heavily loaded during the winter months.

![1997-2001 Monthly Generation Data](image)

Figure 3.2 Russian hydropower plants monthly energy production (1997-2001) showing decreased generation during winter months

During the winter, the extremely cold weather in the Leningrad Oblast (annual average of 5°C in Saint Petersburg) and resulting sequestration of water in ice and snow causes major reductions in the monthly energy production by key hydropower plants. Five years of monthly energy production from three hydro plants closest to the wind plant site showed seasonal variation in energy production by a factor of two or more from summer to winter. See GES-13 on Figure 3.2. Annual peak daily demand for electric power in this region typically occurs in late December or
early January. But during peak power demand periods in winter months some of these plants are operated as peaking units and are shut down during off-peak demand periods to save water. Wind plants could often provide support during these periods since windiest months occur between December and April when water flow is lowest and demand for heat and power are highest. These issues are discussed in more detail in Reference [2].

It is clear that integrating wind and hydropower will enhance the value of both resources in the region. This integrated concept is being recognized more in Europe and North America as well.

2.0 Drawing on Interconnection Experience in other Countries

A variety of data were used in preparing the wind power integration and operating agreements and guidelines. The model Wind Power Plant Interconnection Agreement was patterned after the standard Lenenergo “Model Agreement for Electric Power Supply” attached as Appendix B. The model Lenenergo Agreement is used primarily for power delivery interconnects although many provisions regarding operations and billing needed to be modified. In addition, information and example interconnection agreements were drawn from the following sources

- US and European interconnection examples from actual projects [References 3-11].
- International Electrotechnical Commission (IEC) Standards and Definitions
- Turbine manufacturer “Electric Grid Data” technical interconnection criteria [12] attached as Appendix C.
- National Wind Coordinating Committee (NWCC) efforts to standardize interconnection procedures in US [10].

Grid Interconnection Approval Process

The established procedure in Russia for interconnection of the wind power plant to the existing grid had to be adjusted to accommodate the unique aspects of wind energy. Changes were based on experience gained with the large number of interconnected wind plants in Europe and the US. Lenenergo’s standard power supply interconnection agreement was used as the basis for the model Wind Power Plant Interconnection Agreement. Revisions were made only as necessary to account for the variable nature of wind power and for structuring the sale of energy by the wind company. The steps involved in obtaining approval for and signing an Interconnection Agreement are shown in Figure 3.3. LenWind prepared a project interconnection study as part of the Project Feasibility Study which included an evaluation of technical and cost considerations for alternative sites. LenWind then signed an Interconnection Protocol with Lenenergo in order to receive technical specifications for connection and to exchange proprietary information from the earlier Feasibility Study. Next, after the technical specifications are provided by Lenenergo, the project will prepare transmission lines and transformer substation designs which must be approved by the Power Systems Institute in Moscow. The Project Team decided it would include in the project the cost of needed transmission lines, transformer and substations upgrades. This was done to insure that these facilities would be ready when the plant becomes operational. Once these facilities are built, tested and ready for operation, acceptance of transmission lines and transformer substations is made with participation of representatives of Gosenergonadzor, the organization which commissions power projects, and Lenenergo.
Figure 3.3 Interconnection process steps between the Wind Power Project (the Generator) and the Transmission System Operator (Lenenergo)

Technical Aspects of Interconnection and Operational Studies
The studies and agreements required to bring the plant to operation are not long and involved. These actions and their timing are detailed in Figure 3.4 below.

<table>
<thead>
<tr>
<th>Steps To Grid Connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Analysis of interconnection issues and modelling of connection schemes at the various sites was completed in the project Feasibility Study. This study considered transmission line capacity and loading and projected regional load growth. Cost estimates for needed grid reinforcements were included [13].</td>
</tr>
<tr>
<td>2) Lenenergo review and endorsement of the grid connection Feasibility Study: 3 weeks after execution of an Agreement.</td>
</tr>
<tr>
<td>3) Power Systems Institute in Moscow will complete a Grid Impact Study that will involve LenWind, Lenenergo, UES and GE: 4 weeks after Agreement. This study will include a dynamic simulation of the regional grid based on technical data from Lenenergo and on turbine characteristics provided by the manufacturer. LenWind pays for this study.</td>
</tr>
<tr>
<td>4) LenWind will complete a Facility Design Study through an Equipment Procurement and Construction (EPC) subcontractor: 6 weeks after Impact Study is accepted by LenWind and Lenenergo.</td>
</tr>
<tr>
<td>5) LenWind and Lenenergo sign Interconnection Agreement: 4 weeks after completion of PPA and Tariff Agreement.</td>
</tr>
<tr>
<td>6) EPC subcontractor develops a Construction and Connection Agreement: 12 weeks after Facility Design Study is accepted by LenWind.</td>
</tr>
<tr>
<td>7) LenWind develops an Operating Guidelines: 20 weeks after Facility Design Study is accepted by LenWind.</td>
</tr>
</tbody>
</table>

There are technical issues that will be addressed in the Grid Impact Study with the goal of ensuring safe, stable and reliable plant operation during normal conditions and with faults and disruptions present, thus meeting Russian and International wind power norms and standards. The primary criteria to be met will be wind power standards promulgated by the International Electrotechnical Commission (IEC) [14], but specific values will depend on the characteristics of the grid at the point of connection. The project approvals procedures are discussed in other sections of this report. Technical issues that will be considered in the Grid Impact Study include, but are not limited to:

**Wind Turbine Related Technical Issues**
- Power Quality
- Voltage, frequency and VAR control
- Flicker and harmonics

**Stability and transient response**
- Operational Control
- Dispatch
- Ramp up and down rates (storm conditions) – Controllability
- Fault condition response

**Energy Storage** – integration with hydropower on an annual basis
Model Grid Interconnection Agreement

Too achieve grid interconnection for the pilot project, the GEF Team worked in parallel on Goal 2 and developed a Model Grid Interconnection and Operations Agreement and identified the process for obtaining such approval for such an agreement. The process first required a Protocol with the designated utility to agree to develop an Interconnection Agreement, based on LenWind’s plans and to release of the specifications needed for interconnection. General discussions addressed the amount of power to be delivered and when, rights and obligations – should wind not blow or should the grid not be able to accept the power, metering and billing to be done by LenWind, dispute settlement procedures, termination (Liquidation) procedures, liability of the Parties, and agreement period. Next steps in the process will be implemented following the completion of Power Purchase Agreements. The actual implementation of the interconnection process and the series technical studies and working agreements are all based on a large experience base in other countries, so the risk for Lenenergo and the developer is considered to be low.

References:
‘Lenenergo’ Owned Lines of 35-330 kV; and for Operation in Conjunction with Existing Hydropower Plants”, 2002. (Proprietary and confidential report)
APPENDIX A
Abbreviations and Definitions used in the
Model Grid Interconnection Agreement

Abbreviations:
CHP – Combined Heat and Power Plant (Thermal)
ECP - Equipment Procurement Contractor
FOREM (ZAO) – Federal Wholesale Market of Electricity of the Russian Federation
GEF – Global Environment facility
GES – Russian Numbered Hydro Electric power Station
HPP – Hydropower Plant
IEC – International Electrotechnical Commission
IFC – International Finance Corporation, part of the World Bank Group
LenWind – Leningrad Wind Power Company OOO
PPA – Power purchase agreement
RF – Russian Federation
(RAO) UES – United Energy Systems
WPP – Wind power plant

Definitions:
Automatic Generation Control (AGC) - The automatic regulation of the power output of
electric generators within a prescribed area in response to change in system frequency, tie-line
loading, so as to maintain the scheduled frequency or the established interchange with other
areas within predetermined limits.

Availability – percentage of time (normally calculated annually) a generator to ready to produce
deliver electric power at the levels and in compliance with other technical requirements as
instructed by the dispatch center.

Availability Test – a test performed by the dispatch center, or its designee, to check the actual
capability of a generator to deliver electric power at the level of electrical load and meeting other
technical requirements as instructed by the dispatcher.

Average cost - A method of determining the cost of providing service to the various consumer
classes. Average cost-of-service figures may be used in setting rates. Average costs are total
costs divided by the number of units produced.

Avoided Costs - The costs an electric utility would otherwise incur to generate power if it did
not purchase electricity from another source.

