JOINT IMPLEMENTATION PROJECT DESIGN DOCUMENT FORM
Version 01 - in effect from 15 June 2006

CONTENTS

Annexes

SECTION A. General description of the project

A.1. Title of the project:

Increase in efficiency of heating supply system of Novo-Lenino district, the Irkutsk city, Irkutsk region, Russian Federation
Sectoral scopes: 1. Energy industries (renewable/non-renewable sources).
Version number: 5.
Date: 13 May, 2011.

A.2. Description of the project:

The Project's purposes are to increase an efficiency of heating supply system of Novo-Lenino, one of Irkutsk city districts, and to reduce greenhouse gases emissions.

Novo-Lenino is a district of large industrial and house construction. The main consumers of heat energy in Novo-Lenino are the housing-and-municipal sector, public buildings, utilities and the enterprises of various industries. In structure of Novo-Lenino heat loading the share of housing-and-municipal sector makes 70 %.

Before the Project heat supply of Novo Lenino was provided from a coal boiler-house of northern industrial block (KSPU) with available heat capacity of 185.4 Gcal/h and two electrical boiler houses (EBHs): "Bytovaya" with available heat capacity of 125,0 Gcal/h and "Novo-Lenino" with available heat capacity of 77,6 Gcal/h. All boiler-houses are interconnected through thermal distribution networks and operated by entities associated with a joint-stock company (JSC) "Irkutskenergo": closed CJSC "Baikalenergo" operates KSPU coal boiler house, while "Novo-Lenino" and "Bytovaya" EBHs are under operation by Novo-Irkutsk thermal power plant TPP (N-ITPP).

Under existing heat supply scheme the heat sources worked isolated (each for its site) that led to a low degree of heat supply reliability and to an absence of a possibility for optimization of installed equipment modes.

Baseline scenario

Continuation of the existing situation is considered as the baseline scenario, as available heat capacity of boiler-houses is sufficient to cover heat loadings both today's and those predicted in perspective till 2020.The Ikutskenergo policy aims at maintaining existing capital assets which will assure to provide reliable operation of heat supply system till 2012 as a minimum.

The electricity for heat production in EBHs is delivered from the regional power supply system of JSC "Irkutskenergo" that mainly uses coal as a fuel. The production of 1 Gcal of heat in Irkutsk EBH requires to burn circa 0,464 tonnes of coal equivalent (t.c.e) at Irkutskenergo power stations.

Project

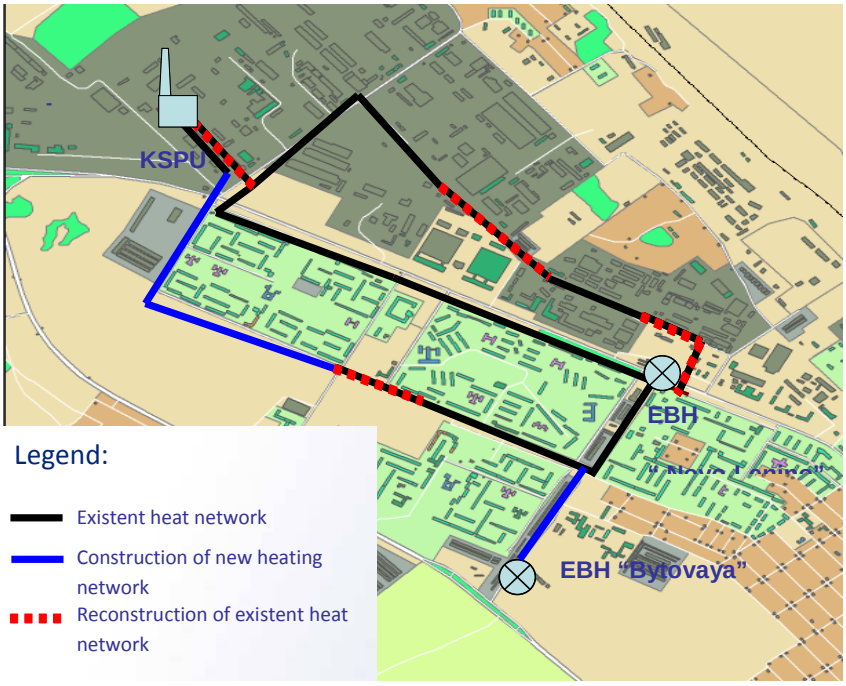
The Project scenario includes a load shift from the two environmentally inefficient EBHs of Novo-Lenino district to a more effective coal boiler-house (KSPU). The average specific coal consumption for production of 1 Gkal of heat at KSPU makes 0,199 t.c.e. The specific fuel consumption for heat production by using electricity that generated by power supply system in condensation mode makes 0,464 t.c.e/Gkal. Thus, the baseline specific fuel consumption for heat production at EBHs as high as 2,3 than the specific fuel consumption at KSPU. Realization of the Project leads to economy of fuel (coal) in a power supply system and to a reduction of greenhouse gases emissions and pollutants due to reduction of coal burning.

Project activity includes:

- Construction of new heat network from KSPU to “Bytovaya” EBH with the length of 3711 m and 600 mm in diameter;
- Reconstruction of Lenin district heat network with the length of 2743 m and diameters of 500 mm, 600 mm, 700 and 800 mm;
- Reconstruction of KSPU boiler unit #3 for the total load shift from EBHs. Bytovaya and Novo-Lenino EBHs are transferred in reserve. The heat load will be provided due to increase in heat production at KSPU.

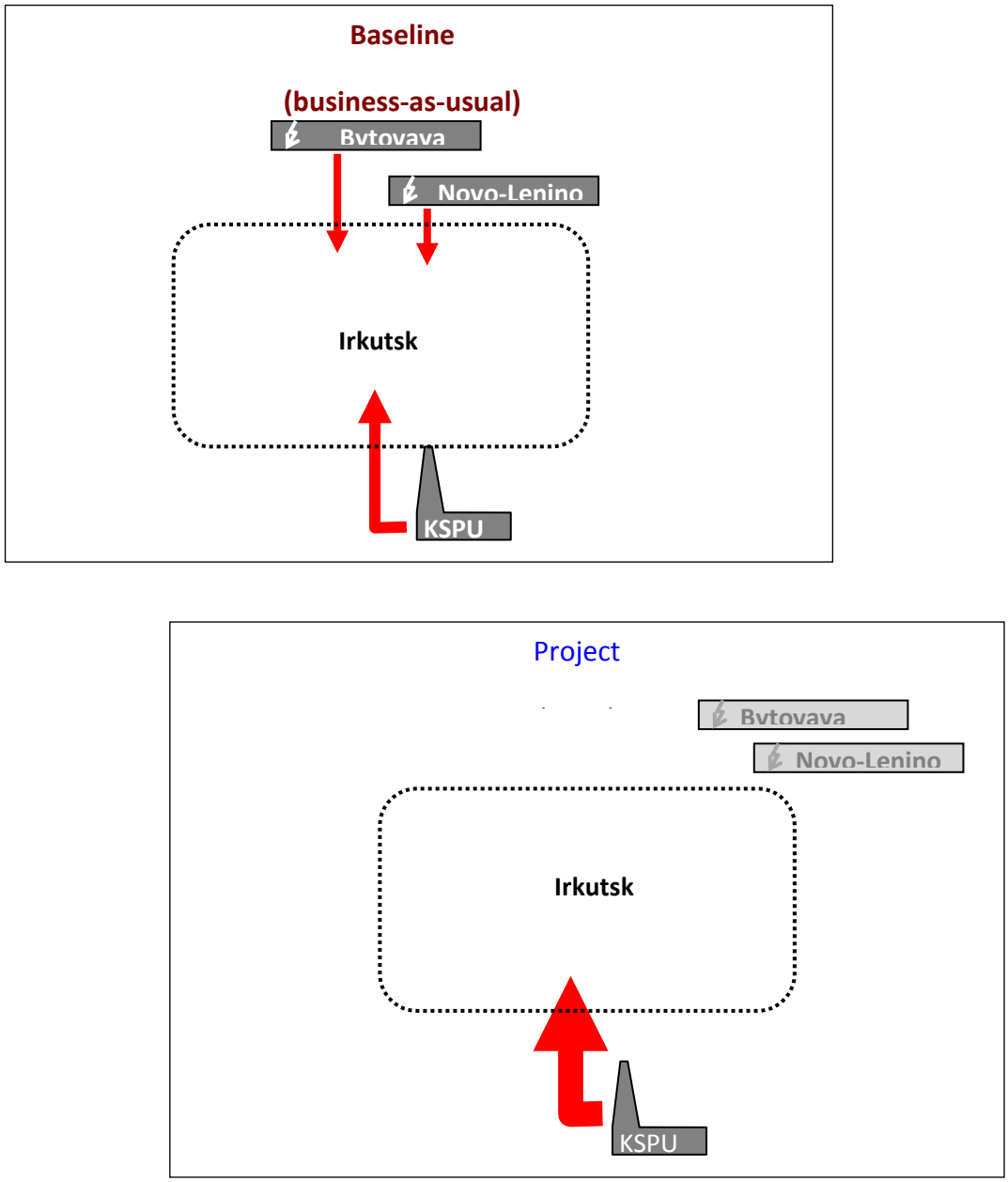
The scheme of existing heat networks and those that will be reconstructed is provided in the figure A-1.

Fig. A-1 Reconstruction of Novo-Lenino heat supply network for reception of heat from KSPU



Heat supply scheme as a result of project realization as a whole is presented below

Fig. A-2. Heat supply scheme as a result of Project realization



For the purpose of project reconstruction of existing main heating system between heat sources with pipe diameters expansion and construction of new pipeline sections are necessary. Due to new pipeline sections construction heat losses will increase on the value of heat losses from new pipeline sections. Reconstruction of existing pipeline will lead to decrease of heat losses. In conservative way, heat losses from existing pipelines involved in project is the same for both baseline and project.

The history of Project development

The project as a JI-project activity has begun on December, 29th, 2007. The management of JSC "Irkutskenergo" made a decision to include the project into the investment programme for 2008.

Decision was made considering possible revenue from the ERU sells. Without ERU sells the project is unattractive for JSC "Irkutskenergo".

During 2008-2009 a KSPU -"Bytovaya" EBH network section has been constructed and 100 percent and 50 percent load shift to KSPU from respectively "Bytovaya" and "Novo-Lenino" EBHs has been carried out.

As a result of project realization following purposes will be reached:

• Reliability enhancement of a heat supply of "Novo-Lenino" district

• Enhancement of an environmental situation in the region: reductions of GHG and pollutant's emissions.

On November, 28th, 2008 the first partial output of replaced heat from Bytovaya EBH has been carried out at KSPU.

A.3. Project participants:

Party involved	Legal entity project participants (as applicable)	Please indicate if the Party involved wishes to be considered as project participant (Yes/No)
Party A - Russian Federation (Host party)	Irkutsk Joint Stock Company for Energy and Electrification (JSC Irkutskenergo)	No
Party B - United Kingdom	CF Partners (UK) LLP	No

A.4. Technical description of the project:

A.4.1. Location of the project:

A.4.1.1. Host Party (parties):

The Russian Federation

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

Irkutsk Oblast is located in south-eastern Siberia in the basins of Angara, Lena, and Nizhnyaya Tunguska Rivers, and occupies an area of 767,900 km² (4.6% of Russia's territory). Extent of Irkutsk Oblast from the West to the east is 1300 km, from the south to the north is 1500 km. See the map below.

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

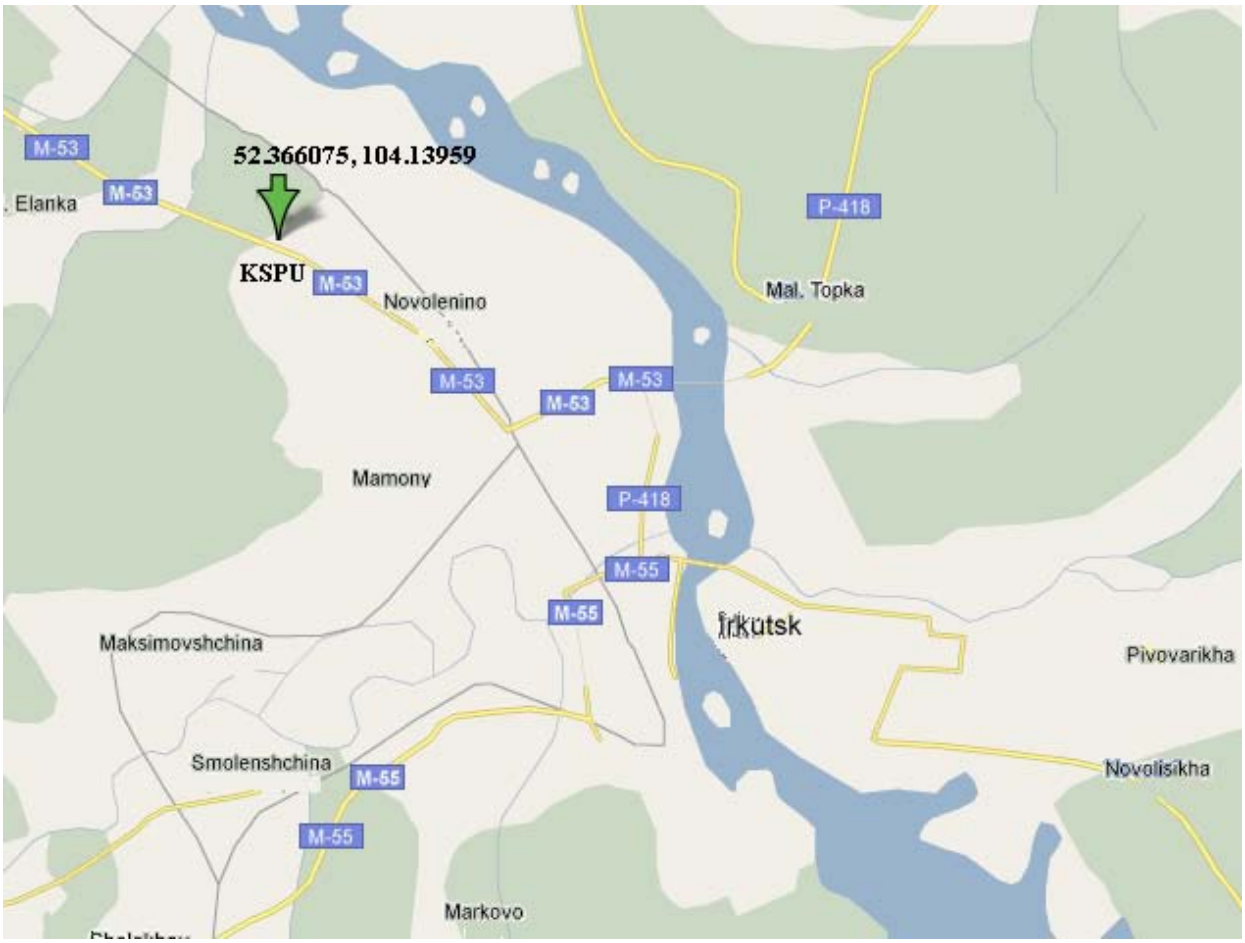
The city of Irkutsk is a capital the Irkutsk oblast and is located in the south of oblast. Population of Irkutsk is about 600 thousand of people.

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

The project is carried out in Novo-Lenino district of Irkutsk.

Novo-Lenino is a minidistrict located in large industrial and the housing construction area of the western part of Leninskiy district of Irkutsk. The district is built up by many-storied and well-furnished apartment houses; the southern part is occupied by individual farmstead buildings. At northern outskirt of district cottage building takes places. At the territory of district there are industrial enterprises and objects,

Fig. A.4.1.4.1. Location of the project on the map of Irkutsk



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

As a result of Project realization KSPU takes the heat load of Novo-Lenino district from "Novo-Lenino" and "Bytovaya" EBHs that are put into reserve. For this purpose construction of new and reconstruction of existing heat supply networks has been planned. Project activities are implemented in parallel at various sites and in several stages.