Breaker - An automatic switch that operates like a fuse and interrupts a circuit when too strong
an electric current is passing through it. A switching device capable of making, carrying and
breaking currents under normal circuit conditions and also making, carrying for a specified time,
and breaking currents under specified abnormal conditions such as those of a short circuit.
**Busbar (Bus)** - An electrical conductor in the form of rigid bars which serves as a common connection for two or more electric circuits.

**Commission** – The completion of all required testing and approvals prior to commencing normal commercial operation

**Converter** - A device that changes alternating current power to direct current power or vice versa, or changes one frequency to another.

**Current** - The flow of electricity or electrons through a circuit. Current is measured in amperes and can only flow through a circuit by a voltage.

**Current Transformer (CT)** - A transformer used in conjunction with a meter to measure the flow of current through a circuit.

**Disconnect Switch** - A power system device used to open a circuit in which only a negligible amount of current, or no current is flowing. Disconnecting switches are manually or motor operated, and are used to isolate relatively unloaded equipment. Air is the usual insulating medium between the contacts in the open position.

**Dispute Resolution** – The pre-selected procedures and processes for resolving contractual disputes between parties, such as arbitration, mediation or litigation.

**Distributed Generation** - Small generating units that may be placed throughout a power supply system rather than at a central location.

**Distribution Company** – The electric utility entity that constructs and maintains the distribution system connecting the transmission grid to the end-use customers.

**Disturbance** - Any occurrence that adversely affects normal power flow in a system, such as lightning surge on a line, or a short circuit.

**Excitation** - The power required to energize the magnetic field of generators in an electric generating station, motors and transformers.

**Fault** - An unintentional short circuit in a power system, due to a breakdown in insulation and causing abnormal current flow. When the fault current flows in ground, the fault is called a Ground Fault (e.g., tree branch in the line or broken conductors that contact the ground or other conductors.

**Flicker** - Slow variations in voltage that cause the light intensity in a fluorescent light to vary and give the impression of unsteadiness of visual perception.

**Frequency** - The number of cycles through which an alternating current passes per second. Frequency has been generally standardized in the electric utility industry at 50 cycles per second (50 hertz).

**Grid** - The layout of an electrical transmission and/or distribution system. The name given to an interconnected system of electric transmission lines and associated equipment for the movement or transfer of electric energy in bulk between points of supply and points of demand.

**Gross Generation** - The total amount of electric energy produced by the generating unit at a generating station or stations, measured at the generator terminals.

**Ground Fault** – Any undesirable current path from a current-carrying conductor to ground.
**Harmonics** - A sinusoid, which has a frequency that is an integral multiple of a certain frequency.

**Instantaneous reclosing** – A term that describes the time (18 to 30 cycles) to reclose (interrupt) a utility breaker as quickly as possible after the interrupting fault current.

**Interconnection** - Inter-tie between two or more electric utility systems, including generators, that permits a passage of current.

**Inverter** - An electro-mechanical or electronic device for converting direct current into alternating current.

**Isolation** – Separation between electrical input and output, such as an isolation transformer or optical coupler or separation of one section of a system from the undesired influences of other sections.

**License** – A permit granted by the Energy Regulatory Commission to a person or entity to (1) construct a generating facility (Construction License) and (2) operate the generating facility, transmission system, and distribution system or perform system services (Operations License).

**Lockout** – A device to prevent the reclosure of a power circuit breaker.

**Meter (Metering)** – An instrument or device used to measure the delivery and receipt of energy (kilowatt-hours), capacity (kilowatts), and/or reactive power and energy (kilovars and kilovar-hours), primarily for billing and payment purposes.

**Net Generation** - Gross generation less the electric energy consumed at the generating station for station use.

**Network** - A system of transmission or distribution lines so cross connected and operated as to permit multiple power supply to any principal point on it.

**One-line Diagram** – A diagram using single lines and standard symbols to show electrical wire or Busbar and component parts of an electric circuit or system of circuits, to demonstrate the control strategy for system operation.

**Open Access** – In the electric sector, it is the requirement for transmission and/or distribution companies to transport electricity directly from a supplier to a purchaser. In both cases, the appropriate regulatory commission usually presets the transportation tariffs charged for the service.

**Out-of-Phase** - A condition existing when two waves are of the same frequency, but their maximum values do not occur at the same instant.

**Overcurrent Relay** - A relay that operates when its input current exceeds a predetermined value.

**Point of Delivery** - Point of interconnection on the utility distribution or transmission system where capacity and/or energy generated by the renewable resource is delivered into the system.

**Potential Transformer (PT):** A small capacity transformer used to supply reduced voltage to voltmeters, wattmeters, and relays.
**Protective Relay** - A device whose function is to detect defective lines or apparatus or other power system conditions of an abnormal or dangerous nature and to initiate appropriate control action.

**Relay** – An electromagnetic device that interprets input conditions (which reflect the operation of another piece of equipment) in a prescribed manner, and, after specified conditions occur, responds to cause contact operation or similar abrupt change in a circuit controlling the equipment.

**Reliability** - An electric utility’s ability to deliver uninterrupted electricity to its customers upon demand, to whatever degree required. Reliability consists or two criteria: generation system reliability and transmission/distribution system reliability.

**Renewable Resource** - Naturally occurring fuels that are capable of being replaced by ecological cycles; sun and wind are two renewable resources.
Appendix B

Typical Russian Interconnection Agreement

Lenenergo Agreement for Electric Power Supply

Saint-Petersburg

Date:__________

The Joint-stock Company ‘Lenenergo’, hereinafter referred to as the Power Supply Company’ represented by the Head of the Industrial Power Consumer Unit ________________ acting pursuant to Power of Attorney ________________ dated _____________, as one party and ___________________________ , hereinafter referred to as the Consumer represented by __________________________, as the other party, and collectively referred to as the Parties have entered into this Agreement as follows:

Subject-matter of the Agreement

Under this Agreement the Power Supply Company shall undertake to sell to the Consumer electric energy (hereinafter Energy) through connection to the grid under power (hereinafter Power) determined under this Agreement, and the Consumer shall undertake to pay in a timely manner for such energy and power consumed as well as to comply with the energy and power consumption regime, ensure safe operation of power circuit under its jurisdiction and keep in repair instruments and equipment related to consumption of electric energy.

The boundaries related to balance jurisdiction of electric plants between the Power Supply Company and the Consumer are determined under Reports dated ____________.

Maintenance Agreements No ______ dated ______ establish the responsibility limits related to the maintenance of electric plants between the Power Supply Company and the Consumer.

The list of sub-consumers connected to the Consumer’s grid is given in Schedule 1.1. hereto.

The parties have agreed that the terms as are used hereunder shall mean the following:

Energy – electric energy (kW hour, kilovarh).

Power – electrical power (kVA, kW, kilovar).

The Consumer (power supplying facility) is a territorially detached facility (structure, a part of a structure, shop, site, office, etc.) connected to the grids of the Power Supply Company and consuming energy through an energy receiving system.
A notice means a communication of information to a party hereto or an authorized person by letter, registered letter, registered letter with a notice upon receipt, telephone message, facsimile message, hand delivery, a.f. rediffusion net as well as by other mean where it is possible to determine the fact and time when such notice has been received.

Rights and Obligations of the Parties

The Power Supply Company shall:

Deliver Energy and Power to the Consumer through the connected grid in amounts determined under Schedules 2.1, 2.2. hereto to the following users of the Consumer at:

<table>
<thead>
<tr>
<th></th>
<th>User Name</th>
<th>User Address (actual location)</th>
<th>User Code</th>
<th>Main Tariff Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
<td></td>
<td></td>
<td>Industrial user</td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td></td>
<td></td>
<td>Population</td>
</tr>
</tbody>
</table>

Change, upon request of the Consumer, limit contractual rates of energy and power. Such Consumer’s request shall be executed in the form of a written application and be submitted to the Power Supply Company for examination at least 10 days before the accounting period where such changes in contractual rates are anticipated.

Change in the rates of contractual power is possible only provided that the metering system is available, which registering the Consumer’s load at the peak hours of the power system.

The adjustments to the contractual rates for energy consumption may be made not more than 1 time within the accounting period (month), and power – not more than 1 time in a quarter with the appropriate changes in rates of process and emergency armor of power supply. Changes in contractual values of energy and power consumption towards its increase shall be made only provided that the Consumer is not in arrears for energy and power consumed and a technical feasibility on the part of the Power Supply Company.

Maintain on the boundary of balance jurisdiction the performance indices of energy delivered to the Consumer, which are in line with GOST 13109-97.

Ensure supply of electric energy in accordance with the agreement.

Upon the Consumer’s request, make necessary disconnection, and sealing of equipment.

Maintain in good repair all power supply equipment and network owned by the same.

Comply with requirements of the State Energy Supervision authority (Gosenergonadzor), which are taken within its competence.

The Power Supply Company may:
Terminate or limit delivery of energy to the Consumer upon notice in the following instances:

a) improper performance of financial liabilities arisen out of this Agreement;
b) connection of loads beyond metering instruments or a failure to meet energy metering systems;
c) unauthorized connection of loads to the Power Supply Company’s network or increase in power extra rates fixed under the Agreement;
d) putting into operation of electric plants specified under clause 2.4.2 without involvement and authorization from a representative of the Power Supply Company;
e) upon instructions from state energy supervision authorities;
f) a failure to provide access to authorized representatives of the Power Supply Company or State Energy Supervision authority to user’s power plants or metering instruments;
g) consumption of electric energy extra limits envisaged under energy consumption plans;
h) the Consumer has no trained and certified staff for attending networks and power plants;
i) a failure to meet specifications issued by the Power Supply Company for connection of the Consumer;
j) in other instances provided for under effective regulatory acts.

Disconnect and limit transmission of electric energy to the Consumer when there is scheduled repair in the networks of the Power Supply Company as well as if it is necessary to connect new consumers and/or users, but not more than 2 times in a quarter for 12 hours.

The Consumer shall be advised on scheduled disconnection (limitation) not later than 10 days before such scheduled disconnection (limitation).

If an emergency shortage of energy and power arises, make limitations in delivery (supply) of energy as well as disconnection of the Consumer in full or in part in accordance with the schedules for consumption limitation and temporary disconnection of energy approved by the Power Supply Company in the established manner.

When enforcing the schedules for limiting the consumption and disconnection of energy, the Power Supply Company, upon approval with the Consumer, shall remedy the quantity of energy failed to supply, in future periods.

Establish for the Consumer economic values and technical limits for consumption and production of reactive energy and power (Schedule 5).

Perform disconnection or limitation of energy consumption without a preliminary notice to the Consumer with a further notice about the reasons for disconnection or limitation to take steps aimed at prevention or liquidation of accidents (emergency operation), including:

- electric plants of the user are in unsatisfactory condition, where there is a threat of an accident, fire or putting in jeopardy people’s life;
- failures in the prescribed consumption regime;
- electric power supply performance indices drop at the user’s fault reaching the figures violating a standard operation of electric plants of the Power Supply Company and other users.

Terminate the agreement with the Consumer if there are recurrent failures in the payment periods for electric power.

The Consumer shall:

Comply with the Rules for operation of users’ electric plants, Safety Rules for operation of electric plants.

Meet the terms and rates for energy and power consumption set out by this Agreement.

Meet operative instructions related to the energy consumption regime; observe parameters and settings prescribed by the Power Supply Company for relay protection and automatic equipment, circuit-breaker settings and safety devices; approve the installation of automatic throw-over circuit breakers with the Power Supply Company.

Within the validity of the Agreement, make payments for accepted energy and contractual power in the period determined under this Agreement.

Ensure a free access in any time to the Consumer’s territory and its users to authorized representatives of the Power Supply Company to control the compliance with the provisions of this Agreement, energy consumption regime, maintenance of metering instruments as well as equipment of the Power Supply Company located on the Consumer’s premises as well as representatives from the State Energy Supervision Authority for checking on conditions of operation of electric plants and observance of safety rules.

Submit monthly to the Power Supply Company a report on energy consumption in the established form by each user on the 1st day of the month following the month reported.

The Consumer takes the readings of the metering instruments at 00:00 a.m. of the 1st day of each month, make entries in the daily log for energy and power consumption and submits it to the Power Supply Company before 5:00 p.m. on the first business day of the month following the month reported by telefax or in writing by hand delivery within the same deadline.

Submit applications for energy and power consumption in the coming year with a monthly breakdown not later than before 1 August of the current year.

Use electric energy for heating and hot water supply provided that there is written consent from the Power Supply Company.
For maintaining the stability and survivability of the power system when an emergency shortage of energy and/or power arises (including as a result of limitation in supply of energy and/or power with the FOREM by operative instructions of the Operator Control Center (Regional Operator Control) of the RF UES:

- upon instructions of the Power Supply Company introduce regime limitations of energy and/or power consumption in accordance with Schedule 6 hereto;
- participate in emergency load relief of the power system when the schedules for disconnection of energy and power are enforced in accordance with Schedule 7 hereto.

If there is no user of the Consumer in the schedules for temporary disconnection and limitation, the Power Supply Company may terminate the supply of power to such user, if necessary, take urgent steps for preventing or liquidation of accident (emergency operation) in the operation of the power system of the Power Supply Company.

The Power Supply Company shall not be liable for limitation (termination) of energy and power supply through the reasons referred to in this clause.

Ensure intact seals installed by a representative of the Power Supply Company.

Ensure safety and safe operation of the networks, metering instruments and electric equipment and devices, emergency circuit-breakers owned by the Power Supply Company and located on the Consumer’s premises as well as safety of hardware and software of automated metering system, control and operation system for energy supply installed on the Consumer’s premises; immediately notify the Power Supply Company on all failures in equipment owned by the Power Supply Company.

Check on the state, preventive tests and repairs of electric plants and safety equipment owned by the same as well as repairs of switchgear premises and transformers in the scope and deadline prescribed by effective standards and rules.

Based on specifications issued by the Power Supply Company, acquire and install electric meters, including electronic, as well as other electric energy and power metering means (totalizing instruments, automatic metering and control systems, etc.) intended for settlement with the Power Supply Company for consumed electric energy.

Perfect the power supply scheme with allocation of critical loads to reserved grid connections ensuring delivery of electric energy for covering process and emergency armor of electric supply when the power system performs emergency relief.

Provide with telephone connection (assign a telephone number) for making an automatic scanning of instruments and metering systems from the Operator’s Desk of the Power Supply Company if there are metering instruments using remote data transmission devices and automated electric energy metering systems.
Promptly notify the Power Supply Company on accidents, fire, failures in metering instruments as well as other failures and emergencies arisen when using energy.

Submit the list of persons with the right to conduct operative talks, signing monthly reports on consumption, telephones and fax for prompt communication (Schedule 10 hereto). The list shall include titles and names of authorized persons and their office telephones. The Consumer shall undertake to notify promptly the Power Supply Company on changes in the details specified hereunder.

Not allow changes in the fixed performance indices fixed for electric energy on the boundary of balance jurisdiction caused by the Consumer’s actions, including turning on a non-linear load.

Perform the instructions of the Power Supply Company on implementing given regimes of energy consumption in the established deadline.

Ensure attendance of electric plants by trained staff with required qualifications with appointment of responsible persons for good condition and safe operation of electric plants.

When doing any kind of work related to changes or violation in the electric energy metering scheme, notify the Power Supply Company thereabout in writing before commencement.

Relocation and replacement of metering transformers powering metering instruments shall be made only upon consent of the Power Supply Company.

Have as-built drawings and passports to all electric plants and networks as well as operation manuals approved with the Power Supply Company.

Not allow building of structures, storage of materials, planting trees as well as earth work in conservative zone of power lines and cable routes, which are on the balance and maintained by the Power Supply Company without a permit from the same.

Notify the sub-consumers (including lessees) connected to the Consumer’s networks, on periods and reasons for limitation (termination) of power supply performed in accordance with clause 2.2., immediately after a notice from the Power Supply Company on limitation (termination) of power supply.

Monthly before the 10th day of the following month, submit to the Power Supply Company the schedules of electric energy and power consumption for representative working days.

Inform on a loss of rights to energy receivers and other equipment required for entering into power supply agreement.
To the Consumers being financed from the budgets of all levels, submit to the Power Supply Company, allocated limits for energy consumption in actual figures and amounts earmarked for such purposes under the budget as well as in addition to personal accounts opened with the treasury units a number of current account for keeping-records of the funds generated from business and other income-generating activity; reports on the accounting method adopted by the Consumer, including its specialization.