The boiler-house of northern industrial block (KSPU) is a basic source of a heat supply of Northern and Northwest industrial blocks and housing development of Novo-Lenino district. The total heat capacity of KSPU is 257 Gcal/h, but available heat capacity is 185,4 Gcal/h. The Project activities at KSPU include major overhaul of the boiler № 3 that will help improve its capacity up to 257 Gcal/h. Installed equipment of KSPU include 5 BKZ-75-39fb boilers (put in operation in 1974-1983). Fuel is Azejsky brown coal. The design temperature schedule of a boiler-house is 150-70 °C. Before Project realisation the temperature schedule of heat output was 130-70 °C. The scheme of hot water supply is open.

All the boilers go through inspection on a regular basis. Subject to the results of inspection permission for their operation for specified period is issued. After expiration of this period,

inspection is renewed and operation term is prolonged. In the table below the fuel consumption data are provided.

Table A 1. Data for coal consumption at KSPU

Item/year	2007	2008	2009	2010
Coal consumption at KSPU (tce)	55 196	76 742	100 098	105 909

Electrical boiler-house "Novo-Lenino" (Novo-Lenino EBH) – one of the basic heat supply sources of Novo-Lenino communal sector. The total heat capacity is 156,5 Gcal/h, available heat capacity is 125,0 Gcal/h. The hot water supply capacity is 23 Gcal/h. The temperature schedule of heat output– 130-70 °C, the scheme of hot water supply is open. Installed equipment include electrical boilers KEV-6000/6 (2 units, put into operation in 1981), KEV-8000/6 (2 units, put into operation in 1973, 1986), EVNE-VNE-8000/6 (8 units, put into operation in 1966), KEV-10000/6 (9 units, put into operation in 1981, 1984).

The main parameters of the work of boiler house in 2005-2007 are presented in table A-1.

Electrical boiler-house "Bytovaya" (Bytovaya EBH) also supplies with heat the consumers of Novo-Lenino district. The total heat capacity is 82,6 Gcal/h, available heat capacity is 77,6 Gcal/h. The temperature schedule of heat output is 130-70 °C, the scheme of hot water supply is open, under the closed scheme 43 thermal points at residential buildings in Novo-Lenino district area are connected. Installed equipment include 16 electrical boilers of 3TS-KEV-6000/6 type (launched in 1989, 1998).

The electricity supply of EBHs is carried out from a regional network of JSC “Irkutskenergo” that includes 9 thermal power plants (TPPs) and 3 HPPs (hydro power plants). 80 % of brown coal and 20 % of bituminous coal are used as fuel on TPPs of the Irkutsk power supply system. In the case of reduction in the use of electricity generated at the grid first of all reduction of electricity production at the least efficient condensation cycle occurs. Average specific fuel consumption rate of JSC “Irkutskenergo” for electricity generation under condensation cycle makes 0.399 t.e.c/MWh, the CO_2 emission factor makes 1.159 tCO2/MWh. Detailed calculation is presented in Annex 2.

Table A 2. Shedule of the project realization

Period	Stage	Works entitlement
2007	Project design	Elaboration of Project design technical documentation
1 start-up complex		

2008-2009	Construction of heat supply networks	Central heat supply station of Bytovaya EBH – TK-5b-1 (L=650 m, Dn = 600 mm) TK-4b-5 - ut.3 (L = 400 m, Dn=600 mm) ut.3 - ut.2 (L = 1140 m, Dn=600 mm) ut.2 - TK-0 (L = 1521 m, Dn=600 mm)
	Reconstruction of heat supply network	Central heat supply station of Bytovaya EBH – TK-5b-1 (L=650 m, Dn = 800 mm) TK-5b - TK-5b-1(L = 48 m, Dn=700 mm) TK-5b-1- TK-4b (L = 20 m, Dn=600 mm) TK-4b-1- u.7 (L = 64 m, Dn=600 mm)
2 start-up complex		
2010-2011	Reconstruction of heat supply networks	TK-5b-1- TK-2n-12 (L=54 m, Dn=700 mm) TK-2n-12 - TK-2n-6 (L=663 m, Dn=700 mm) TK-2n-6 - TK-2n-4 (L = 80 m, Dn=500 mm) TK-9 - TK-10 (L=122 m, Dn=400 mm to Dn=600) TK-10 - TK-13 (L=504 m, Dn=400 mm to Dn=600) TK-13 - TK-14 (L=32 m, Dn=500 mm to Dn=600)

The basic performance indicators of the boiler-houses for 2005-2007 are presented in table A-2.

Table A 3. Basic performance indicators of the boiler-houses which supply heat to Novo-Lenino district in 2005-2012.

Boiler house	***Item,units***	***2005***	***2006***	***2007***	***2008***	***2009***	***2010***	***2011***	***2012***
KSPU	Heat output,ths.Gcal	282	302	300	428	575	598	632	632

	Fuel consumption for heat output, ths.t c.e.	61	60	55	77	100	106	113	113
Bytovaya EBH	Heat output,t hs.Gcal	172	189	167	85	7	13	10	10
	Electricity consumption, mln.KWh	228	218	191	103	8	15	11	11
	Fuel consumption in power grid, ths.t.c.e	91	87	76	41	3	6	4	4
Novo-Lenino EBH"	Heat output, th.Gcal	366	352	288	297	208	203	164	181
	Electricity consumption, mln.KWh	395	396	339	341	244	238	191	211
	Fuel consumption in power grid, ths.t.c.e	158	158	135	136	97	95	76	84

Reconstruction of heat pipeline is carried out in areas with dense building at the big saturation of a zone of a lining underground communications. The operating engineering communications which are getting into a zone of building are carrying out. The laying designed heat pipelines is provided in an elevated variant on low partially high separate ferro-concrete support and in ferro-concrete channels. The design of the ferro-concrete channels, reconstructed heat chambers located under a highway, will be reconsidered under loading from motor transport.

Pipelines and its elements have anticorrosive protection - complex polyurethane coating "Vector".

As the basic heat-insulation layer for pipelines it is used products of factory manufacturing of high density polyurethane. New heat isolation possesses considerably better characteristics, it much more moistureproof, stronger and can be reused, a sheeting made of fibreglass which has been built in the basic heat-insulation layer. Heat isolation of old pipelines represents the mineral wool covered with aluminium sheets. It mechanically weak and in case of soaking losses the properties. Heat isolation of the old sample has heat-conduction coefficient is 2 times larger, than new polyurethane isolation, and also it cannot be reused.

Roads confluence with electric transport in the considered project are absent. On supply and return pipelines of reconstructed and newly constructed parts of heating system which are component of the project, for supervision over internal corrosion two indicators of corrosion in each endpoints are provided, one of which serves for supervision over oxygen corrosion, another behind the general corrosion of pipelines.

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

Project realization will lead to replacement of heat produced by electrical boiler-houses with heat produced by the coal boiler-house. As a result there will be an economy of fossil fuel due to a reduced consumption of electricity that would be produced by a power grid in a condensation mode. Specific fuel consumption in Irkutsk power grid in condensation mode makes 0.464 t.c.e/Gcal, whereas specific fuel consumption for heat production at KSPU coal boiler-house makes 0,199 t.c.e/Gcal. Thus, to produce heat in EBH it is required to burn fuel 2,3 times as

large as in KSPU. Consequently, reduction of fuel consumption will lead to reduction of CO_2 emission reductions.

Calculation of greenhouse gases emission is presented in section E. For the definition of the emission factor for condensation cycle in the Irkutsk power grid JI specific approach is used.

In absence of the project (the baseline scenario) further operation of the Bytovaya and Novo-Lenino electrical boiler-houses operation with higher level of indirect emissions would proceed. The following facts tell in favour of it:
- EBHs have a spare capacity reserve which would allow covering their share in growing heat demand.
- The technical condition of EBHs allows their further operation both in a former mode and in the case of load growth.
- There are no financial incentives for reconstruction of a heating system (in the frame of the proposed project activity).

Detail consideration of the given facts is presented in section B.

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

	Years
Length of the crediting period: **2008-2012**	5
Year	Estimate of annual emission reductions in tonnes of CO_2 equivalent
2008	31019
2009	244311
2010	259877
2011	281199
2012	281199
Total estimated emission reductions over the crediting period (tones of CO_2 equivalent)	1097604
Annual average of emission reductions over the crediting period (tones of CO_2 equivalent)	219521

A.5. Project approval by the Parties involved:

On October 28, 2009 the Chairman of the Russian Federation Government, V. Putin, signed Resolution 843 “On measures for realization of Article 6 of the Kyoto Protocol to the United Nations Framework Convention on Climate Change”. This document depicts a JI-project approval procedure in the Russian Federation.

According to the item 8 of Provision the approval of projects will be carried out by Ministry of Economic Development of the Russian Federation subject to results of competitive selection of applications submitted by proponents of potential JI-projects. Competitive selection of demands is carried out by the operator of carbon units (Sberbank of RF) according to the item 5 of the Government Decree of the Russian Federation № 843.

The order of Ministry of Economic Development «On approval of competitive selection rules submitted for the purpose of the approval of projects implemented according to the article 6 of the Kyoto Protocol to the UN Framework Convention on Climate Change» defines requirements to a structure and a content of the application. The application structure includes «the positive expert opinion on the project design documentation prepared according to the international requirements by the accredited independent entity chosen by the applicant».

Thus, according to the legislation of the Russian Federation in the field of JI projects realization, the Project approval is possible after reception of the positive determination opinion from AIE.

SECTION B. Baseline

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

According to "Guidelines for users of the JI PDD form" version 04 (Appendix B), the approved CDM methodology or JI specific approach regarding baseline setting can be chosen.
To describe and justify the chosen baseline the JI specific approach is applied. It is developed according to JISC "Guidance on criteria for baseline setting and monitoring" version 02 (paragraph 9a)
The JI specific approach based on alternative scenarios consideration and estimation with help of the following stages that used in this PDD:

Step 1. Indication and description of the approach applied

1. Identification of alternative scenarios.

At this stage all alternative candidates of the baseline scenario are identified and their conformity to the current legislation is checked.

2. Barrier analysis.

This stage includes definition of the barriers which could interfere to realize the alternative scenarios identified at the previous stage and the influence analysis of the given barriers on alternative scenario realization is carried out.

3. Analysis of common practice.

The given stage supplements the researcher conducted at the previous stage by the analysis about degree of technology prevalence offered in the given Project and in others Russian companies. The baseline scenario is the most technically feasible and prevalent alternative.

As a result of the aforesaid stages the definition of the baseline scenario serves. The baseline scenario is the most possible alternative. Realization of the baseline scenario is not interfered by the considered barriers.

Step 2. Application of the approach chosen

1. Identification of alternative scenarios

Alternative scenario 1. Continuation of the current situation (in the absence of the proposed project activity).
This alternative means that for heat supply of Irkutsk district "Novo-Lenino" "Bytovaya" and "Novo-Lenino" EBHs and KSPU coal boiler-house would be operated not at full capacity as they did before the Project realization. At the same time heat would be transported through old

heat pipelines. The preventive maintenance connected with partial replacement of pipes for maintenance of a technical condition of heating pipelines would be made.

Table B 1.1. Heat output under alternative scenario 1.

Item/year	2008 (Dec)	2009	2010	2011	2012
KSPU (Gcal)	43 091	272 511	267 785	258 601	258 601
«Novo-Lenino» EBH (Gcal)	45 594	334 756	352 946	350 776	350 776
«Bytovaya» EBH (Gcal)	23 949	175 834	185 389	184 248	184 248
Total heat output (.Gcal)	112 634	783 101	806 120	793 625	793 625
Heat losses (Gcal)	11 149	102 206	102 021	86 396	86 396
Total productive supply (Gcal)	101 485	680 895	704 099	707 229	707 229

Alternative scenario 2. The proposed project activity undertaken without being registered as a JI project

Project activity assumes the construction of a new and reconstruction of a present heating system of Irkutsk “Novo-Lenino” district to shift the heat load from "Bytovaya" and «Novo-Lenino» EBHs to the KSPU coal boiler-house with the subsequent drawing out of EBHs into reserve. Project realization will lead to replacement of the heat produced by EBHs with heat produced by coal boiler house.

Table B 1.2. Heat output under alternative scenario 2.

Item/year	2008 (Dec)	2009	2010	2011	2012
KSPU (Gcal)	80 243	575 410	597 726	631 944	631 944
«Novo-Lenino» EBH (Gcal)	33 562	208 066	202 547	160 456	160 456
«Bytovaya» EBH (Gcal)	0	6 805	13 219	10 100	10 100
Total heat output (Gcal)	113 805	790 281	813 492	802 500	802 500
Heat losses (Gcal)	12 320	109 386	109 393	95 271	95 271
Total productive supply (Gcal)	101 485	680 895	704 099	707 229	707 229

Alternative scenario 3. The proposed project activity undertaking with use of another type of fuel at boiler house: fuel oil, natural gas or biofuel.

This alternative assumes the construction of a new and reconstruction of a present heating system of Irkutsk "Novo-Lenino" district to shift the heat load from "Bytovaya" and «Novo-Lenino» EBHs to the boiler-house on fuel oil, natural gas or biofuel with the subsequent drawing out of EBHs into reserve.

Conclusion: All of the described above alternative scenarios are consistent with the mandatory laws and regulations and may be discussed in the further analysis.

2. Barrier analysis

The analysis of barriers considers the influences exerted on alternative scenarios by the **technological** and **financial barriers**.

Technological barrier prevents the realization of alternatives from the capability of technological feasibility.

Financial barrier prevents the realization of alternatives from the commercial efficiency viewpoint. Financial barrier is justified further through the investment analysis.

Alternative scenario 1. Continuation of the current situation (without the project activity)

The *technological barrier* exerts no effect on alternative scenario 1, since this scenario is a current situation and there is no any lack of experience or risk of technological failure.

The *financial barrier* also exerts no effect on alternative scenario 1, since further operation of 2 Irkutsk district EBHs does not constitute an investment activity, which would be assessed from the economic efficiency viewpoint.

Alternative scenario 2. The proposed project activity undertaken without being registered as a JI project.

Technological barrier
This alternative scenario doesn't assume any technological difficulties as construction of a new and reconstruction of present heating system is a typical activity. KSPU is a coal boiler house There is no need to do any reconstructions or installation any additional equipment at KSPU. Coal is a typical and most cheap fuel of Irkutsk region. JSC "Irkutskenergo" is an owner of LLC "Vostsibugol company" – the main coal producer and supplier in Irkutsk region. That is why there is no any problem with coal supply. All aforesaid confirms lack of technological barrier.

Financial barrier
For estimation of economic project's efficiency the official Methodology of JSC Irkutskenergo issued on 28.12.2007 and the appropriate computer program were applied. The Methodology is based on commonly used formulae for calculation of key financial/economic indicators of an

investment project. The calculations were performed on the condition that investment expenses will be covered by the tariff on heat after the Project becomes operational. At the same time the tariff on heat from the Irkutskenergo heat sources corresponds to a level that would be under continuation of existing situation.

After full return of the investment effects due to reduction of expenses on purchasing electricity and power capacity for production of heat at EBHs are eliminated.

According to the Methodology of JSC Irkutskenergo for estimation of economic efficiency the project following positions are applied for calculations:
1. The discounting rate makes 15 %
2. The horizon of project calculation makes 12 years
3. Growth rates for the tariffs and the prices of production, goods, materials and services are assumed equal to the inflationary expectations accepted by experts of JSC “Irkutskenergo”.

Tables with economic indicators calculation in excel format are presented in the Annex 4.

Table B.1.3 shows results of the economic efficiency analysis of the alternative scenario 2.

Table B.1.3. Financial/economic indicators

Indicator	Unit	Project activity without ERU sales
Investment	mln. Rbls	607 425
Average annual revenues (without VAT)	mln. Rbls/year	496 996
Average annual operating cost	mln. Rbls/year	441 418
Average annual amortization (is not included in cash flow analysis)	mln. Rbls/year	28 991
Average annual revenues from ERU’s sale	mln. Rbls/year	0
NPV	mln. Rbls	-105 607
IRR	%	10,2
Profitability index	-	0,81
Discount payback period	Years	- -

Alternative scenario 2 is not commercially effective.

Alternative scenario 3. The proposed project activity undertaking with use of another type of fuel at boiler house: fuel oil, natural gas or biofuel.

Technological barrier

This alternative scenario assumes technological difficulties for KSPU reconstruction for using any other fuel instead of coal: fuel oil, natural gas or biofuel. Irkutsk region is a coal-based, that is why natural gas can't be used because of the lack of a gas transmission and distribution network.
Technological barrier is exist for alternative scenario 3.

Financial barrier

Coal is the cheapest fuel in Irkutsk region. Results of analysis of project economy effectiveness with use of coal as a fuel represented above. Using of fuel oil, natural gas or pellets need additional investment for boiler house reconstruction plus operating cost will be much higher because of higher fuel prices.

Table B.1.4 Fuel prices in Siberian Federal district in 2010-2015*

Fuel	Price (r/t.c.e)
Coal*	1602
Fuel oil*	From 3730 till 4846
Natural gas*	From 3082 till 3152
Pellets**	4680

*According to Scenary conditions of electroenergy development till 2030 (Energy forecasting energy)
** According to price in Irkutsk region

Financial barrier exerts on alternative scenario 3.

Conclusion:

The above analysis showed that the financial barrier represents a considerable obstacle to realization of alternative 2.

Table B 1.5. Results of analysis of barrier

Barrier	Alternative 1	Alternative 2	Alternative 3
Technological	Barrier does not exist	Barrier does not exist	Barrier exists
Financial	Barrier does not exist	Barrier exists	Barrier exists

Therefore, the financial and technological barriers does not exist for alternative scenario 1. There is substantial financial barrier, which impede alternative scenario 2.
Technological and financial barriers impede alternative scenario 3.

2. Common practice analysis

Incompleteness and inopportuneness of financing of the housing and communal services in the Russian Federation is the basic problem. In the circumstances investors do not put money in sphere of housing and communal services because of not clear system of tariff regulation, pricing decision and accumulate budget debts to the public utilities.

During preparation of housing and communal services objects for operation in autumn and winter period regular preventive maintenance (PM) in Russian Federation is carried out. The given position is fixed in «Rules of the organisation of maintenance support of the equipment,

buildings, constructions of power stations and networks» SO 34.04.181-2003. The given document is recommendatory. PM is carried out according to the confirmed schedule. PM expansion is caused by the fact, that ,as a rule, it is compensated by the heat prime cost, therefore it is not required additional investing. It is the most important factor for housing and communal services, that incur deficit of the investment.

On the basis of information represented in Table B 2.1, in the Siberia and Far East regions the tendency of input new or modernization of existing electroboiler houses is evidenced.

Table B2.1

Region	Year	Action	Source
Murmansk Region	2003	Input of 1-st turn of electroboiler house	http://www.murmannews.ru/allnews/78742/
	2005	Input of new electroboiler house	http://www.murman.ru/themes/heat-15092005.shtml
	2006	Input of 2-nd turn of electroboiler house	http://www.hibiny.ru/news/ru/archive/4032
Krasnoyarsk Territory	2008	Modernization of existing electroboiler house	http://www.rosteplo.ru/news.php?zag=1227168821
Amur Region	2004	Input of new electroboiler house	http://www.rosteplo.ru/news.php?zag=1098990600
Khakassia	2006	Input of new electroboiler house	http://meria-abakan.ru/news/5562/5566.html>
Irkutsk region	2007	Input of new electroboiler house	http://www.pressa.irk.ru/day/2007/494.html
	2009	Modernization of existing electroboiler house	http://www.oblkommunenergo.ru/index.php?option=com_content&view=article&id=107&Itemid=36
Magadan Region	2006	Input of new electroboiler house	http://www.regnum.ru/news/539694.html
Chukotka	2006	Input of new electroboiler house	http://www.pevek.ru/articles/item258.html

Closing of electroboiler houses in some regions of Russia, for example in Murmansk area, Republic of Karelia is not the same with presented project. Electricity production in Irkutsk region is the cheapest in Russia because of big share of HPP. That is why using of electricity for heat production in Irkutsk region is not unprofitable as in the other regions of Russia.
JSC “Irkutskenergo” is a Irkutsk regional power company which carries out such a project activity for the first time. The given Project is a pilot project on optimization of the heat supply

scheme on territory of the Irkutsk region. 688 mln. rubles is required for realization of the project, therefore operating income from the heat selling cannot be a financing source for this project. It realization is possible only as JI project in the frame of Kyoto protocol.

Conclusion:

Based on the barrier analysis and common practice analysis the alternative scenario 1 - Continuation of the current situation (without the project activity) is a most plausible, thus it is identified as the baseline scenario.

Baseline is determined according to following JI specific approach:

$BE_y = BE_{coal\ KSPU,y} + BE_{el\ KSPU,y} + BE_{el\text{-}heat\ NL,y} + BE_{el\ aux\ NL,y} + BE_{el\text{-}heat\ B,y} + BE_{el\ aux\ B,y}$ **(formula B.1)**

where:

$BE_{coal\ KSPU}$ –baseline emissions from fuel burning for heat output by KSPU, t CO_2

$BE_{el\ KSPU}$ -baseline emissions from auxiliaries electricity consumption by KSPU, t CO_2

$BE_{el\text{-}heat\ NL}$ –baseline emissions from electricity consumption for heat output by "Novo-Lenino" EBH, t CO_2

$BE_{el\ aux\ NL}$ –baseline emissions from auxiliaries electricity consumption by "Novo-Lenino" EBH, t CO_2

$BE_{el\text{-}heat\ B}$ –baseline emissions from electricity consumption for heat output by "Bytovaya" EBH, t CO_2

$BE_{el\ aux\ B}$ –baseline emissions from auxiliaries electricity consumption by e/b "Bytovaya" EBH, t CO_2

$BE_{coal\ KSPU,y} = FC_{BE\ coal\ KSPU} * COEF_{coal}$ **(formula B.2)**

where:

$FC_{BE\ coal\ KSPU}$ –Baseline quantity of coal burned by KSPU, t.c.e/year;

$COEF_{coal}$ – CO_2 emission factor for coal, t CO_2/t.c.e;

$FC_{coal\ KSPU} = HO_{BE\ KSPU} * SFC_{BE\ KSPU\ heat}$ **(formula B.3)**

$HO_{BE\ KSPU} = HO_{KSPU\ zone\ PEy}$ **(formula B.4)**

where:

$HO_{BE\ KSPU}$ - Baseline heat output from KSPU, Gcal/year

$SFC_{BE\ KSPU\ heat}$ - Average specific coal consumption by KSPU for baseline heat output, t.c.e/Gcal

$HO_{KSPU\ zone\ PEy}$- heat output to KSPU heat zone under the project, Gcal/year

$BE_{el\ KSPU} = EC_{BE\ el\ KSPU} * EF_{grid}$ **(formula B.5)**

where:

$EC_{BE\ el\ KSPU}$ – baseline auxiliaries electricity consumption by KSPU, MWh/year

$EC_{BE\ el\ KSPU} = SEC_{BE\ el\ KSPU} * HO_{BE\ KSPU}$ **(formula B.6)**

where

$SEC_{BE\ el\ KSPU}$ – Average specific auxiliaries electricity consumption by KSPU for heat output ,MWh/Gcal

$BE_{el\text{-}heat\ NL} = EC_{BE\ heat\ NL} * EF_{grid}$ **(formula B.7)**

where:

$EC_{BE\ heat\ NL}$ –baseline electricity consumption for heat output by "Novo-Lenino" EBH, MWh/year

$$EC_{BE\ heat\ NL} = HO_{BE\ heat\ NL} * SEC_{BE\ heat\ NL} \quad \textbf{(formula B.8)}$$

where:

$HO_{BE\ heat\ NL}$ – baseline heat output by e/b "Novo-Lenino", Gcal/year (see formula B.15)

$SEC_{BE\ heat\ NL}$- Average specific electricity consumption by e/b "Novo-Lenino" for baseline heat output,MWh/Gcal

$$BE_{el\ aux\ NL} = EC_{BE\ aux\ NL} * EF_{grid} \quad \textbf{(formula B.9)}$$

where**:**

$EC_{BE\ aux\ NL}$- baseline auxiliaries electricity consumption by "Novo-Lenino" EBH for heat output, MWh/year

$$EC_{BE\ aux\ NL} = SEC_{BE\ aux\ NL} * HO_{BE\ heat\ NL} \quad \textbf{(formula B.10)}$$

where:

$SEC_{BE\ aux\ NL}$ – Average specific auxiliaries electricity consumption by "Novo-Lenino" EBH for heat output, MWh/Gcal

$$BE_{el\text{-}heat\ B,y} = EC_{BE\ heat\ B} * EF_{grid} \quad \textbf{(formula B.11)}$$

where:

$EC_{BE\ heat\ B}$ – baseline electricity consumption for heat output by "Bytovaya" EBH, MWh/year

$$EC_{BE\ heat\ B} = HO_{BE\ heat\ B} * SEC_{BE\ heat\ B} \quad \textbf{(formula B.12)}$$

where:

$HO_{BE\ heat\ B}$ – Baseline heat output from e/b "Bytovaya" EBH, Gcal/year (see formula B.15)

$SEC_{BE\ heat\ B}$- Average specific electricity consumption by "Bytovaya" EBH for baseline heat output, MWh/Gcal

$$BE_{el\ aux\ B,y} = EC_{BE\ aux\ B} * EF_{grid} \quad \textbf{(formula B.13)}$$

where:

$EC_{BE\ aux\ B}$- baseline auxiliaries electricity consumption by "Bytovaya" EBH for heat output, MWh/year

$$EC_{BE\ aux\ B} = SEC_{BE\ aux\ B} * HO_{BE\ heat\ B} \quad \textbf{(formula B.14)}$$

where:

$SEC_{BE\ aux\ B}$- Average specific auxiliaries electricity consumption by "Bytovaya" EBH for heatoutput,MWh/Gcal

Electroboiler houses heat output calculates on the basis of index of electroboiler house load increase and average data on electroboiler house heat output in 2005-2007. Index of electroboiler house load increase calculates as proportion between real heat output to the zone of NI TPP under the project and average heat output to the zone NI TPP in 2005-2007.

$$HO_{i-eb\ BEy} = \overline{HO_{i-eb\ 2005-2007}} \times I_{eby} \quad \textbf{(formula B.15)}$$

where:

$HO_{i\text{-}eb\ BE\ y}$- Baseline electroboiler houses heat output in year y (Gcal),

$\overline{HO_{i-eb\ 2005-2007}}$ - average electroboiler houses heat output in 2005-2007 (Gcal),

I_{eby} – index of electroboiler house load increase in year y

$$I_{eby} = \frac{HO_{NI\ TPP\ zone\ PE\ y}}{\overline{HO}_{NI\ TPP\ zone\ 2005-2007}}$$ **(formula B.16)**

where:
HO $_{NITPPzone\ PE\ y}$ – heat output to the zone of NI TPP under the project in year y (Gcal),
$\overline{HO}_{NITPP\ zone\ 2005-2007}$ - average heat output to the zone of NI TPP in 2005-2007 (Gcal)

$$HO_{NITPP\ zone\ BE\ y} = HO_{PE\ B\ y} + HO_{PE\ NL\ y} + HO_{KSPU\ NITPP\ zone\ PE\ y} - L_{h\ y}$$ **(formula B.17)**

where:
HO $_{PE\ B\ y}$ – heat output from electroboiler house "Bitovaya" under the project in year y (Gcal),
HO $_{PE\ NL\ y}$ – heat output from electroboiler house "Novo-Lenino" under the project in year y (Gcal),
HO $_{KSPU\ NITPP\ zone\ BE\ y}$ – heat output from KSPU to the zone of NI TPP under the Project in year y (Gcal),
$L_{h\ y}$ – heat losses from new pipeline in year y (Gcal)

$$L_{h\ y} = L_{h\ ratio} * HO_{KSPU\ Bitovaya\ PE\ y}$$ **(formula B.18)**

where:
$L_{h\ ratio}$ - Project heat losses ratio (for new pipeline),%
$HO_{KSPU\ Bitovaya\ PE\ y}$ - heat output from KSPU to the zone of electroboiler house Bitovaya under the Project in year y (Gcal)

The table with the key data and the variables used for the baseline definition is presented below:

Data and parameters that are not monitored throughout the crediting period, but are determined only once (and thus remain fixed throughout the crediting period), and that are available already at the stage of determination regarding the PDD:

Data/Parameter 1	L_{hi}
Data unit	%
Description	Project heat losses ratio (for new pipeline)
Time of determination /monitoring	Determined once in 2011 for the credit period
Source of data	Ratio specific heat losses calculation
Value of data applied (for ex ante calculations/determinations)	5,3%
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Calculated as average heat losses ratio in 2005-2007 and difference between ratio of specific heat losses for the old heat network and for the new heat network.