Meet the requirements of the State Energy Supervision authorities taken within its competence.

The Consumer may:

Claim to the Power Supply Company errors found in payment documents.

Connect electric plants to networks owned by the same with voltage up to 1,000 V within the power stated under the agreement without an additional permit of the Power Supply Company, except electric heating plants for heating purposes and water supply, and above 1,000 V – only upon a permit from the Power Supply Company AO Lenenergo. Connection of said electric plants as well as sub-users shall be made only upon approval of design documents with the Power Supply Company and a permit to operate from authorized representatives of the Power Supply Company and State Energy Supervision authority.

Upon preliminary consent of the Power Supply Company, connect sub-consumers to its network upon implementation of specifications issued by the Power Supply Company.

Upon approval with the Power Supply Company, refuse in full or in part from electrical load. In such case the Consumer will do disconnection of all its networks and power consuming equipment from the external grid (on the boundary of balance jurisdiction of the Consumer) by sealing disconnecting devices and issuance of a report on disconnection by an authorized representative of the Power Supply Company.

Demand from the Power Supply Company to ensure reliability of energy supply to users of the Consumer in accordance with the provisions of this Agreement.

Metering of Electric Energy

Consumption rates of electric energy for the accounting period shall be taken according to readings of meters.

Power stated by the Consumer and participating in the peak load of power system shall be fixed under the agreement and be checked by the Power Supply Company according to actual average weighted half an hour maximum load of the user.
determined according to the readings of metering instruments or metering instruments registering the peak load of the Consumer.

Registration of active and reactive energy and power for settlements between the Power Supply Company and consumer shall be taken at the registration point on the boundary of balance jurisdiction of the electricity supply network of the Power Supply Company and the user.

If metering instruments for registration of electric energy are mounted not on the boundary of balance jurisdiction of the parties, the amount of electric energy registered by electric energy meters shall be increased (decreased) by the amount of process expenses of electric energy for its delivery.

Loss percentage of electric energy in networks within the section from the installation point of electric meters to the boundary of network separation shall be determined by estimations of the Power Supply Company together with the Consumer.

The balance jurisdiction of metering instruments is given in Schedules ___ hereto.

The maintenance of metering instruments shall be performed by the Power Supply Company.

If instruments and automated electricity metering systems are on the user’s balance, their repairs, check and replacement shall be performed by the user.

If the Consumer has no information and metering electric energy system or if it fails, the same shall keep daily records in the electricity and power consumption log on the readings of electricity metering instruments each 30 minutes at the peak hours of the power system.

If there are no metering instruments for reverse reactive energy transmitted to the network of the Power Supply Company, the generation rate of reactive energy shall be determined by the Power Supply Company by estimations and is given in Schedule ___.

If it is established loss (theft), damage, unworkable state of meters and electricity metering systems with the Consumer owned by the Power Supply Company, the Consumer shall compensate for damage either through provision (replacement) of new meters and metering systems or by payment of monies for lost equipment (in the amount of the book value on the day of payment).

If the Power Supply Company performs work with electricity metering instruments of the Consumer (replacement of meters, tests, etc.) without release from load, electricity registration shall be made by estimation for the period when such work has been carried on.

If there was a failure to register energy as a result of replacement of equipment by the Consumer specified in Schedules __________ without approval with the Power Supply Company, the amount of energy consumed by the Consumer shall be determined by the Power Supply Company based on estimations and adjustments be
made for the limitation period or for the period from the latest inspection on the metering schemes.

Electric plants of electricity users shall be supplied with necessary metering instruments for settlements for electric energy with the Power Supply Company. If the users have current transformers intended for electricity metering, test terminal boxes (TTB) shall be mounted.

Instruments and automated electricity metering systems as well as metering transformers for voltage and current shall be tested at the RF Gosstandard authorities.

Current transformers intended for electricity metering shall comply with contractual rates of power consumed and requirements to the Arrangement of electric plants by its performance capability.

Settlement Procedure

Settlements for energy shall be made by monies according to tariffs for the relevant groups of consumers approved in accordance with effective laws, based on readings of metering instruments for the accounting period. The Consumer shall pay for energy and power consumed by monthly advances in the manner prescribed by this agreement.

The Power Supply Company shall notify the Consumer on changes in tariffs by publications in the newspapers Saint-Petersburg Vedomosty or Nevskoye Vremya in a three-day period upon their approval, but not later than 10 days before they become effective.

Upon conclusion of the agreement the Consumer shall remit to the settlement account of the Power Supply Company an advance for a month, which will be the first month for supply of energy and power. The Consumer shall undertake to remit an advance for the following month not later than 5 days before it begins, but not earlier than this Agreement becomes effective. Energy and power supply shall begin after payment of such advance.

If contractual rates for energy and power change as well as change in tariffs, the Power Supply Company may not make readjustments to the amount of advance.

A monthly advance equals to a monthly cost of contractual (claimed) energy and power under this Agreement.

If the user has been incorrectly attributed to this or that tariff group, readjustment for electricity shall be made for the entire period of electricity supply, but within limitation period.
The Power Supply Company shall issue and submit a payment document to the Consumer’s bank monthly before the 10th day of the month following the settlement (paid) month with the following details:

**For users, which estimations are based on a two-rate tariff:**

- payment for contractual power (kW) and payment for actual energy consumed (kWh) of the accounting month according to the readings of metering instruments;
- payment for reactive energy and power consumed extra fixed economic figures under the agreement as well as for generated reactive energy to the network of the Power Supply Company in the accounting month;
- an advance for a month following the month when a payment document has been made.

**For users, which estimations are based on a one-rate tariff:**

- payment for actual energy consumed (kWh) in the previous month according to the readings of metering instruments;
- payment for reactive energy and power consumed extra fixed economic figures under the agreement as well as for generated reactive energy to the network of the Power Supply Company in the accounting month;
- an advance for a month following the month when a payment document has been made.

The amount of a payment document shall be reduced for the amount of an advance paid for the accounting month.

If the Consumer exceeds the electricity and power regime established under the Agreement, a five-time multiplied tariff payment shall be charged for all electricity and power consumed extra rates provided for under the Agreement.

Payment documents shall be paid without acceptance by the Consumer in term before the 25th day of the month where a payment document has been made.

The day of payment shall be the day when the funds were credited to the settlement account of the Power Supply Company.

Verification of settlements shall be made on either party’s initiative, but at least one time in a year. The Power Supply Company shall notify the Consumer on such verification at least 10 days before it.

If the Consumers fails to appear at the specified deadline, such verification report shall be made on the basis of the data available from the Power Supply Company. The Consumer shall be advised about results of such verification of settlements. If the Consumer fails to make objections to the verification report within 10 days upon such advice, such report shall be deemed acknowledged by the Consumer.

Other methods of settlements for energy (power), except specified hereunder, may be effected only upon approval with the Power Supply Company.
Other methods of termination of the Consumer’s obligations to pay for energy (power) consumed, except specified hereunder, may be effected only upon approval with the Power Supply Company.

If the user fails to communicate the readings of electric meters, estimation shall be made based on average consumption of electricity for the previous period. In such case the estimation period for average daily electricity consumption shall not exceed one accounting period, upon expiry of which electricity consumption shall be determined by the Power Supply Company based on authorized contractual power or installed (connected) power of current collectors and number of hours within which the user operated before communicating the readings of electricity meters, without further readjustments.

The Consumers shall make settlements for electric energy with sub-consumers according to tariffs established by the Russian Energy Committee for the appropriate user groups, where such sub-consumers are included.

The amount of payment made by the Consumer, which is insufficient to discharge financial liabilities under this Agreement in full, first of all, shall discharge arrears on penalties, fines, interest for enjoyment of the funds, and the remaining part – arrears on supplied energy (power), and thereafter – an advance.

The payer shall undertake to notify the Power Supply Company if errors are found in the payment document.

The Power Supply Company shall, not later than 10 days from the day when an application has been filed, check on the estimation and, if necessary, the meter and such check results shall be communicated to the payer and make adjustments for the latest accounting period or from the day of previous technical check of electric plants and a meter, but within limitation period when issuing a regular payment document for electric energy.