QA/QC procedures (to be) Applied	Calculated according to the "Methodological instructive regulations for composition of energy characteristics for systems of transport the heat energy on the indicator "thermal losses" approved by an Ministry of Energy Order # 278 from 30.06.2003
Any comment	

Data/Parameter 2	**$SFC_{BE\ KSPU}$**
Data unit	t.c.e/Gcal
Description	Average specific coal consumption by KSPU for baseline heat production
Time of determination /monitoring	Determined once
Source of data	Initial data for calculation of this parameter is taken from yearly reports of KSPU.
Value of data applied (for ex ante calculations/determinations)	0,199 t.c.e/Gcal
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Calculated as the average specific coal consumption for baseline heat production by KSPU in 2005-2007. Calculated by experts of JSC "Irkutskenergo". Calculation is presented in excel file-Annex 5.
QA/QC procedures (to be) Applied	All measurements are made by the calibrated measuring devices according to standards in power branch.
Any comment	

Data/Parameter 3	**$SFC_{BE\ KSPU}$**
Data unit	t.c.e/Gcal
Description	Average specific coal consumption by KSPU for baseline heat production
Time of determination /monitoring	Determined once
Source of data	Initial data for calculation of this parameter is taken from yearly reports of KSPU.
Value of data applied (for ex ante calculations/determinations)	0,199 t.c.e/Gcal

Justification of the choice of data or description of measurement methods and procedures (to be) applied	Calculated as the average specific coal consumption for baseline heat production by KSPU in 2005-2007. Calculated by experts of JSC "Irkutskenergo". Calculation is presented in excel file-Annex 5.
QA/QC procedures (to be) Applied	All measurements are made by the calibrated measuring devices according to standards in power branch.
Any comment	

Data/Parameter 4	**SEC** $_{BE\ NL}$
Data unit	MWh /Gcal
Description	Average specific electricity consumption by "Novo-Lenino" EBH for baseline heat production
Time of determination /monitoring	Determined once
Source of data	Initial data for calculation of this parameter is taken from yearly reports of e/b "Novo-Lenino".
Value of data applied (for ex ante calculations/determinations)	1,122 MWh/Gcal
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Calculated as the average specific electricity consumption for baseline heat production by "Novo-Lenino" EHB in 2005-2007. Calculated by experts of JSC "Irkutskenergo". Calculation is presented in excel file-Annex 5.
QA/QC procedures (to be) Applied	All measurements are made by the calibrated measuring devices according to standards in power branch.
Any comment	

Data/Parameter 5	**SEC** $_{BE\ B}$
Data unit	MWh/Gcal
Description	Average specific electricity consumption by "Bytovaya" EHB for baseline heat production
Time of determination /monitoring	Determined once
Source of data	Initial data for calculation of this parameter is taken from yearly reports of e/b "Bitovaya".
Value of data applied (for ex ante calculations/determinations)	1,207 MWh/Gcal

Justification of the choice of data or description of measurement methods and procedures (to be) applied	Calculated as the average specific electricity consumption for baseline heat production by "Bytovaya" EHB in 2005-2007. Calculated by experts of JSC "Irkutskenergo". Calculation is presented in excel file-Annex 5.
QA/QC procedures (to be) Applied	All measurements are made by the calibrated measuring devices according to standards in power branch.
Any comment	

Data/Parameter 6	**EF_{coal}**
Data unit	t CO_2/TJ
Description	CO_2 emission factor for coal combustion
Time of determination /monitoring	Determined once
Source of data	
Value of data applied (for ex ante calculations/determinations)	96.1 t /TJ
Justification of the choice of data or description of measurement methods and procedures (to be) applied	This parameter is provided in 2006 IPCC Guidelness for National Greenhouse Gas Inventories, Table 1.4.
QA/QC procedures (to be) Applied	Calculated on the basis of an inventory of greenhouse gases.
Any comment	-

Data/Parameter 7	**$SEC_{BE\ el\ KSPU}$**
Data unit	MWh/Gcal
Description	Average specific electricity consumption for own needs by KSPU
Time of determination /monitoring	Determined once
Source of data	Initial data for calculation of this parameter is taken from yearly reports of KSPU.
Value of data applied (for ex ante	0,016 MWh/Gcal

calculations/determinations)	
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Calculated as the average specific electricity consumption for own needs in KSPU in 2005-2007. Calculated by experts of JSC "Irkutskenergo". Calculation is presented in excel file-Annex 5.
QA/QC procedures (to be) Applied	All measurements are made by the calibrated measuring devices according to standards in power branch.
Any comment	-

Data/Parameter 8	**SEC** $_{BE\ aux\ NL}$
Data unit	MWh/Gkal
Description	Average specific auxiliaries electricity consumption by "Novo-Lenino" EBH for heat production
Time of determination /monitoring	Determined once
Source of data	Initial data for calculation of this parameter is taken from yearly reports of "Novo-Lenino" EBH.
Value of data applied (for ex ante calculations/determinations)	0,015 MWh/Gcal
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Calculated as the average specific auxiliaries electricity consumption for heat production by e/b "Novo-Lenino" in 2005-2007. Calculated by experts of JSC "Irkutskenergo". Calculation is presented in excel file-Annex 5.
QA/QC procedures (to be) Applied	All measurements are made by the calibrated measuring devices according to standards in power branch.
Any comment	

Data/Parameter 9	**SEC** $_{BE\ aux\ B}$
Data unit	MWh/Gcal
Description	Average specific auxiliaries electricity consumption by "Bytovaya" for heat production
Time of determination /monitoring	Determined once
Source of data	Initial data for calculation of this parameter is taken from yearly reports of "Bytovaya" EBH.

Value of data applied (for ex ante calculations/determinations)	0,015MWh /Gcal
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Calculated as the average specific auxilaries electricity consumption for heat production by e/b "Bitovaya" in 2005-2007. Calculated by experts of JSC "Irkutskenergo". Calculation is presented in excel file-Annex 5.
QA/QC procedures (to be) Applied	All measurements are made by the calibrated measuring devices according to standards in power branch.
Any comment	-

Data/Parameter 10	**EF_{grid}**
Data unit	tCO_2/MWh
Description	CO_2 emission factor for condensation mode of Irkutskenergo power system
Time of determination /monitoring	Determined once in 2011 for the credit period
Source of data	JSC "Irkutskenergo" software: "Program complex of automated collection, processing and fuel use analysis system of CHP-plants and Power and electrification production association"
Value of data applied (for ex ante calculations/determinations)	1.159
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Calculated according to the Regulating document 34.08-559-96 "Methodical guidance for analysis of specific fuel consumption changes at electric power stations and power associations". More detail information see in Annex 2
QA/QC procedures (to be) Applied	The result confirms by ORGRES (JSC "Engineering Center UES")
Any comment	

Data and parameters that are monitored throughout the crediting period:

Data/Parameter 11	**$HO_{BE\ KSPU}$**
Data unit	Gcal/year
Description	Baseline heat output from KSPU

Time of determination /monitoring	Calculated every year
Source of data	Calculated by experts of JSC "Irkutskenergo" Calculation is presented in excel file-Annex 5.
Value of data applied (for ex ante calculations/determinations)	2008 (Dec) – 43 091 2009 –272 511 2010 –267 785 2011 – 258 601 2012 – 258 601
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Calculated as the share of KSPU heat output from total heat production by 3 boiler-houses (KSPU, "Novo-Lenino" and "Bytovaya" EBH) in 2005-2007. This share is spread on the period after project realization.
QA/QC procedures (to be) Applied	All measurements will be conducted with calibrated measurement equipment according to standards in the power industry
Any comment	

Data/Parameter 12	**$HO_{BE\ B}$**
Data unit	Gcal/year
Description	Baseline heat output from "Bitovaya" EHB
Time of determination /monitoring	Calculated every year
Source of data	Calculated by experts of JSC "Irkutskenergo" Calculation is presented in excel file-Annex 5.
Value of data applied (for ex ante calculations/determinations)	2008 (Dec) – 23 949 2009 – 175 834 2010 – 185 389 2011 – 184 248 2012 – 184 248
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Calculated as the share of "Bitovaya" EHB heat output from total heat production by 3 boiler-houses (KSPU, "Novo-Lenino" and "Bytovaya" EHB) in 2005-2007. This share is constant for the period after project realization.
QA/QC procedures (to be) Applied	All measurements will be conducted with calibrated measurement equipment according to standards in the power industry
Any comment	

Data/Parameter 13	**$HO_{BE\ NL}$**
Data unit	Gcal/year
Description	Baseline heat output from "Novo-Lenino" EHB

Time of determination /monitoring	Calculated every year
Source of data	Calculated by experts of JSC "Irkutskenergo" Calculation is presented in excel file-Annex 5.
Value of data applied (for ex ante calculations/determinations)	2008 (Dec) – 45 594 2009 – 334 756 2010 – 352 946 2011 – 350 776 2012 – 350 776
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Calculated as the share of "Novo-Lenino" EBH heat output from total heat production by 3 boiler-houses (KSPU, "Novo-Lenino" and "Bytovaya" EHB) in 2005-2007. This share is constant for the period after project realization.
QA/QC procedures (to be) Applied	All measurements will be conducted with calibrated measurement equipment according to standards in the power industry
Any comment	

Data/Parameter 14	$\mathbf{I_{eby}}$
Data unit	-
Description	Index of electricity boiler house load
Time of determination /monitoring	Calculated as proportion between real heat output to the zone of NI TPP under the project and average heat output to the zone NI TPP in 2005-2007.
Source of data	Calculated by experts of JSC "Irkutskenergo" Calculation is presented in excel file-Annex 5.
Value of data applied (for ex ante calculations/determinations)	2008 (Dec) – 0.136 2009 – 0.998 2010 – 1.052 2011 – 1.046 2012 – 1.046
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Calculated as proportion between real heat output to the zone of NI TPP under the project and average heat output to the zone NI TPP in 2005-2007. Calculated by experts of JSC "Irkutskenergo". Calculation is presented in excel file-Annex 5.
QA/QC procedures (to be) Applied	All measurements will be conducted with calibrated measurement equipment according to standards in the power industry
Any comment	

Data/Parameter 15	$\mathbf{NCV_{coal}}$

Data unit	Kcal/kg
Description	Net calorific value of coal used at KSPU
Time of determination /monitoring	With every fuel delivery (about 25 fuel delivery in a month)
Source of data	This parameter is provided in the fuel certificate, estimated by certified laboratory.
Value of data applied (for ex ante calculations/determinations)	3962 Kcal /kg
Justification of the choice of data or description of measurement methods and procedures (to be) applied	This parameter is provided in the fuel passport, estimated by certified laboratory.
QA/QC procedures (to be) Applied	All measurements are made by the calibrated measuring devices according to standards in power branch.
Any comment	-

Data/Parameter 16	**HO** $_{\textbf{PE KSPU}}$
Data unit	Gcal/year
Description	Project heat output from KSPU
Time of determination /monitoring	Every month
Source of data	Program complex enclose to heat calculator SPT961
Value of data applied (for ex ante calculations/determinations)	2008 (Dec) – 80 243 2009 –575 410 2010 –597 726 2011 – 631 944 2012 – 631 944
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Measured by heat calculator SPT961
QA/QC procedures (to be) Applied	Measured by heat calculator SPT961 Procedure of the measuring device checking is carried out every 4 years by Federal agency on technical regulation and metrology FSI «Irkutsk centre of standardization, metrology and certification» which is accredited on technical competence in the field of checking of SI and registered in the Register under №004.

	All measurements are made by the calibrated measuring devices according to standards in power branch.
Any comment	

Data/Parameter 17	**HO** $_{PE\ NL}$
Data unit	Gcal/year
Description	Project heat output from “Novo-Lenino” EHB
Time of determination /monitoring	Every month
Source of data	Program complex enclose to heat calculator SPT961
Value of data applied (for ex ante calculations/determinations)	2008 (Dec) – 33 562 2009 –208 066 2010 –202 547 2011 –160 456 2012 – 160 456
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Measured by heat calculator SPT961
QA/QC procedures (to be) Applied	Measured by heat calculator SPT961 Procedure of the measuring device checking is carried out every 4 years by Federal agency on technical regulation and metrology FSI « Irkutsk centre of standardization, metrology and certification» which is accredited on technical competence in the field of checking of SI and registered in the Register under №004. All measurements are made by the calibrated measuring devices according to standards in power branch.
Any comment	

Data/Parameter 18	**HO** $_{PE\ B}$
Data unit	Gcal/year
Description	Project heat output from “Bytovaya” EHB
Time of determination /monitoring	Every month
Source of data	Program complex enclose to heat calculator SPT961
Value of data applied (for ex ante calculations/determinations)	2008 (Dec) – 0 2009 – 6 805 2010 – 13 219 2011 – 10 100

	2012 – 10 100
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Measured by heat calculator SPT961
QA/QC procedures (to be) Applied	Measured by heat calculator SPT961 Procedure of the measuring device checking is carried out every 4 years by Federal agency on technical regulation and metrology FSI « Irkutsk centre of standardization, metrology and certification» which is accredited on technical competence in the field of checking of SI and registered in the Register under №004. All measurements are made by the calibrated measuring devices according to standards in power branch.
Any comment	

Data/Parameter 19	**$HO_{KSPU\ zone\ PE}$**
Data unit	Gcal/year
Description	heat output to the zone of KSPU under the project in year y
Time of determination /monitoring	Every month
Source of data	Calculation for Act of productive supply.
Value of data applied (for ex ante calculations/determinations)	2008 (Dec) – 42 678 2009 – 262 650 2010 – 260 838 2011 – 255 601 2012 – 255 601
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Calculated by an engineer of technological department of JSC “Baikalenergo” proportionally to contract loads.
QA/QC procedures (to be) Applied	Calculated by an engineer of technological department of JSC “Baikalenergo” proportionally to contract loads for preparation the Act of productive supply.
Any comment	

Data/Parameter 20	**HO** **KSPU NITPP zone PE y**
Data unit	Gcal/year
Description	heat output from KSPU to the zone of NI TPP under the project in year y
Time of determination /monitoring	Every month
Source of data	Calculation for Act of productive supply.
Value of data applied (for ex ante calculations/determinations)	2008 (Dec) – 37 152 2009 – 302 899 2010 – 329 941 2011 – 373 343 2012 – 373 343
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Calculated by an engineer of technological department of NITPP proportionally to contract loads.
QA/QC procedures (to be) Applied	Calculated by an engineer of technological department of NITPP proportionally to contract loads for preparation the Act of productive supply.
Any comment	

Data/Parameter 21	**HO** **KSPU Bitovaya PE y**
Data unit	Gcal/year
Description	heat output from KSPU to the zone of electroboiler house Bitovaya under the Project in year y
Time of determination /monitoring	Every month
Source of data	Calculation for Act of productive supply.
Value of data applied (for ex ante calculations/determinations)	2008 (Dec) – 22 080 2009 – 135 430 2010 – 139 059 2011 – 167 399 2012 – 167 399

Justification of the choice of data or description of measurement methods and procedures (to be) applied	Calculated by an engineer of technological department of NITPP proportionally to contract loads.
QA/QC procedures (to be) Applied	Calculated by an engineer of technological department of NITPP proportionally to contract loads for preparation the Act of productive supply.
Any comment	

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

According to "Guidelines for users of the JI PDD form" version 04, the approved CDM methodology or JI specific approach to demonstrate additionality can be chosen.
To demonstrate additionality the JI specific approach is applied. It is developed in according with JISC "Guidance on criteria for baseline setting and monitoring" version 02 (Annex 1, paragraph 2b).
The project's additionality is analyzed below by means of the JI specific approach.

Step 1. Indication and description of the approach applied

A JI specific approach is based on an explanation that the project activity would not have occurred anyway due to low economy effectiveness of the project and that the project is not a common practice. Economy effectiveness is showed through the investment analysis.

1. Investment analysis

Investment analysis includes the evaluation of the project's economic efficiency and hence must be resulted in the conclusion of the attractiveness of the project realization without JI registration.

The investment analysis result is quantitative definition of the project economic efficiency indicators, such as NPV, IRR and the discounted payback period.

Additional carbon revenue from ERU's sale is taken into consideration at this stage. Additional revenue can influence on decision making by management of JSC "Irkutskenergo".

In the frame of investment analysis the project sensitivity analysis for such variables, as the electricity price and capital expenses is carried out.

The project is additional if it is not economically attractive without ERU sales.

2. Analysis of common practice.

The given stage supplements the researcher conducted at the previous stage by the analysis about degree of technology prevalence offered in the given Project and in others Russian companies. The project is additional if it is not a common practice.

Step 2. Application of the approach chosen

1. **Investment analysis**

Alternative scenario 2 assumes investment activity.

Table B.2.1 shows results of the economic efficiency analysis of the alternative scenario 2.

Table B.2.1. Financial/economic indicators

Items	Units	Project activity without ERUs sales	Project activity with ERU sales
Investment	mln. Rbls	607 425	607 425
Average annual revenues	mln. Rbls/year	496 996	496 996
Average annual operating cost	mln. Rbls/year	441 418	441 418
Average annual amortization (is not included in cash flow analysis)	mln. Rbls/year	28 991	28 991
Average annual revenues from ERU's sale	mln. Rbls/year	0	135 505
NPV	mln. Rbls	-105 607	207 891
IRR	%	10,2	22,27
Profitability index	-	0,81	1,36
Discount payback period	Years	--	6,06

Alternative scenario 2 is not commercially efficient without ERUs sales.
Tables with economic indicators calculation in excel format are presented in the Annex 4.

Sensitivity analysis

The sensitivity analysis has been performed based on deviation of the following key indicators: investment cost and electricity tariff.

Table B 2.2 Results of sensitivity analysis

Parameter/Variations	**-10%**	**+ 10%**
Investment		
IRR	10,201%	10,194%
NPV(mln.rbls)	-93 812	- 117 402
Discounting payback period (years)	-	-
Electricity tariff		
IRR	8,88%	11,70%
NPV(mln. Rbls)	-156101	-55114
Discounting payback period (years)	-	-
Coal price		

IRR	10,66%	9,75%
NPV(mln. Rbls)	-89 472	-121 743
Discounting payback period (years)	-	-
Heat tariff		
IRR	11,30%	9,30%
NPV(mln. Rbls)	-68 402	-137 774
Discounting payback period (years)	-	-

Under optimistic scenario, Project's IRR increases on 0,004 % when capital investments are decreased on 10 % (till 547 million rubles instead of 607 million rubles). The increase or reduction of investments on 10 % leads correspondingly to NPV reduction or increase on 11.7 million rubles.
Under pessimistic scenario, in case of negative economic tendencies the increase of capital investments is required. In the case of 10 % increase (till 668 million rubles) Project's IRR decreases on 0,003 %.
The electricity price influence on economic attraction of Project is more significant. Electricity price increasing on 10% will lead to increase of project IRR on 1,5%, NPV will become higher on 50.5 million rubles. Decreasing of electricity price will lead to decrease of IRR on 1.32% and NPV will become on 50.5 million rubles lower.
Influence of coal price and heat tariffs variance are not so sufficiently as electricity price variance.
In the case of coal price 10% increasing or decreasing project IRR changes on 0.45% and 0.47% correspondingly, project NPV will changed on 16 million rubles.
Variation of heat tariffs on 10% will change project NPV on 41 million rubles. Project IRR will increase on 1.2% in the case of heat tariff decreasing on 10%. If heat tariff will increase on 10% project IRR will become on 0.9% smaller.
The project is more sensitive to the electricity price then investment cost,coal price and heat tariff. The size of electricity price gives an essential influence on parameters of economic efficiency.
Conclusion: The above analysis shows that the project activity is economically unattractive without ERUs sales. Common practice analysis, which carried out in section B.1., shows that project activity is not a common practice. Therefore proposed project activity is **additional.**

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

The Project boundaries include the GHG emission sources related to the Project activity. The estimates of emissions take into account greenhouse gases, which contribute significantly (more than 1%) to the total amount of GHG emissions.

The spatial extent of the project boundary includes KSPU coal boiler house, Novo-Lenino and Bytovaya EBHs and Irkutsk regional power system, which is effectively JSC "Irkutskenergo" power system (the grid). The given decision is based on the following reasons:

1. The Irkutsk power supply system is excessive. Demands in electricity of Irkutsk region customers are covered from the Irkutsk grid, therefore there is no need for extra electricity imports. At present TPPs Irkutskenergo produces about 16-17 TWh of electricity and can expand the generation up 21 TWh at the maximum. In a 5 year run this maximum will not be reached,
2. Electricity cross-flow takes place only in the form of export to the neighbor deficit power systems.
3. Irkutskenergo has ineffective thermal power plants, which will be unloaded in the case of reducing demand.

According to the item 2.3. Regulations of calculation for the choice of the generating equipment structure (the Annex № 3.1 to the Contract on joining to trading system of the wholesale market) (further under the text – Regulations), Irkutskenergo submits to the System operator the notice on structure and parameters of the generating equipment, containing the information according to section 3 of Regulations of notification submissions by the participants of the wholesale market (the Annex № 4 to the Contract on joining to trading system of the wholesale market), considering information on additional generation due to realization of the Project "Increase in efficiency of water resources use at Bratsk HPP" . On the basis of the received data and the data collected according to section 4 of Regulations, the System operator forms mathematical model of choice of the power-on generating equipment, taking into account forecasting parameters of power system operation, reliability of power supply and minimization of electricity cost.

All factors that influence at reliability of a power system of the Irkutsk region and Siberia considered at forming of mathematical model (according to the Annex 1 to Regulations). Therefore the System operator, for the purpose of possibility of item 6.3 and 6.4 "Regulations of operative dispatch control at electropower mode of UES of Russia objects" leaves transmission capacity reserve on intersystem communications that does not allow to release electricity to the neighbor regions in bigger volume.

Further, the mathematical model automatically, according to the principle of electricity generating total cost minimization, carries out loading redistribution between thermal stations of the Irkutsk power system, reducing their loading in condensation mode by a rating of price proposals, in case of released electricity due to realization of the project « Increase in efficiency of heating supply system of microdistict Novo-Lenino».

Table B.3.1. GHG sources included /excluded from the project boundary.

	Source	Greenhouse gas (GHG)	Included of not?	Substantiation/explanation
Ba sel in	Burning of coal at	CO_2	Yes	Main emission source

boiler house	CH_4	No	The emissions are insignificant. According to the IPCC Guidelines for National Greenhouse Gas Inventories, 2006, Volume 2, Chapter 2, Table 2.2 Default emission factors for stationary combustion in the energy industries for CH_4 is very insignificant (according to the calculation)
	N_2O	No	The emissions are insignificant. According to the IPCC Guidelines for National Greenhouse Gas Inventories, 2006, Volume 2, Chapter 2, Table 2.2 Default emission factors for stationary combustion in the energy industries for N_2O is very insignificant (according to the calculation in Annex 5)
Burning of residual oil at the boiler house	CO_2	No	The emissions are insignificant. Residual oil at KSPU is used only as emergency and starting fuel, a kindling can take place once in a cold season. Emissions from burning of residual oil on KSPU averages 0,1 % from emissions resulted from coal burning. It is insignificant.

	CH_4	No	The emissions are insignificant. According to the IPCC Guidelines for National Greenhouse Gas Inventories, 2006, Volume 2, Chapter 2, Table 2.2 Default emission factors for stationary combustion in the energy industries for CH_4 is very insignificant (according to the calculation in Annex 5)
	N_2O	No	The emissions are insignificant. According to the IPCC Guidelines for National Greenhouse Gas Inventories, 2006, Volume 2, Chapter 2, Table 2.2 Default emission factors for stationary combustion in the energy industries for N_2O is very insignificant (according to the calculation in Annex 5)
Electricity production by coal TPPs of regional power system, which is displaced as a result of project activity.	CO_2	Yes	Main emission source.
	CH_4	No	The emissions are insignificant. According to the IPCC Guidelines for National Greenhouse Gas Inventories, 2006, Volume 2, Chapter 2, Table 2.2 Default emission factors for stationary combustion in the energy industries for CH_4 is very insignificant (according to the calculation in Annex 5)

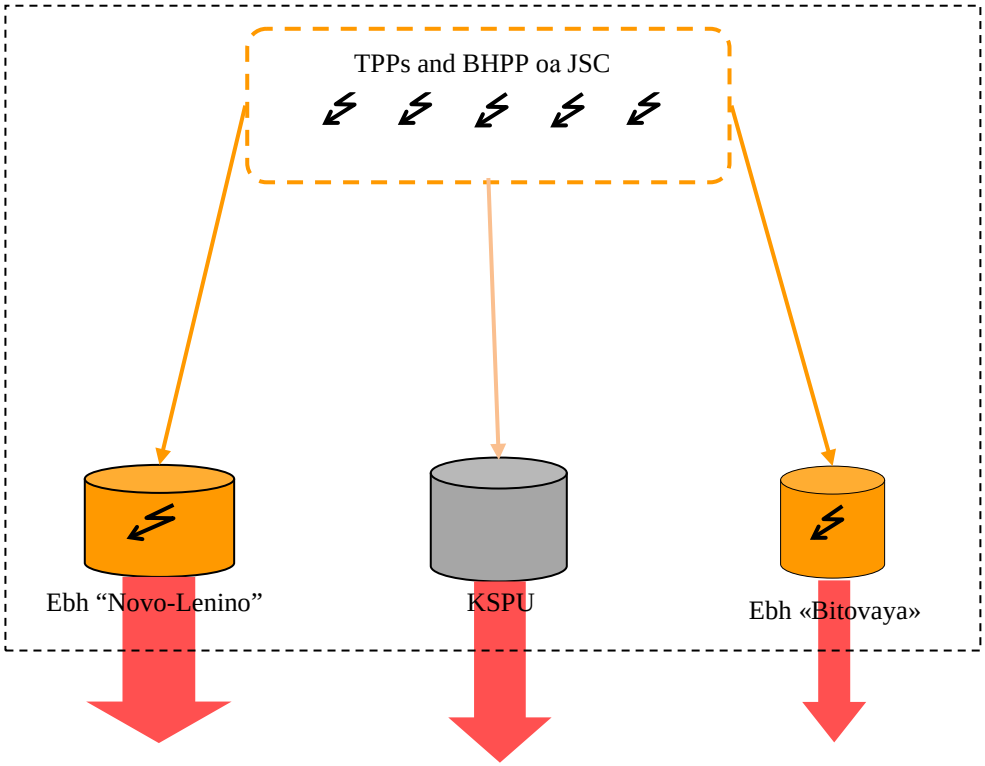
		N_2O	No	The emissions are insignificant. According to the IPCC Guidelines for National Greenhouse Gas Inventories, 2006, Volume 2, Chapter 2, Table 2.2 Default emission factors for stationary combustion in the energy industries for N_2O is very insignificant (according to the calculation in Annex 5)
Project	Burning of coal at boiler house	CO_2	Yes	Main emission source
		CH_4	No	The emissions are insignificant. According to the IPCC Guidelines for National Greenhouse Gas Inventories, 2006, Volume 2, Chapter 2, Table 2.2 Default emission factors for stationary combustion in the energy industries for CH_4 is very insignificant (according to the calculation in Annex 5)
		N_2O	No	The emissions are insignificant. According to the IPCC Guidelines for National Greenhouse Gas Inventories, 2006, Volume 2, Chapter 2, Table 2.2 Default emission factors for stationary combustion in the energy industries for N_2O is very insignificant (according to the calculation in Annex 5)

Burning of residual oil at the boiler house	CO_2	No	The emissions are insignificant. Residual oil at KSPU is used only as emergency and starting fuel, a kindling can take place once in a cold season. Emissions from burning of residual oil on KSPU averages 0,1 % from emissions resulted from coal burning. It is insignificant.
	CH_4	No	The emissions are insignificant. According to the IPCC Guidelines for National Greenhouse Gas Inventories, 2006, Volume 2, Chapter 2, Table 2.2 Default emission factors for stationary combustion in the energy industries for CH_4 is very insignificant (according to the calculation in Annex 5)
	N_2O	No	The emissions are insignificant. According to the IPCC Guidelines for National Greenhouse Gas Inventories, 2006, Volume 2, Chapter 2, Table 2.2 Default emission factors for stationary combustion in the energy industries for N_2O is very insignificant (according to the calculation in Annex 5)
Electricity production by coal TPPs of regional power system, which is displaced as a result of project activity.	CO_2	Yes	Main emission source.

	CH_4	No	The emissions are insignificant. According to the IPCC Guidelines for National Greenhouse Gas Inventories, 2006, Volume 2, Chapter 2, Table 2.2 Default emission factors for stationary combustion in the energy industries for CH_4 is very insignificant (according to the calculation in Annex 5)
	N_2O	No	The emissions are insignificant. According to the IPCC Guidelines for National Greenhouse Gas Inventories, 2006, Volume 2, Chapter 2, Table 2.2 Default emission factors for stationary combustion in the energy industries for N_2O is very insignificant (according to the calculation in Annex 5)

The project boundary is shown in Figure B.3-1

Fig. B.3.1. Project boundary for baseline scenario



Legend:

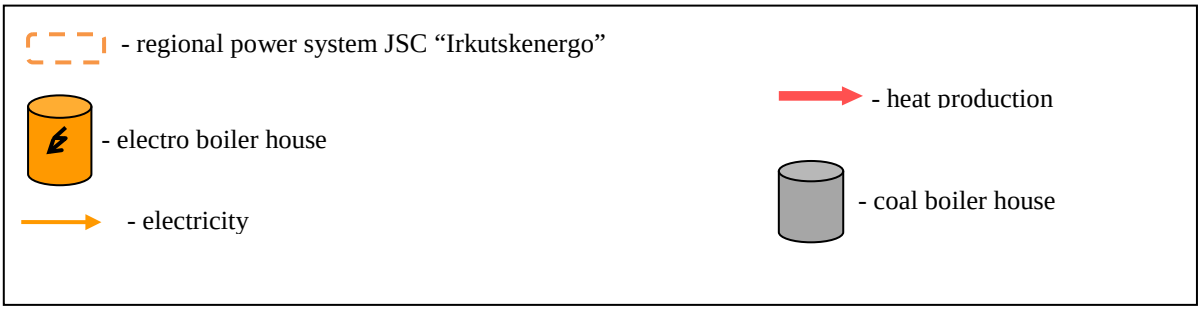
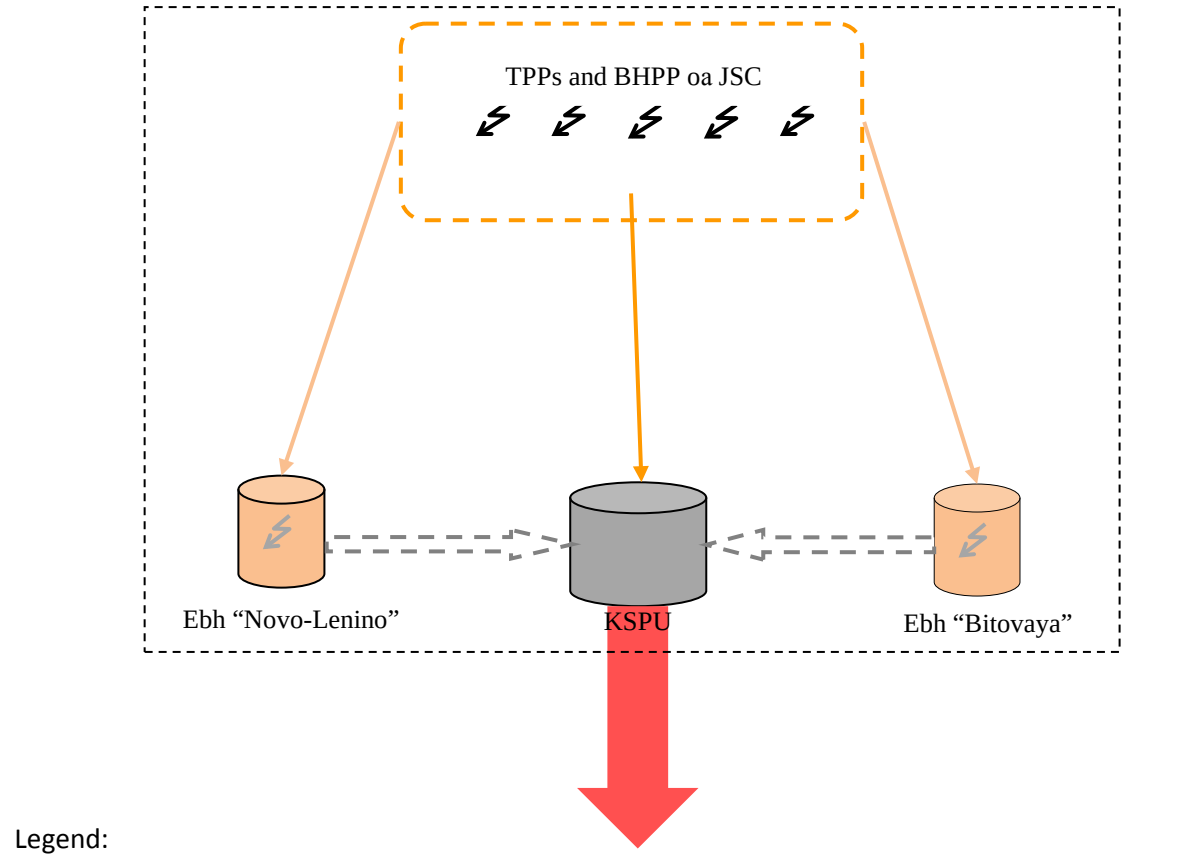
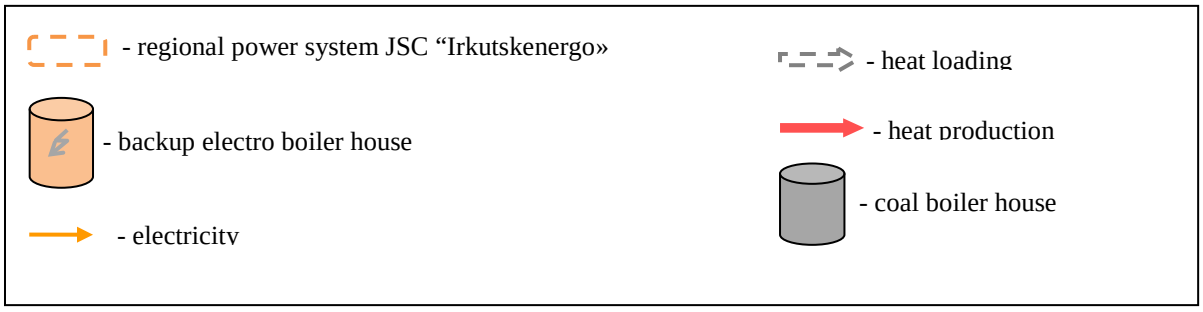


Figure. B.3.2. Project boundary for project scenario.