If metering instruments are damaged (a seal is removed, a glass is broken, etc.), change in the scheme of turning on metering instruments or theft of electric energy, the Power Supply Company shall undertake to make adjustments to electric energy consumption according to contractual power or installed (connected) power of current collectors and number of hours when the Consumer operated, for the entire period from the day of the latest replacement of metering instruments or check on turning on scheme with respect thereto, but not more than for limitation period.

Electric energy failed to supply to users at the fault of the Power Supply Company shall be determined as a difference between an average daily consumption of electric energy for the latest 3 days preceding limitation and actual consumption for those days, when such failure to supply has occurred.

The Creditor’s rights to financial liabilities arising out of this Agreement shall pass to a new creditor in the scope agreed with the same.
Termination (Limitation) Procedure for Energy Supply

Limitation (termination) procedure for energy supply in the event of improper performance of financial liabilities without amendment (termination) of the power supply agreement:

If there is improper performance of financial liabilities arising out of this Agreement and continuing more than three days, the Power Supply Company may limit energy supply up to the level of emergency armor, and if it is missing – terminate energy supply in full, and the Consumer shall be notified thereabout.

The Power Supply Company shall determine the procedure for limitation (termination) of energy supply and notify the Consumer thereabout by notice on limitation (termination) of energy supply that includes:

1) the deadline for settlement of arrears on financial liabilities;
2) listing of users with respect to which energy (power) supply is subject to limitation (termination);
3) type of energy (power), which supply is subject to limitation (termination);
4) level for limitation (termination) of energy (power) supply;
5) date and time when such limitation (termination) is effective.

A notice on limitation (termination) of energy (power) supply shall be communicated to the Consumer at least one day before such limitation (termination) of energy (power) supply is effective.

Renewal of energy (power) supply shall be effected only upon settlement of all financial liabilities of the Consumer before the Power Supply Company, including as is provided under clause 5.6.

The procedure for limitation (termination) of energy (power) supply if there is improper performance of financial obligations arising out of this agreement with amendment (termination) of the power supply agreement:

If the deadline for payment of supplied energy (power) is failed for the second time within the validity of this power supply agreement, except actions specified under clause 5.1 hereunder, the Power Supply Company may terminate the performance of this Agreement unilaterally in full or in part, i.e. terminate the Agreement or amend its terms.

The procedure for limitation (termination) of energy (power) supply shall be performed in accordance with clause 5.1. In such case a notice on limitation (termination) of energy (power) supply shall include the clause worded as follows:

- in the event of full termination of energy (power) supply:
  ‘This is to notify the Consumer on a unilateral refusal of the Power Supply Company to perform the agreement in full, i.e. on termination of the agreement.’
- in the event of limitation of energy (power) supply:
   ‘This is to notify the Consumer on a unilateral refusal of the Power Supply Company to perform the
   agreement in part, i.e on amendment of the terms of the agreement on the quantities of energy and/or power
   supplied.’

This Power Supply Agreement shall be deemed terminated (amended) upon a notice
on a unilateral refusal to perform (in full or in part) this power supply agreement.

Renewal of energy (power) supply in the previous quantities to the Consumer where the Power Supply
Agreement has been terminated or amended in the manner specified under clause 5.2 hereunder is possible only
provided that the power supply agreement was entered into or making amendments thereto containing one or several
following conditions:

- settlements of the Consumer with the Power Supply Company shall be made under
  irrevocable covered letter of credit;

- the surety or bank guarantee issued for the period of the power supply agreement and
  approved with the Power Supply Company shall serve as a security of the Consumer’s
  obligations, or pledge of the Consumer’s property;

- upon request of the Power Supply Company, novation of failed financial liabilities of the
  Consumer under financial liabilities arisen out of this Agreement shall be made to obligations
  under the loan agreement with the Power Supply Company.

If the Consumer’s actions have resulted in a violation in selectivity of protection
performance at the Consumer caused operation of protection devices on the part of
the Power Supply Company, the Power Supply Company may demand payment of a
penalty by the Consumer at the rate of 1,000 minimum size of wage payment.
Connection of the Consumer shall be made upon signing of a bilateral report fixing
operation of protection devices caused cut off electric energy.

If the Consumer is cut off for the second time through described reasons, connection of the Consumer shall
be carried out only upon payment of penalty for the previous cases when selectivity of operation of the Consumer’s
protection has been violated.

The procedure for limitation (termination) of energy (power) supply through the reasons
provided for under subclauses b)-j) clause 2.2.1 shall be determined by the Power
Supply Company unilaterally, if otherwise is not provided for under effective laws or
fixed under other obligatory way for the Power Supply Company otherwise.

The Consumer shall be notified on future limitation (termination) of energy (power) supply at least than a day
before prior to limitation (termination) of energy (power) supply with the observance of the notice details specified
under clause 5.1.2.

Should emergency shortage of energy occur, limitation (termination) of energy (power)
supply shall be performed in accordance with clauses 2.2.5, 2.3.9.

Expenses for limitation, termination and renewal of energy (power) supply of the Power
Supply Company incurred in accordance with clauses 5.1-5.4 shall be compensated
by the Consumer.
Liability of the Parties

The Consumer shall pay a penalty for unauthorized, without a permit from the Power Supply Company connection to the grid of the Power Supply Company as well as unauthorized connection of transformers, high-voltage electric motors, sub-consumers, electric heating plants as well as for a failure to meet the operation regime for electric heating plants and a violation of specifications (Schedules ________) at the rate of a five-time multiplied tariff for all power connected or used in a violation of the agreement, for the entire agreement period, but not more than limitation period.

If the Consumer’s actions, including specified under clause 5.3. hereunder as well as breaks-down at the power plants of the consumer have resulted in a failure to deliver energy to other consumers of the Power Supply Company or a damage is caused to the Power Supply Company, the Consumer shall be responsible for compensation of damages caused.

If the Consumers delays in payment to the Power Supply Company, it shall pay a penal forfeit at the rate of 0.5% of unpaid or unpaid in an untimely manner amount for each day of delay. A penalty shall be charged until the arrears have been discharged in accordance with clause 4.7.2.

The company, on which balance is an electric plant, shall be responsible for the maintenance and technical condition of metering transformers and secondary circuits, including connection lines of automated systems powering metering instruments.

The company on which premises electric meters are installed shall be responsible for safety and integrity of such meters regardless of the property right to them.

The Power Supply Company shall not be property liable before users for a failure to deliver electric energy in full caused by:

a) natural calamities, such as fire, floods, lightning if there are lighting protectors in the electricity supply networks as well as ice-slicks, storm, slush, snow-wreath, etc.;

b) incorrect actions of the user’s staff or outside persons (erroneous turning on, cut off or switching, foreign matters on wires of aerial power lines, mechanical damage of aerial or cable lines, etc.);

c) conditions for limitation or termination of electric energy supply to users as is provided for under clause 2.2.1;

d) performance of work in accordance with clause 2.2.2.

The Power Supply Company shall not be property liable before the user for supply of electric energy of lower quality within the day during which the Consumer has failed
to meet the prescribed electricity consumption regime, such as let exceeding the established electric energy and power consumption limits, failed to meet the schedule for limitation of electricity and power consumption introduced by the Power Supply Company.

The Power Supply Company shall not be property liable before the user for supply of electric energy of enhanced or reduced level of voltage against limits specified under the agreement, if the Consumer fails to meet optimal figures of reactive power given by the Power Supply Company and consumed from the grid and operation regimes of compensating plants.

The Parties shall not be liable if a proper performance of obligations was impossible through force-majeure circumstances (force-majeure). The parties hereto have included the following in force-majeure: natural disaster phenomena (earthquake, flood, other weather conditions render impossible regular human activities); moratorium of authorities and administration; strikes organized in the established manner by law; reduction in frequency of electric energy in Russia’s grid through reasons beyond the parties’ control and other circumstances which may be defined as force-majeure preventing the proper performance of obligations.

Should limitations on energy (power) supply, cutting off the Consumer for a failure to pay or through other reasons provided for under regulatory acts, agreement be introduced, the Power Supply Company shall not be liable for effects caused by such limitation or cutting off.

If the Consumer violates the consumption regime of energy and/or power (Schedules ________) prescribed under the Agreement, a payment shall be charged at the rate of a five-time tariff for energy and/or power consumed extra rates provided for under the Agreement.

If the Consumer fails to meet the Rules for Protection of Power Networks as well as for a damage or removal of a stamp (seal) made by the Power Supply Company or State Energy Supervision, the Consumer shall pay a penalty at the rate of 5 minimum size of wage payment as well as the relevant executives of the Consumer may be held liable in the administrative form established under effective laws.