Legend:



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

Date of baseline set-up: 08/06/2010.

The baseline has been designed by CJSC "National carbon sequestration foundation" (Moscow)

Contact person : Baydakova Evgenia, Senior expert Project Development Department
Tel. +7 (499) 788-78-35,ext 104
Fax +7 (499) 788-78-35,ext 107
e-mail: BaydakovaEV@ncsf.ru

CJSC "National carbon sequestration foundation" is not a project participant.

SECTION C. Duration of the project / crediting period

C.1. Starting date of the project:

The project started on 7 of April 2008 when the first works on reconstruction of heating system in the area of "Bytovaya" EBH were started.

C.2. Expected operational period of the project:

30 years or 360 months: 01.12.2008 – 30.11.2038

C.3. Length of the crediting period:

4 years and 1 month or 49 months: From 01.12.2008 till 31.12.2012

SECTION D. Monitoring plan

D.1. Description of monitoring plan chosen:

1. Indication and description of the monitoring approach applied

In accordance with "Guidelines for users of the JI PDD form" version 04 for monitoring of the project it is necessary to apply either approved CDM methodology or the JI specific approach
Monitoring plan of the given project based on the JI specific approach in accordance with following regulations:

- Guidelines for the implementation of Article 6 of the Kyoto Protocol (Appendix B. Criteria for baseline setting and monitoring, II. Monitoring[1]
- Guidance on criteria for baseline setting and monitoring, Version 02 (D. Guidance on monitoring)[2].

In accordance with "Guidelines for users of the JI PDD form" version 04, in section D it is necessary explicitly and clearly distinguish:

a) Data and parameters that are not monitored throughout the crediting period, but are determined only once (and thus remain fixed throughout the crediting period), and that are available already at the stage of determination regarding the PDD;
b) Data and parameters that are not monitored throughout the crediting period, but are determined only once (and thus remain fixed throughout the crediting period), but that are not already available at the stage of determination regarding the PDD;
c) Data and parameters that are monitored throughout the crediting period.

[1] http://unfccc.int/resource/docs/2005/cmp1/eng/08a02.pdf#page=2 9/CMP.1 Guidelines for the implementation of Article 6 of the Kyoto Protocol. Report of the Conference of the Parties serving
[2] as the meeting of the Parties to the Kyoto Protocol on its first session, held at Montreal from 28 November to 10 December 2005.

2. Application of the approach chosen

Project activity represents the optimization of heat supply scheme that provides decommission of inefficient electrical boiler houses and redistribution of its load on the more effective coal boiler house. This will lead to reduction of the fuel consumption under the same heat production.

Project scenario provides gradual transition to heat production for micro district of Irkutsk Novo-Lenino only by the coal boiler house KSPU. Baseline scenario consists in production of the same quantity of heat on coal boiler-house KSPU and 2 electroboiler-houses. Thus, reduction of greenhouse gases emission is calculated by the way of comparison of the fuel and electricity consumption for production of the equal quantity of heat under the baseline and project scenario.

For monitoring purpose measurement and calculation of the following data will be carried out:

1. Data and parameters that are not monitored throughout the crediting period, but are determined only once (and thus remain fixed throughout the crediting period), and that are available already at the stage of determination regarding the PDD:
   - Average specific fuel consumption for heat production on KSPU for the period 2005-2007.
   - Average specific electricity consumption for heat output from “Bytovaya” EBH for the period 2005-2007
   - Average specific electricity consumption for heat output from “Novo-Lenino” EBH for the period 2005-2007
   - Average electricity auxiliary consumption by KSPU for the period 2005-2007.
   - Average electricity auxiliary consumption by “Bytovaya” EBH for the period 2005-2007.
   - Average electricity auxiliary consumption by “Novo-Lenino” EBH for the period 2005-2007.
   - Emission factor for condensation mode of Irkutskenergo power system.

2. Data and parameters that are not monitored throughout the crediting period, but are determined only once (and thus remain fixed throughout the crediting period), but that are not already available at the stage of determination regarding the PDD:
   - There are no such data

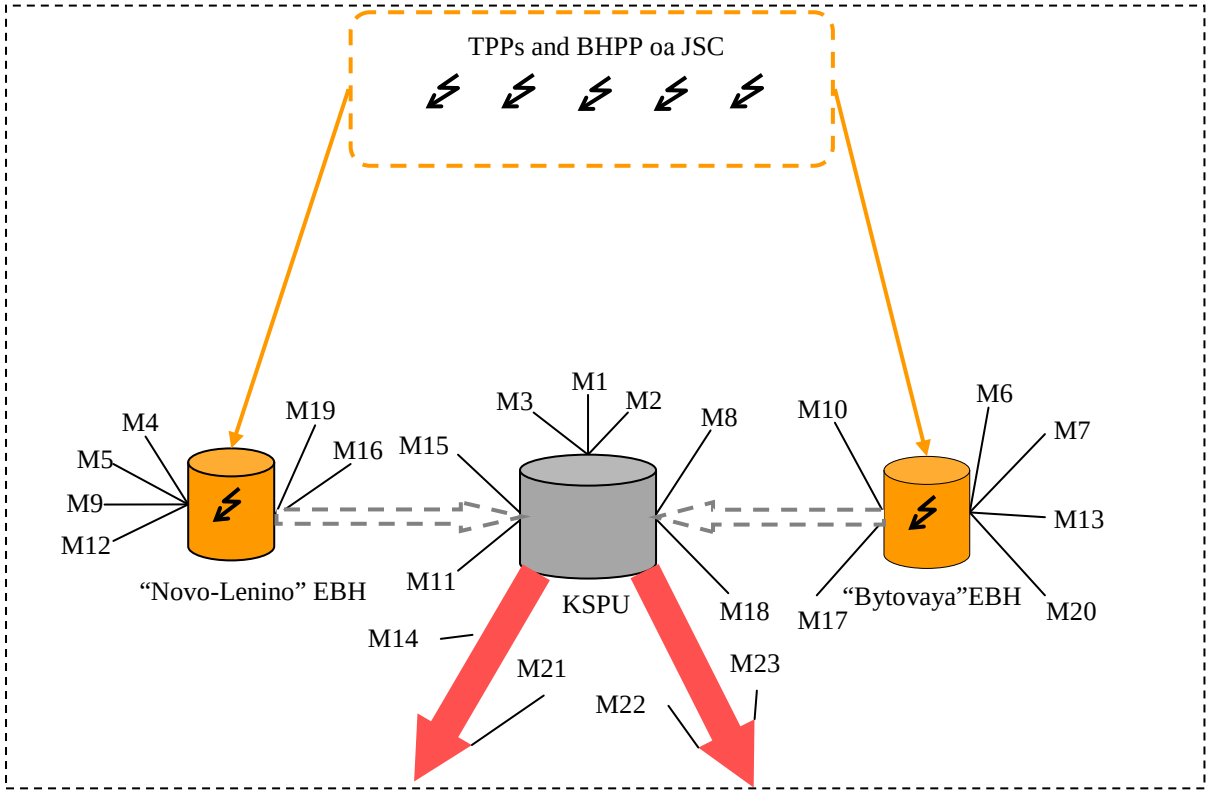
3. Data and parameters that are monitored throughout the crediting period:

   - Heat output from KSPU, e/b “Novo-Lenino” and “Bitovaya”

- Fuel consumption for heat output from KSPU
- Electricity consumption on heat output from e/b “Novo-Lenino” and “Bitovaya”
- Electricity auxiliary consumption by KSPU, e/b “Novo-Lenino” and “Bitovaya”
- Net calorific value of coal burned in KSPU

The parameters pointed in Tables below are subject to monitoring for the project. All data collected as part of monitoring will be kept at least for 2 years after the end of the crediting period (2015). 100% of the data will be monitored if not indicated otherwise in the tables below. All measurements will be conducted with calibrated measurement equipment according to standards in the power industry.

Activities of JSC “Irkutskenergo” in the field of measurements and monitoring correspond to the requirements of Federal Law No. 4871-1 of 27th April 1993 «On securing the unification of measuring system» and some other national regulation and the regional metrology inspection rules. There are the corresponding plans, documents, schedules of calibration of instruments, etc at JSC “Irkutskenergo”. The measuring devices have the special certificate for implementation, permits for use and are periodically calibrated.
Project boiler houses are followed by following monitoring standards: RD-34.08.552-1995 “Methodical guidance for drawing up the thermal profitability of the equipment report for electric power station and joint-stock company of power and electrification” and Order about 6-tp form confirmation. Project boiler houses are included in total calculation of 6-tp form, that is why all necessary data is collected in accordance with established procedure.
The measurements of the main project parameters come within the metrology system, which is currently active in the country.
The monitoring points scheme presented below:



Option 1 was chosen from the two suggested for carrying out the monitoring plan.

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

D.1.1.1. Data to be collected in order to monitor emissions from the project, and how these data will be archived:								
ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comments
M1	**$FC_{coal\ KSPU}$** Quantity of coal burned by KSPU	Technical calculation of CJSC "Baikalenergo " technical department	t/year	(c)	Once a month	100%	Paper and electronic	The calculation is carried out according to the formulas that recommended by RD 34-08-552-95, nomogramms and diagrams from report of boilers tests run.
M2	**NCV_{coal}** Net calorific	Fuel certificate	Kkal/kg	(m)	With every fuel delivery	100%	Paper	This parameter is

	value				(about 25 fuel delivery in a month)			contained in the fuel passport, estimated by certified laboratory.
M3	**$EC_{PE\ el\ KSPU}$** project auxiliaries electricity consumption by KSPU for heat production	Daily records	MWh/year	(m)	Constantly	100%	Paper	Measured by electric meter Mercury 230AM-00
M4	**$EC_{PE\ heat\ NL}$** Project electricity consumption for heat output from "Novo-Lenino" EBH	Daily records	MWh/year	(m)	Constantly	100%	Paper	Measured by electric meter Mercury 230AM-00
M5	**$EC_{PE\ aux\ NL}$** Project auxiliaries electricity	Daily records	MWh/year	(m)	Constantly	100%	Paper	Measured by electric meter Mercury 230AM-00

	consumption by "Novo-Lenino" EBH for heat production							
M6	**EC** $_{PE\ heat\ B}$ Project electricity consumption for heat output from "Bytovaya" EBH	Daily records	MWh/year	(m)	Constantly	100%	Paper	Measured by electric meter A1802RLQ
M7	**EC** $_{PE\ aux\ B}$ Project auxiliaries electricity consumption by "Bytovaya" EBH for heat output	Daily records	MWh/year	(m)	Constantly	100%	Paper	Measured by electric meter A1802RLQ

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

$$PE_y = PE_{coal\ KSPU,y} + PE_{el\ KSPU,y} + PE_{el\text{-}heat\ NL,y} + PE_{el\ aux\ NL,y} + PE_{el\text{-}heat\ B,y} + PE_{el\ aux\ B,y} \quad \textbf{(formula D.1-1)}$$

where, $PE_{coal\ KSPU}$ – project emissions from fuel burning for heat output from KSPU, t CO_2
$PE_{el\ KSPU}$ - project emissions from auxiliaries electricity consumption by KSPU, t CO_2
$PE_{el\text{-}heat\ NL}$ – project emissions from electricity consumption for heat output from "Novo-Lenino" EBH, t CO_2
$PE_{el\ aux\ NL}$ – project emissions from auxiliaries electricity consumption by "Novo-Lenino" EBH, t CO_2
$PE_{el\text{-}heat\ B}$ – project emissions from electricity consumption for heat output from "Bytovaya" EBH, t CO_2
$PE_{el\ aux\ B}$ – project emissions from auxiliaries electricity consumption by "Bytovaya" EBH, t CO_2

$$PE_{coal\ KSPU,y} = FC_{PE\ coal\ KSPU} * COEF_{coal} \quad \textbf{(formula D.1-2)}$$

where, $FC_{PE\ coal\ KSPU}$ – Project quantity of coal burned by KSPU, t.c.e/year;
$COEF_{coal}$ – CO_2 emission factor for coal, t CO_2/t.c.e;
Determine of $COEF_{Coal}$ carried out by the following way:

$$COEF_{Coal} = NCV * EF_{CO2,\ Coal} \quad \textbf{(formula D.1-3)}$$

where, **NCV–** net calorific value ,TJ/th. T;
$EF_{CO2,\ Coal}$ –CO_2 emission factor for coal burning, t CO_2/TJ
$NCV = CAL_{coal} * 4{,}1868/1000000$ **(formula D.1-4)**

Table D.1. Data for CO_2 emission factor calculation

Parameter	Coal
EF, t CO_2/TJ	101[3]

[3] 2006 IPCCGuidelines for National Greenhaus Gas Inventories, Volume 2, Energy

CAL_{coal}	From support documentation with fuel delivery to the boiler houses
Conversion factor (kal/J)	4,1868

$$PE_{el\text{-}heat\ NL} = EC_{PE\ heat\ NL} * EF_{grid} \quad \textbf{(formula D.1-5)}$$

where, $EC_{PE\ heat\ NL}$ – Project electricity consumption for heat output from "Novo-Lenino" EBH, MWh/year
EF_{grid} – Emission factor for condensation mode of Irkutskenergo power system, tCO_2/MWh (calculation presented in Annex 2)

$$PE_{el\ aux\ NL} = EC_{PE\ aux\ NL} * EF_{grid} \quad \textbf{(formula D.1-6)}$$

where , $EC_{PE\ aux\ NL}$- Project auxiliaries electricity consumption by "Novo-Lenino" EBH for heat output, MWh/year

$$PE_{el\text{-}heat\ B,y} = EC_{PE\ heat\ B} * EF_{grid} \quad \textbf{(formula D.1-7)}$$

where, $EC_{PE\ heat\ B}$ – Project electricity consumption for heat output from "Bytovaya" EBH, MWh/year

$$PE_{el\ aux\ B,y} = EC_{PE\ aux\ B} * EF_{grid} \quad \textbf{(formula D.1-8)}$$

where , $EC_{PE\ aux\ NL}$- Project auxiliaries electricity consumption by "Bitovaya" EBH for heat output, MWh/year

D.1.1.3. Relevant data necessary for determining the baseline of anthropogenic emissions of greenhouse gases by sources within the project boundary, and how such data will be collected and archived:								
ID number *(Please use numbers to*	Data variable	Source of data	Data unit	Measured (m), calculated (c)	Recording frequency	Proportion of data to be monitored	How will the data be archived?	Comments

ease cross-referencing to D.2.)				, estimated (e)			(electronic/ paper)	
M 8	**HO BE KSPU** Baseline heat output from KSPU	Calculated by experts of JSC "Irkutskenergo" Calculation is presented in excel file-Annex 5.	Gcal/year	(c)	Every year	100%	Electronic	Calculated by experts of JSC "Irkutskenergo" by the formula D 1.1
M 9	**HO BE NL** Baseline heat output from "Novo-Lenino" EBH	Calculated by experts of JSC "Irkutskenergo" Calculation is presented in excel file-Annex 5.	Gcal/year	(c)	Every year	100%	Electronic	Calculated by experts of JSC "Irkutskenergo" by the formula D 1.1
M 10	**HO BE B** Baseline heat	Calculated by experts	Gcal/year	(c)	Every year	100%	Electronic	Calculated by experts

	output from "Bitovaya" EBH	of JSC "Irkutskenergo" Calculation is presented in excel file-Annex 5.						of JSC "Irkutskenergo" by the formula D 1.1
M 11	**HO PE KSPU** Project heat output from KSPU	Program complex enclose to heat calculator SPT961	Gcal/year	(m)	Every month	100%	Electronic	Measured by heat calculator SPT961
M 12	**HO PE NL** Project heat output from "Novo-Lenino" EBH	Program complex enclose to heat calculator SPT961	Gcal/year	(m)	Every month	100%	Electronic	Measured by heat calculator SPT961
M 13	**HO PE B** Project heat output from "Bytovaya" EBH	Program complex enclose to heat calculator SPT961	Gcal/year	(m)	Every month	100%	Electronic	Measured by heat calculator SPT961

M 14	**L_{hi}** Project heat losses ratio (for new pipeline)	Calculated by experts of JSC "Irkutskenergo" Calculation is presented in excel file-Annex 5.	%	(c)	Determined once	100%	Electronic and paper Calculated according to the	Calculated at the base of average heat losses ratio in 2005-2007 and difference between ratio of specific heat losses for the old heat network and for the new heat network.
M 2	**NCV_{coal}** Net calorific value	Fuel certificate	Kcal/kg	(m)	With every fuel delivery (about 25 fuel delivery in a month)	100%	Paper	This parameter is contained in the fuel 59uxiliaries, estimated by certified laboratory.
M 15	**$SFC_{BE\ KSPU}$** Average	Initial data for	t.c.e/Gcal	(c)	Determined once	100%	Electronic	Calculated by experts

	specific coal consumption by KSPU for baseline heat output	calculation of this parameter is taken from yearly reports of KSPU.						of JSC "Irkutskenergo" by the formula D 1.2
M 16	**SEC** $_{BE\ NL}$ Average specific electricity consumption by "Novo-Lenino" EBH for baseline heat output	Initial data for calculation of this parameter is taken from yearly reports of "Novo-Lenino" EBH.	MWh /Gcal	(c)	Determined once	100%	Electronic	Calculated by experts of JSC "Irkutskenergo" by the formula D 1.3
M 17	**SEC** $_{BE\ B}$ Average specific electricity consumption by Bytovaya EBH for baseline heat output	Initial data for calculation of this parameter is taken from yearly reports of Bytovaya EBH.	MWh /Gkal	(c)	Determined once	100%	Electronic	Calculated by experts of JSC "Irkutskenergo" by the formula D 1.3

M 18	**SEC** $_{\textbf{BE el KSPU}}$ Average specific auxiliaries electricity consumption by KSPU for heat output	Initial data for calculation of this parameter is taken from yearly reports of KSPU.	MWh /Gcal	(c)	Determined once	100%	Electronic	Calculated by experts of JSC "Irkutskenergo" by the formula D 1.4
M 19	**SEC** $_{\textbf{BE aux NL}}$ Average specific auxiliaries electricity consumption by "Novo-Lenino" EBH for heat output	Initial data for calculation of this parameter is taken from yearly reports of "Novo-Lenino" EBH.	MWh /Gcal	(c)	Determined once	100%	Electronic	Calculated by experts of JSC "Irkutskenergo" by the formula D 1.4
M 20	**SEC** $_{\textbf{BE aux B}}$ Average specific 61uxiliaries electricity consumption by "Bytovaya"	Initial data for calculation of this parameter is taken from yearly reports of	MWh /Gcal	(c)	Determined once	100%	Electronic	Calculated by experts of JSC "Irkutskenergo" by the formula D 1.4

	EBH for heat output	"Bitovaya" EBH						
M 21	**$HO_{KSPU\ zone\ PE}$** heat output to the zone of KSPU under the project in year y	Calculation for Act of productive supply. Calculated by an engineer of technological department of JSC "Baikalenergo" proportionally to contract loads.	Gcal	(c)	Every month	100%	Electronic and paper	Calculated by an engineer of technological department of JSC "Baikalenergo" proportionally to contract loads.
M 22	**$HO_{KSPU\ NITPP\ zone\ PE\ y}$** heat output from KSPU to the zone of NI TPP under the Project in year y	Calculation for Act of productive supply	Gcal	(c)	Every month	100%	Electronic and paper	Calculated by an engineer of technological department of NITPP proportionally to contract loads.
M 23	**HO_{KSPU}**	Calculation	Gcal	(c)	Every	100%	Electronic and	Calculated

	Bitovaya PE y heat output from KSPU to the zone of electroboiler house Bitovaya under the Project in year y	for Act of productive supply			month		paper	by an engineer of technological department of NITPP proportionally to contract loads.

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

Baseline heat output:

KSPU baseline heat output is equal to KSPU output to KSPU heat zone under the project:

$$HO_{y\ BE\ KSPU} = HO_{KSPU\ zone\ PE\ y} \qquad \textbf{(formula D.1-9)}$$

where $HO_{BE\ KSPU}$ – baseline KSPU heat output in year y (Gcal),
$HO_{KSPU\ zone\ PE}$ – heat output to the zone of KSPU under the project in year y(Gcal)

Electroboiler houses heat output calculates on the basis of index of electroboiler house load increase and average data on electroboiler house heat output in 2005-2007. Index of electroboiler house load increase calculates as proportion between real heat output to the zone of NI TPP under the project and average heat output to the zone NI TPP in 2005-2007.

$$\mathbf{HO_{i-eb\ BEy}} = \overline{\mathbf{HO_{i-eb\ 2005-2007}}} \times \mathbf{I_{eby}} \qquad \textbf{(formula D.1-10)}$$

Where $HO_{i\text{-}eb\ BE\ y}$- Baseline electroboiler houses heat output in year y (Gcal),
$\overline{HO_{i-eb\ 2005-2007}}$ - average electroboiler houses heat output in 2005-2007 (Gcal),
I_{eby} – index of electroboiler house load increase in year y

$$I_{eby} = \frac{HO_{NI\ TPP\ zone\ PE\ y}}{\overline{HO_{NI\ TPP\ zone\ 2005-2007}}} \qquad \textbf{(formula D.1-11)}$$

Where $HO_{NITPPzone\ PE\ y}$ – heat output to the zone of NI TPP under the project in year y (Gcal),
$\overline{HO_{NITPP\ zone\ 2005-2007}}$ - average heat output to the zone of NI TPP in 2005-2007 (Gcal)

$$HO_{NITPP\ zone\ BE\ y} = HO_{PE\ B\ y} + HO_{PE\ NL\ y} + HO_{KSPU\ NITPP\ zone\ PE\ y} - L_{h\ y} \qquad \textbf{(formula D.1-12)}$$

Where $HO_{PE\ B\ y}$ – heat output from electroboiler house “Bitovaya” under the project in year y (Gcal),
$HO_{PE\ NL\ y}$ – heat output from electroboiler house “Novo-Lenino” under the project in year y (Gcal),
$HO_{KSPU\ NITPP\ zone\ BE\ y}$ – heat output from KSPU to the zone of NI TPP under the Project in year y (Gcal),
$L_{h\ y}$ – heat losses from new pipeline in year y (Gcal)
$L_{h\ y} = L_{h\ ratio} * HO_{KSPU\ Bitovaya\ PE\ y}$
Where $L_{h\ ratio}$ - Project heat losses ratio (for new pipeline)
$HO_{KSPU\ Bitovaya\ PE\ y}$ - heat output from KSPU to the zone of electroboiler house Bitovaya under the Project in year y (Gcal)

Project heat losses ratio
$L_{h\ ratio}$ calculated at the base of historical data (2005-2007) on heat losses ratio from old heat network and difference between ratio of specific heat losses for the old heat network and for the new heat network.
Calculation presented in Annex 5.

Specific rates

Baseline specific parameters are determined by calculation.

Baseline specific coal consumption by KSPU SFC $_{BE\ KSPU}$ is calculated as average specific fuel consumption for heat output by KSPU for the period 2005-2007:

$$SFC_{BE\ KSPU} = \frac{\overline{FC_{KSPU\ 2005-2007}}}{HO_{KSPU\ 2005-2007}} \quad \textbf{(formula D.1-13)}$$

Where $\overline{FC_{KSPU\ 2005-2007}}$ - average fuel consumption for heat output by KSPU for the period 2005-2007, t.c.e

$\overline{HO_{KSPU\ 2005-2007}}$ - average heat output by KSPU for the period 2005-2007, Gcal

Average baseline specific electricity consumption by "Novo-Lenino" and "Bytovaya" EBHs **SEC $_{BE\ I}$** is calculated as the average specific electricity consumption for baseline heat output by "Novo-Lenino" and "Bytovaya" EBHs in 2005-2007.

$$SEC_{BE\ i} = \frac{\overline{EO_{i\ 2005-2007}}}{HO_{i\ 2005-2007}} \quad \textbf{(formula D.1-14)}$$

Where $\overline{EC_{i\ 2005-2007}}$ - average electricity consumption by EBH i for heat output for the period 2005-2007, MWh

$\overline{HO_{i\ 2005-2007}}$ -average heat output by electroboiler house i for heat output for the period 2005-2007,Gcal

Average specific electricity auxiliary consumption for heat output from KSPU, "Novo-Lenino" and "Bytovaya" EBHs **SEC $_{BE\ aux\ I}$** calculated as average specific electricity consumption for heat output by KSPU, "Novo-Lenino" and "Bytovaya" EBHs for the period 2005-2007:

$$SEC_{BE\ aux\ i} = \frac{\overline{EC_{BE\ aux\ i\ 2005-2007}}}{HO_{i\ 2005-2007}} \quad \textbf{(formula D.1-15)}$$

where $\overline{EC_{BE\ aux\ i\ 2005-2007}}$ - Average baseline electricity auxiliary consumption by boiler house I, MWh

$$BE_y = BE_{coal\ KSPU,y} + BE_{el\ KSPU,y} + BE_{el\text{-}heat\ NL,y} + BE_{el\ aux\ NL,y} + BE_{el\text{-}heat\ B,y} + BE_{el\ aux\ B,y} \quad \textbf{(formula D.1-16)}$$

where, $BE_{coal\ KSPU}$ –baseline emissions from fuel burning for heat output by KSPU, t CO_2
$BE_{el\ KSPU}$ -baseline emissions from auxiliaries electricity consumption by KSPU, t CO_2
$BE_{el\text{-}heat\ NL}$ –baseline emissions from electricity consumption for heat output by "Novo-Lenino" EBH, t CO_2
$BE_{el\ aux\ NL}$ –baseline emissions from auxiliaries electricity consumption by "Novo-Lenino" EBH, t CO_2
$BE_{el\text{-}heat\ B}$ –baseline emissions from electricity consumption for heat output by "Bytovaya" EBH, t CO_2
$BE_{el\ aux\ B}$ –baseline emissions from auxiliaries electricity consumption by e/b "Bytovaya" EBH, t CO_2

$$BE_{coal\ KSPU,y} = FC_{BE\ coal\ KSPU} * COEF_{coal} \quad \textbf{(formula D.1-14)}$$

where, $FC_{BE\ coal\ KSPU}$ –Baseline quantity of coal burned by KSPU, t.c.e/year;
$COEF_{coal}$ – CO_2 emission factor for coal, t CO_2/t.c.e;

$$FC_{coal\ KSPU} = HO_{BE\ KSPU} * SFC_{BE\ KSPU\ heat} \quad \textbf{(formula D.1-15)}$$

где, $HO_{BE\ KSPU}$ - Baseline heat output from KSPU, Gcal/year
$SFC_{BE\ KSPU\ heat}$ - Average specific coal consumption by KSPU for baseline heat output, t.c.e/Gcal

$$BE_{el\ KSPU} = EC_{BE\ el\ KSPU} * EF_{grid} \quad \textbf{(formula D.1-16)}$$

where, $EC_{BE\ el\ KSPU}$ – baseline auxiliaries electricity consumption by KSPU, MWh/year

$$EC_{BE\ el\ KSPU} = SEC_{BE\ el\ KSPU} * HO_{BE\ KSPU} \quad \textbf{(formula D.1-17)}$$

where $SEC_{BE\ el\ KSPU}$ – Average specific auxiliaries electricity consumption by KSPU for heat output ,MWh/Gcal

$$BE_{el\text{-}heat\ NL} = EC_{BE\ heat\ NL} * EF_{grid} \quad \textbf{(formula D.1-18)}$$

where, $EC_{BE\ heat\ NL}$ –baseline electricity consumption for heat output by "Novo-Lenino" EBH, MWh/year

$EC_{BE\ heat\ NL} = HO_{BE\ heat\ NL} * SEC_{BE\ heat\ NL}$ **(formula D.1-19)**

where, $HO_{BE\ heat\ NL}$ – baseline heat output by e/b "Novo-Lenino", Gcal/year

$SEC_{BE\ heat\ NL}$- Average specific electricity consumption by e/b "Novo-Lenino" for baseline heat output,MWh/Gcal

$BE_{el\ aux\ NL} = EC_{BE\ aux\ NL} * EF_{grid}$ **(formula D.1-20)**

where , $EC_{BE\ aux\ NL}$- baseline auxiliaries electricity consumption by "Novo-Lenino" EBH for heat output, MWh/year

$EC_{BE\ aux\ NL} = SEC_{BE\ aux\ NL} * HO_{BE\ heat\ NL}$ **(formula D.1-21)**

where $SEC_{BE\ aux\ NL}$ – Average specific auxiliaries electricity consumption by "Novo-Lenino" EBH for heat output, MWh/Gcal

$BE_{el\text{-}heat\ B,y} = EC_{BE\ heat\ B} * EF_{grid}$ **(formula D.1-22)**

where, $EC_{BE\ heat\ B}$ – baseline electricity consumption for heat output by "Bytovaya" EBH, MWh/year

$EC_{BE\ heat\ B} = HO_{BE\ heat\ B} * SEC_{BE\ heat\ B}$ **(formula D.1-23)**

where, $HO_{BE\ heat\ B}$ – Baseline heat output from e/b "Bytovaya" EBH, Gcal/year

$SEC_{BE\ heat\ B}$- Average specific electricity consumption by "Bytovaya" EBH for baseline heat output, MWh/Gcal

$BE_{el\ aux\ B,y} = EC_{BE\ aux\ B} * EF_{grid}$ **(formula D.1-24)**

where , $EC_{BE\ aux\ B}$- baseline auxiliaries electricity consumption by "Bytovaya" EBH for heat output, MWh/year

$EC_{BE\ aux\ B} = SEC_{BE\ aux\ B} * HO_{BE\ heat\ B}$ **(formula D.1-25)**

where, $SEC_{BE\ aux\ B}$- Average specific auxiliaries electricity consumption by "Bytovaya" EBH for heatoutput,MWh/Gcal

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

Option 2 is not used

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

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

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

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

In baseline scenario delivery of coal to TPP for electricity generation instead of delivery to KSPU (project scenario) would be carried out. Thus all condensate TPPs which will unload as a result of project realization are located further, than KSPU, hence, more fuel would be burnt by transport. Thus, the leakage is assumed be equal to zero as conservative.