The Party, which has failed or improperly met the obligation hereunder, shall be liable in accordance with the agreement and RF effective laws.

The provisions provided for under Articles 807-813, 819-823 of the RF Civil Code shall be applicable to the arrears arisen out of this Agreement.

The Power Supply Company shall undertake to compensate to the Consumer for actual damages caused for an unreasonable break in delivery of energy.
The Power Supply Company may make adjustments to the payment for energy consumed from the day of the latest technical inspection, but not more than for limitation period, in the event of unauthorized connection of power not through the metering instruments, a violation of the metering schemes caused a failure to meter energy in full, use of energy for purposes not agreed with the Power Supply Company and paid by other tariff against regular tariffs.

**Agreement Period**

This Agreement enters into force from ________ and is valid until _________. This Agreement shall be deemed renewed for the next year, if neither party notified about refusal from the terms of this agreement or its revision thirty days prior to expiry of the Agreement.

This Agreement may be terminated by the Power Supply Company unilaterally
- if there is no energy receiving system or necessary equipment with the Consumer;
- in accordance with clause 5.2 hereunder.

If the Consumer has lost its right to energy receiving system or other necessary equipment, the Power Supply Company shall inform the Consumer on termination of the Power Supply Agreement at least 3 days before its termination. A termination day shall be the day specified in the notice.

If energy (power) consumption is terminated on the initiative of the Consumer, the Consumer shall, with respect to each user
- notify the Power Supply Company thereabout 7 days before termination of consumption;
- disconnect its networks from the grid of the Power Supply Company on the boundary of balance jurisdiction;
- redeliver metering instruments owned by the Power Supply Company.

The parties shall issue a bilateral report on termination of consumption and compliance with specified procedure.

If a facility is transferred to a new owner the Agreement may be terminated without compliance of the provision to disconnect networks and redelivery of metering instruments specified in clause 7.3 provided that such power supply agreement be re-executed simultaneously to the facility with a new owner.

Obligations arisen out of this Agreement prior to its termination and failed to be met properly shall survive until they have been discharged.

**Special Provisions**
The provisions of this Agreement on advances shall not be applicable to agencies financed from the budgets of all levels and government enterprises.

Miscellaneous

The Parties hereby agree that either party may submit differences to arbitration if such differences arise in entering into the agreement. All disputes, which may arise out of this agreement or in connection with the same shall subject to the Arbitration Court of Saint-Petersburg and Leningrad Oblast.

The Parties shall be governed by the RF laws, Rules for Use of Electric and Heat Energy approved by Order No 310 of the USSR Ministry of Energy and Electrification dated 06.12.81 and other regulatory acts in all other matters not provided for under this Agreement.

The Parties shall undertake to notify each other within a five-day period on all changes in registered address, banking details, name, departmental jurisdiction and actual location.

Specifications issued by the Power Supply Company for connection of the Consumer shall make a schedule to this Agreement.

All schedules, discrepancy report, changes and amendments to this Agreement shall make its integral part.

This Agreement is executed in two copies, one copy for each party.

The Party, which has failed to meet the requirements stated in clauses 2.317, 2.3.26, 9.3 shall bear a risk of adverse effects.
Registered Addresses and Banking Details of the Parties

The Power Supply Company: OAO Lenenergo
Location: __________________________
Settlement account: ___________________
Correspondent account: ________________
Code OKONH ________ Code OKPO Taxpayer’s number (INN) __________
Single transit account__________________

The Consumer:
Registered address: _____________________
Actual location: ______________________
Settlement account: _____________________
BIC _________________________________
Correspondent account: ________________
Code OKONH ________ Code OKPO Taxpayer’s number (INN) __________
Under jurisdiction of ____________________

For the Power Supply Company For the Consumer

Signature Signature
Seal Seal
Date: ___________ Date: ___________
Appendix C

GE Wind Energy Interconnection Specifications, GE 1.5s, “Electric Grid Data”, Version 08, 2003
Appendix D

MODEL
WIND POWER PLANT INTERCONNECTION
STUDY AND COOPERATION AGREEMENT
between

[TRANSMISSION OPERATOR]
and

[GENERATOR]
Wind Power Plant Interconnection Study and Cooperation Agreement

This Wind Power Plant Interconnection Study and Cooperation Agreement (referred to as “Agreement”) is executed between Lenenergo (hereby referred to as Transmission Operator”) and Leningrad Wind Power Company OOO (LenWind) (hery referred to as “Generator”. Both Generator and Transmission Operator are sometimes referred to as “Party” and collectively as “Parties”

Whereas, Generator desires to construct own and operate a wind powered electric generation plant (‘Facility”) to be located in region. The Facility would interconnect to the Transmission Operator’s Grid. The Generator plans to sell electricity to specified customers (“Customers”) who currently purchase power from Lenenergo (“Current Energy Supplier”) and take delivery off of the same Grid.

Whereas Customers plan to enter into other commercial agreements to exchange energy originating from Generator and delivered onto the Grid in lieu of receiving energy now supplied by Current Energy Supplier.

It is the intent of the Generator to: (1) pay for such studies, (2) pay for the necessary upgrades to the Grid, if any, and the capital cost of constructing a New Interconnection Facility (“NIF” - transmission interconnection line, substation, and associated protection equipment necessary to accomplish this interconnection goal), (3) give the NIF free of charge to the Transmission Owner and (4) document the interconnection process to serve as a model for other wind power plant projects.

The Generator believes that the Transmission Operator and Current Energy Supplier will achieve many benefits from this plan including but not limited to: (1) Receiving a long-term supply of new wind generation that will help meet the associated growing demand for power and increase reliability, as well as reduce the atmospheric emissions (2) Receive a generation supply who power characteristics can be periodically changed to meet the changing needs of the Transmission Operator (i.e. shift in power factor from leading to lagging) (3) Provide supply of new generation close to the new industrial load growth areas. (4) Provide a needed new interconnection line that can be used by Transmission Operator to increase reliability of the Grid.

The Parties hereby agree that it is to both of their benefit to accomplish these objectives as swiftly and efficiently as possible.

Now, therefore, the Parties hereby agree to diligently work toward these objectives and commit to the following plan of action and “Target Schedule”.

1) Commit to complete and/or endorse existing Feasibility Study: 3 weeks after execution of this Agreement
2) Complete Impact Study: 4 weeks after Feasibility Study
3) Complete a Facility Study: 6 weeks after Impact Study is accepted by Generator
4) Develop a Construction and Connection Agreement: 12 weeks after Facility Study is accepted by Generator
5) Develop an Operating Guideline: 20 weeks after Facility Study is accepted by Generator

1.) Administration Agreement and Notification:
   A) Each party shall appoint a designated representative ("Representative") and back up to oversee the administration of this Agreement.

   Generator:
   Primary Contact:
   Title
   Mail Address
   Landline phone
   Mobile phone
   e-mail address
   Fax number

   Backup Contact:
   Title
   Mail Address
   Landline phone
   Mobile phone
   e-mail address
   Fax number

   Transmission Operator
   Primary Contact
   Title
   Mail Address
   Landline phone
   Mobile phone
   e-mail address
   Fax number

   Backup Contact:
   Title
   Mail Address
   Landline phone
   Mobile phone
   e-mail address
   Fax number

   B) The Parties acknowledge, that from time to time, these representatives may change or most likely, additional associate representatives will be appointed to represent them on specified issues. At such time, the contact information of the replacement or associate representative shall be provided to the other Parties Representative.

   C) It shall be the judgment of the Representatives to select the best method of communication in order to most effectively complete the objectives. Notwithstanding, all deliverables must be prepared and delivered in writing.
D) If at any time, either Party realizes that a Target Schedule date cannot be achieved, they shall promptly notify the other Party and discuss. If both Parties collectively, cannot find a solution, then a new Target Schedule date shall be mutually agreed upon and communicated in writing.

2.) Coordination Responsibility of Transmission Operator

A) The Generator understands that the Transmission Operator is (a) fully familiar with all the Federal and local regulations dealing with the proposed issues and objectives (b) has a working relationship with Transmission Owner and (c) has established relationships with the appropriate representatives of such regulatory and permitting agencies (“Agencies”). Collectively, the Transmission Owner, regulators and Agencies will be referred to as “Stakeholders.” Therefore, the Generator hereby requests the Transmission Operator to advise all appropriate Stakeholders of this Agreement. It will be the responsibility of the Transmission Operator to keep the Stakeholders informed of all activity related to this Agreement. B) The Transmission Operator will have the right to invite Stakeholder representatives to any meetings or copy them on relevant agreements.

C) The Transmission Operator will keep the Generator informed of any potential issues that are of concern or may develop regarding any of the Stakeholders.

3.) Coordination Responsibility of Generator:

A) The Generator will maintain the responsibility of communicating with the (a) Media (newspapers, magazines, radio, television, etc), (b) Politicians and (c) Customers and (d) Interested community groups or associations).

B) The Generator will keep the Transmission Operator informed of critical news releases and critical meetings with these entities. The Generator would greatly appreciate receiving advise from the Transmission Operator as to the timing and what information should be communicated.

C) The Generator shall have the responsibility of hiring any necessary technical consultants and engineers necessary to supply Facility information to the Transmission Operator

D) The Generator shall coordinate any technical information required by equipment suppliers (generators, transformers, control room equipment, etc.)

E) The Generator reserves the right to also inform appropriate Federal and local officials regarding activities relating to this Agreement.

4.) Facility Description & NIF description:

A) The facility will consist of approximately 50 (up to 70) wind turbine generators, all interconnected in parallel to a common bus-bar. Each generator will have the capability of generating approximately 1,500 kilowatts each at rated wind conditions. The voltage output of the generators is approximately 690 volts. By the use of two transformers, the voltage of all wind generators will be stepped up to the voltage of the Grid (currently anticipated to be (110,000 volts). Necessary protection equipment (relays, switchgear, fuses, etc.) will be installed to protect the Grid from any potential damage that could result from the Facility. A state of the art control room will also be installed adjacent to the Facility Substation that will monitor and control the generation Facility. It will be manned on a continuous basis (365 days per year, 24 hours per day). The appropriate communication lines will be installed between the Facility and the Transmission Operator.

B) Once the voltage level is stepped up to the appropriate Grid voltage, it will be metered and delivered onto the NIF that will become part of the Grid.

C) A new transmission line will be constructed along an existing electric right-of-way to an existing transmission line located approximately 40 away from the Facility. The existing 110 kV transit network line runs between the substations at ______ through ______. It will be the responsibility of the Transmission Operator to modify any existing right-of-ways or secure any additional rights of way. A new Interconnection Substation will be constructed adjacent to the existing transmission line that will contain only fuses and circuit breakers.

D) See Exhibit A (1) and Exhibit A (2) for conceptual drawings.

5.) Feasibility Study:
A) The Purpose of this study is to (a) Confirm results of the Feasibility Study completed by the Generator to insure that the request for interconnection is feasible and no fatal flaw exists (b) Provide Generator a preliminary assessment of the type and scope of work that will be required, (including system upgrades) (c) Establish a schedule for completing further studies, engineering and constructing (d) Identify responsibilities of the Generator versus the Transmission Operator and provide a very preliminary cost estimate (magnitude only). The Feasibility study will employ various assumptions regarding the Interconnection Request, including the most current system data known to the Transmission Operator and Transmission Owner and the wind turbine systems data known to the Generator and its subcontractors.

B) In 2002, the Generator hired the International Energy Academy (Academy”) based in St. Petersburg to perform a technical feasibility study for this project. This study will be made available to the Transmission Operator for its review. The Generator acknowledges this study is over a year old and may not contain all the information known to the Transmission Operator. The Generator will pay the Academy to provide information about the study and to conduct additional analysis if necessary. In the interest of reducing costs and expediting the process, the Generator encourages the Transmission Operator to endorse this existing study.

C) In addition to endorsing the technical feasibility study and developing a project cost estimate, the Generator requests the Transmission Operator to (a) Establish a more detailed milestone schedule (b) Identify all permits and regulatory approvals that may be required and associated risks and or issues that may be incurred (c) Identify any preliminary right-of-way issues that may be required (d) Develop or recommend other interconnection strategies to consider other than what has been proposed to date and (e) Identify technical information that will be required to complete the Impact Study.

Attached (see Exhibit B) is a list of requested items required from a transmission operator interconnecting with a wind power plant. This list is provided as an “example only” of the type of information that may be required by a Transmission Operator. The Generator understands that more or less information may be required by the Transmission Operator.

D) A brief report will be prepared by the Transmission Operator confirming the technical feasibility of the project as well as the other issues described in Section 5C.

6.) Impact Study:
A) The purpose of the Impact Study is to perform actual detailed modeling of the Facility on the Grid. This study will utilize power system analysis techniques such as power flow, short circuit and dynamic simulation, which require that certain data be provided by the Generator concerning (i) the equipment to be utilized (See Example B as an illustrative example of the type of data that may be required) as well as (ii) technical data associated with the characteristics of the Grid, (iii) technical characteristics of all generation equipment and (iv) customer loads that are attached to the system.

B) This results of the study will be prepared in writing and provided to the Generator. It will indicate (a) Exactly what parts of the Grid, if any, require upgrading, (b) The most economical solution to rectify these problems (i.e. type and length of circuits that will may have to be replaced, (c) The associated cost estimate of each on improvement.

C) Generator acknowledges there is a significant amount of work to do related to this task requiring knowledge of both wind turbines, the existing and future plans for Grid system. If the Transmission Operator cannot accomplish this task in the suggest time schedule, The Generator may hire an outside consultant to perform this work in behalf of the Transmission Operator. The guidance and oversight would still come from the Transmission Operator.

7.) Facility Study
A) The Facility Study is an engineering study whose purpose to (a) Outline the actual work to be accomplished (new construction plus Grid system enhancements for the interconnection project), (b) Establish a final good faith cost estimate, (c) Establish a good faith time estimate for final engineering, permitting and construction activities. The schedule will be worked out in conjunction with the Generator to establish a proposed schedule that is suitable to both Parties.
B) Generator acknowledges there is a significant amount of work to do related to this task. If the
Transmission Operator cannot accomplish this task in the suggest time schedule, The Generator suggests that it hire
an outside consultant to perform this work in behalf of the Transmission Operator. The guidance and oversight
would still come from the Transmission Operator.

C) The Transmission Operator will deliver the Facility Study in writing to the Generator upon completion.
See Exhibit D for representative sample outline of a Facility Study.

8.) Construction and Connection Agreement:
   A) The Construction and Connection Agreement legally commits the Parties to perform specific tasks and
take on responsibilities. More specifically, (1) The Transmission Operator commits to support and oversee
engineering and construction of specific projects according to detailed specified terms and conditions. (2)
The Transmission Operator authorizes the Generator to engineer and construct specific projects according
to accepted guidelines. (3) The Generator commits to reimburse the Transmission Operator for its work.
(4) The Transmission Operator grants conditional rights (i.e. subject to abiding by Operating Guideline, and
related standards) to the Generator to connect to the Grid and place energy on the to Grid. (5) Establishes
ownership rights, responsibilities for operations and maintenance of the Facility and NIF.

   B) The Generator will take the lead in preparing the commercial framework of this Agreement whereas
the Transmission Operator will take the lead in preparing the technical data. See Exhibit E for a representative
sample outline of a Construction and Connection Agreement.

9.) Operating Guideline:
   Parties acknowledge this will be the first wind power generation facility connected to the Grid that is not
owned or operated by the Current Energy Supplier. Therefore, it will be necessary to document in writing, all of the
rules and procedures that will be required of the Generator and to serve as a model for future projects. The
Transmission Operator will prepare this Operating Guideline. The cost of this task shall be borne by the
Transmission Operator since it will be required for all future independent generators that may attach to the Grid.
The Generator will provide samples of similar guideline books to Transmission Operator when and if requested.

10.) Billing for services required under this Agreement:
   A) To facilitate payment and verification, Transmission Owner shall keep books and records of all expenses
incurred on completing these studies.

   B) The billing period shall be within 60 days of the completion of the Feasibility Study, Impact Study and
Facility Study. The bill shall identify the labor categories, hours and rates for internal study work and an itemized
account (along with contract and bill) from consultants that were hired and directly paid for by Transmission Owner.

   C) Bills that are not in dispute shall be paid within 20 days of receipt.

11.) Confidential Information:
   A) The Parties have and will develop certain information, (prices, schedules, strategies), processes, know-
how techniques and procedures concerning the Facility (collectively “Critical Information”), which they consider
confidential and proprietary.

   B) The Generator understands that the Transmission Operator will have to share some of this information
with various Stakeholders in order for them to fulfill their coordination responsibility. The Generator hereby requests
the Transmission Operator to use its best faith efforts to keep Critical Information confidential especially from the
media and those Agencies (that must legally make all information provided to them available to the public).

   C) The Transmission Operator understands that inappropriate dissemination of such Confidential Information
can cause significant economic harm and unnecessary project risks to the Generator.
In Witness Whereof, the Parties have executed this Agreement.

[Transmission Owner] ___________________; Date: ________________

By: __________________________________
    [Title] ____________________________

[Generator] _________________________; Date: ________________

[Title] _____________________________
Exhibit A  Interconnection Facilities

A1 – Interconnection Concept

Wind Power Plant – Grid Interconnection
Exhibit A2 – Interconnection Facilities Detail

Facility Interconnection Details

- Generation Facility
- Wind Turbine Generator
- Fence
- Motor

Future substation Transmission Operator may construct for future load

Right of way land to be provided by Transmission Operator

Facility Substation will contain necessary relays, switchgear and fuses

Interconnection substation

Land to be provided by generator
Exhibit B

Representative Sample; Request information may be totally different

Attachment A: Unit Capability Data Request Form

\[
\text{Net MW Capacity} = (\text{Gross MW Output} - \text{GSU MW Losses}^* - \text{Unit Auxiliary Load MW} - \text{Station Service Load MW})
\]

1. Maximum Summer (33º C ambient air temp.) Net MW Output** ___________
2. Maximum Summer (33º C ambient air temp.) Gross MW Output: ___________
3. Minimum Summer (20º C ambient air temp.) Gross MW Output: ___________
4. Maximum Winter (2º C ambient air temp.) Gross MW Output: ___________
5. Minimum Winter (-40º C ambient air temp.) Gross MW Output: ___________
7. Individual Unit Auxiliary Load at Maximum Summer MW Output (MW/MVAR): ___________
8. Individual Unit Auxiliary Load at Minimum Summer MW Output (MW/MVAR): ___________
9. Individual Unit Auxiliary Load at Maximum Winter MW Output (MW/MVAR): ___________
10. Individual Unit Auxiliary Load at Minimum Winter MW Output (MW/MVAR): ___________
11. Station Service Load (MW/MVAR): ___________
12. Please provide any comments on the expected capability of the unit: ___________

* GSU losses are expected to be minimal.
** Project’s declared MW, as first submitted in Attachment N, and later confirmed or modified by the Impact Study Agreement, should be based on either the 20º C Ambient Air Temperature rating of the unit(s) or, if less, the declared Capacity rating of the project.

Attachment B: Unit Generator Dynamics Data Request Form

15. MVA Base (upon which all reactances, resistance and inertia are calculated): _______
16. Nominal Power Factor: _______
17. Terminal Voltage (kV): ___________

Unsaturated Reactances (on MVA Base):

19. Direct Axis Synchronous Reactance, X_d(i): _______
20. Direct Axis Transient Reactance, X’_d(i): ___________
21. Direct Axis Sub-transient Reactance, X”_d(i): ___________
22. Quadrature Axis Synchronous Reactance, X_q(i): ___________
23. Quadrature Axis Transient Reactance, \( X'q(i) \): __________
24. Quadrature Axis Sub-transient Reactance, \( X''q(i) \): __________
25. Stator Leakage Reactance, \( X_l \): __________
26. Negative Sequence Reactance, \( X_2(i) \): __________
27. Zero Sequence Reactance, \( X_0 \): __________
28. Saturated Sub-transient Reactance, \( X''d(v) \) (on MVA Base): __________
29. Armature Resistance, \( R_a \) (on MVA Base): __________

**Time Constants (seconds):**

30. Direct Axis Transient Open Circuit, \( T'do \): __________
31. Direct Axis Sub-transient Open Circuit, \( T''do \): __________
32. Quadrature Axis Transient Open Circuit, \( T'qo \): __________
33. Quadrature Axis Sub-transient Open Circuit, \( T''qo \): __________
34. Inertia, \( H \) (kW-sec/kVA, on KVA Base): __________
35. Speed Damping, \( D \): __________
36. Saturation Values at Per-Unit Voltage \([S(1.0), S(1.2)]\): __________

In addition, if available please supply the following

- Exciter/Governor/Other Models and Block Diagrams __________
- Generator Performance Curves __________
- Schematic One-line Diagram showing Unit/GSU/Breakers/Interconnection __________
- Operating Restrictions and/or Procedures __________

37. Generator Step-up Transformer MVA Base: __________
38. Generator Step-up Transformer Impedance \((R+jX)\), on transformer MVA Base: __________
39. Generator Step-up Transformer Rating (MVA): __________
40. Generator Step-up Transformer Low-side Voltage (kV): __________
41. Generator Step-up Transformer High-side Voltage (kV): __________
42. Generator Step-up Transformer Off-nominal Turns Ratio: __________
43. Generator Step-up Transformer Number of Taps and Step Size: __________

**Appendix: Generator, Exciter, Governor, Stabilizer, Excitation Limiter and Current Compensating Models**

The equipment models listed below are those available for use in PSS/E. Each model can have unique data requirements.

Generator Models
Static Var Compensator (SVC) and Frequency Changer Models
Excitation System Models
Prime Mover and Governor Models
Power System Stabilizer Models
Minimum Excitation Limiter Models
Maximum Excitation Limiter Models
Compensating Models
Exhibit C

Representative Sample Outline of System Impact Study

1) List of major assumptions
   • nearby Generation equipment
   • nearby loads
   • one-line diagrams of system

2) Tests performed
   • Network Impact
     ① Normal system
     ② Single contingency
     ③ Second contingency
     ④ Multiple Facility contingency
   • Stability Analysis
   • Short circuit Analysis
   • Dynamic Analysis

3) Recommended System Reinforcement
   • Specific solutions including list of major items to be replaced (length and size of wire from to point A to Point B)
   • Estimated cost for each problem

4) New construction
   • Determination of major materials and estimated cost for
     o Facility Substation
     o New Interconnection Facility
     o Interconnection substation

5) Suggested Cost allocation for System Reinforcement:
   • For example, many improvements may be made that are not directly needed for the Facility Interconnection requirement but make sense to be performed while doing the required work. These benefits will improve the reliability of the Grid and therefore should be paid for by the Transmission Operator or Owner as opposed to the Generator. For example, an old manual switch in a substation might be replaced with a new automatic switch while relocating the switch in order to accommodate some new equipment.
Exhibit D

Representative Sample outline of Facility Study

1) Discreet projects to be built
   • New Construction
     o Facility Substation
     • List of major materials
     • Estimated cost of
     • Project Schedule
     • Permits required
     • Responsibility to engineering and construct
       o Interconnection Line
       o Interconnection substation
   • System upgrades
     o Upgrade1
     o Upgrade2

2) Summary of Total Project Cost
3) Summary of Total Project Schedules
4) One-line drawings of Projects
5) Geographical line routes
Exhibit E

Representative Construction and Connection Agreement between Generator and Transmission Operator

1) Definitions and Interpretations
2) Terms of agreement
3) Generation Interconnection Service (Summary of Technical Commitments Generator must agree to)
4) Operations
5) Maintenance
6) Emergencies
7) Safety
8) Modifications, Construction, and System Upgrades
9) Metering
10) Information Requirements
11) Force Majeure
12) Information Reporting
13) Payments and Billing Procedures
14) Assignment
15) Insurance
16) Indemnity
17) Breach, Cure and Default (Includes Liquidated Damages)
18) Termination of Generation Interconnection Service
19) Subcontractor
20) Confidentiality
21) Audit Rights
22) Disputes
23) Notices
24) Miscellaneous
26) Appendix B: System Upgrades
27) Appendix C: Metering Equipment
28) Appendix D: Joint Use Facilities
29) Appendix E: Operations Date
30) Appendix F: Notices
31) Appendix G: Security Arrangement Details
32) Appendix H: Milestones & Schedules
33) Appendix I: One line Diagram
34) Appendix J: Project Cost Projections