.

D.1.3.1. If applicable, please describe the data and information that will be collected in order to monitor leakage effects of the project:

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

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

The leakage is assumed be equal to zero.

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

$ER_y = BE_y – PE_y$

ER_y - emission reductions, tCO_2

BE_y - baseline emissions, tCO_2

PE_y - project emissions, tCO_2

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

According to the Rosstat resolution № 157 from 30.04.2004 "About confirmation of statistical instrumentation for statistical monitoring of production wastes by Russian Technical Supervisory Authority" and Rosstat order № 166 from 10.08.2009 "About confirmation of statistical instrumentation for statistical monitoring of agriculture and environment" CJSC "Baikalenergo" and NI TPP yearly provides to the Department of environmental security and rational use of nature recourses and then to the profile supervisory subdivision the following reports:

CJSC "Baikalenergo" :
2-tp (air) – Data on Protection of Atmospheric Airgarages
2-tp (waste) – Data on production, deactivation, transportation and disposal of industrial and consumer waste, in volume terms
2тп (service water) - Data on water use, in volume terms
2-OC – Data on accomplishment of water protection works on water objects, in money terms
4-OC – Data on current cost for protection of environment and environmental payments, in money terms
N-I TPP:

2-tp (air) – Data on Protection of Atmospheric Airgarages
2-tp (waste) – Data on production, deactivation, transportation and disposal of industrial and consumer waste, in volume terms
2тп (service water) - Data on water use, in volume terms
2-OC – Data on accomplishment of water protection works on water objects, in money terms
4-OC – Data on current cost for protection of environment and environmental payments, in money terms

Every 5 years the 70uxiliaries organization, usually it is VNIPIEnergoProm is involved for "Inventory of pollutant emission from stationary sources" at all branches of JSC "Irkutskenergo" on the base of the fact data for last three years.

Results of Inventory are affirmed in Rostehnadzor and VNIPIEnergoProm develops on its base "Draft code provision of dangerous pollutant to the atmosphere and harmful physical effect on it", which is coordinated with JSC "Irkutskenergo" and goes to RosPotrebNadzor. RosPotrebNadzor gives out the conclusion and sends for the final agreement to Rostehnadzor. The section "Plans of actions for emission reduction of dangerous pollutant in the atmosphere in the period of unfavorable meteorological conditions" is co-ordinated with RosPrirodNadzor and then with Rostehnadzor. On the base of the conclusion confirmed by Rostehnadzor the "Permission for emission of dangerous pollutant to the atmosphere", validity for five years is issued.

Monthly environmental engineer of N-I TPP and CJSC "Baikalenergo" makes the technical report where actual emissions of pollutant principal views (nitrogen oxide, sulphur dioxide, carbon monoxide, soot etc.) are defined. For calculation of annual emissions the data from station reports and actual testing which are carried out by as other kinds общестанционной the reporting (the fuel expense, etc.), and results of the natural measurements which are carried out by Sanitary Industrial Laboratory under the jurisdiction of LLC "Engineering centre Irkutskenergo" are used. The calculated report goes to the Centre of Laboratory Analysis and Technical Metrology on East Siberian Federal Service for Ecological, Technological and Atomic Supervision region of Rostehnadzor and confirms in Baikal region management of Federal Service for Ecological, Technological and Atomic Supervision. Then the report confirmed by Rostehnadzoro goes to Department of environmental security and rational use of nature recourses from where the reporting goes in Rosstat.

D.2. Quality control (QC) and quality assurance (QA) procedures undertaken for data monitored:		
Data *(Indicate table and ID number)*	Uncertainty level of data (high/medium/low)	Explain QA/QC procedures planned for the data, or why such procedures are not necessary.

M-1 (Table D1.1.1)	Low	Calculated by calculation engineer of KSPU at the base of daily reports. The calculation is carried out according to the formulas that recommended by RD 34-08-552-95, nomogramms and diagrams from report of boilers tests run. Report of boilers test run are made by specialized organization.
M-2 (Tables D1.1.1 and D.1.1.3)	Low	This parameter is contained in the fuel certificate, estimated by certified laboratory.
M-3 (Table D1.1.1)	Low	Measured by electric meter Mercury 230AM-00. Checking is carried out by All measurements are made by the calibrated measuring devices according to standards in power branch.
M-4, M-5 (Table D1.1.1)	Low	Measured by electric meter Mercury 230AM-00. Procedure of the measuring device checking is carried out every 10 years by Federal agency on technical regulation and metrology FSI « Irkutsk centre of standardization, metrology and certification» which is accredited on technical competence in the field of checking of SI and registered in the Register under №004. All measurements are made by the calibrated measuring devices according to standards in power branch.
M-6, M-7 (Table D1.1.1)	Low	Measured by electric meter type A1802RLQ . Checking is carried out by LLC “Elster Metronika” every 8 years. All measurements are made by the calibrated measuring devices according to standards in power branch.

M-8, M-9,M-10 (Table D1.1.3)	Low	Calculated by experts of JSC “Irkutskenergo”. Calculated as the share of heat production by KSPU, e/b “Novo-Lenino” and “Bitovaya from total heat production by 3 boiler-houses (KSPU, e/b “Novo-Lenino”, “Bitovaya”) in 2005-2007. This share is spread on the period after project realization. Calculation is based on the data, which are measured by calibrated measurement equipment according to standards in the power industry
M-11 (Table D1.1.3)	Low	Measured by heat calculator SPT961 Procedure of the measuring device checking is carried out every 4 years by Federal agency on technical regulation and metrology FSI « Irkutsk centre of standardization, metrology and certification» which is accredited on technical competence in the field of checking of SI and registered in the Register under №004. All measurements are made by the calibrated measuring devices according to standards in power branch.
M-12 (Table D1.1.3)	Low	Measured by heat calculator SPT961 Procedure of the measuring device checking is carried out every 4 years by Federal agency on technical regulation and metrology FSI « Irkutsk centre of standardization, metrology and certification» which is accredited on technical competence in the field of checking of SI and registered in the Register under №004. All measurements are made by the calibrated measuring devices according to standards in power branch.
M-13 (Table D1.1.3)	Low	Measured by heat calculator SPT961 Procedure of the measuring device checking is carried out every 4 years by Federal agency on technical regulation and metrology FSI « Irkutsk centre of standardization, metrology and certification» which is accredited on technical competence in the field of checking of SI and registered in the Register under №004.

		All measurements are made by the calibrated measuring devices according to standards in power branch.
M-14 (Table D1.1.3)	Low	Calculated by an engineer of technological department of NITPP on a bases of approved norms with reduction to factual heat network operation parameters (temperature of ambient air and network water) and inclusion of above-standard heat losses (discharges and leaks). Calculated according to the "Instruction on organization in Ministry of Energy of Russian Federation works on calculation and validation norms of process losses by heat energy transferring" approved by an Ministry of Energy Order # 325 from 30.12.2008.
M-15 (Table D1.1.3)	Low	Calculated by experts of JSC "Irkutskenergo". Calculated as the average specific coal consumption for baseline heat production by KSPU in 2005-2007. Calculation is based on the data from yearly reports of KSPU, which are measured by calibrated measurement equipment according to standards in the power industry. Calculation is presented in excel file-Annex 5.
M-16,M-17 (Table D1.1.3)	Low	Calculated by experts of JSC "Irkutskenergo". Calculated as the average specific electricity consumption for baseline heat production by e/b "Novo-Lenino" in 2005-2007. Calculation is presented in excel file-Annex 5. Calculation is based on the data from yearly reports of e/b "Novo-Lenino" and "Bitovaya", which are measured by calibrated measurement equipment according to standards in the power industry.
M-18,M-19,M-20 (Table D1.1.3)	Low	Calculated by experts of JSC "Irkutskenergo". Calculated as the average specific 73uxiliaries electricity consumption by KSPU, e/b "Novo-Lenino" and "Bitovaya" in 2005-2007. Calculation is presented in excel file-Annex 5. Calculation is based on the data from yearly reports of KSPU, e/b "Novo-Lenino" and "Bitovaya", which are measured by calibrated measurement equipment according to standards in the power industry.

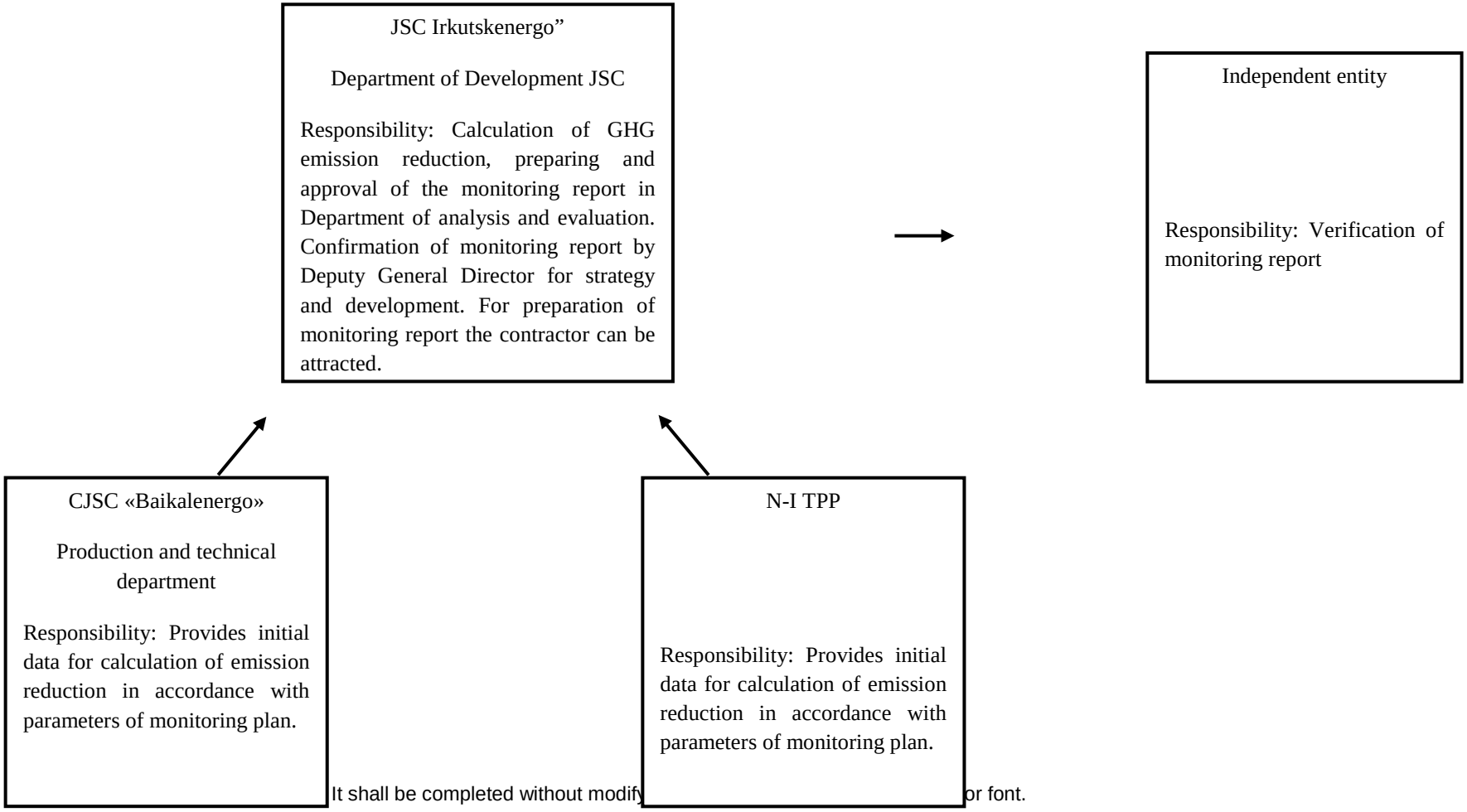
M-21,M-22, M-23 (Table D1.1.3)	Low	Calculated by an engineer of technological department of NITPP and JSC “Baikalenergo” proportionally to contract loads for preparation the Act of productive supply.

Quality Control and Quality Assurance procedures on the above specified parameters are guaranteed by compliance with the following legal documents requirements:

- The Russian Federation Law dated 26.6.2008 N 102-FL “On ensuring the uniformity of measurements”;
- “Regulations for calibration works implementation”, confirmed by Resolution of GosStandart of Russia dated 21.09.1994
- State Register SI (“Measurement Systems”);
- Regulation (PR) 50.2.006-94.

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

Scheme D.3. Operational structure of project monitoring



It shall be completed without modify or font.

Under monitoring the 1-st category engineer of N-ITPP, on an annual basis, gathers the necessary data for submission to Irkutskenergo Executive Directorate for consequent calculations and making the monitoring report. Data is provided from the following sources:

Data	Source
Output of heat from “Novo-Lenino” and “Bytovaya” EBHs	N-ITPP server. Data from heat meters automatically come in Automated Heat and Power Control System (AHPCS). From AHPCS the engineer-planimetrist of electrical equipment plant inputs daily data in the server.
Heat output from KSPU to the zone of NITPP	Calculated every month by the lead engineer of PTD on a bases of contract loads. Calculation goes to annex for Act of productive supply.
Heat losses within “Novo-Lenino” and “Bytovaya” EBHs zones	Calculated by the 1-st category engineer of N-ITPP on a bases of approved norms with reduction to factual heat network operation parameters (temperature of ambient air and network water) and inclusion of above-standard heat losses (discharges and leaks).
Consumption of electricity at “Novo-Lenino” EBH	N-ITPP server. Operator of EBH every day at 05:00 reads data from electricity meters, inputs them in electricity registration log and deliver them to the head of the shift. The head of the shift fill in electricity registration electronic log on the server.
Consumption of electricity at “Bytovaya” EBH	Report of AHPCS system engineer. Data on electricity consumption get in AHPCS, where the system engineer, daily, registers it with XLS-format report from and delivers to the 1-st category engineer of N-ITPP

Under monitoring the lead engineer of production and technical department (PTD) of JSC "Baikalenergo", annually, gathers information for submission to Irkutskenergo Executive Directorate for consequent calculations and making the monitoring report. Data is provided from the following sources:

Data	Source
Heat output from KSPU coal boiler house	Report of KSPU registration technician. Monthly data are read from commercial meter and delivered to the technician (with a copy to sales department). Then data are submitted to PTD of Baikalenergo.
Heat output from KSPU to the zone of KSPU	Calculated every month by the lead engineer of PTD on a bases of contract loads. Calculation goes to annex for Act of productive supply.
Heat losses within KSPU zone	Calculated by the lead engineer of PTD on a bases of approved norms with reduction to factual heat network operation parameters (temperature of ambient air and network water) and inclusion of above-standard heat losses (discharges and leaks).
Consumption of fuel at KSPU	Report of KSPU registration technician. Fuel registration technician make calculations on the base of monthly inventory of the KSPU coal storage. The lead engineer of logistics department is responsible for inventory.
Coal calorific capacity	Report of KSPU registration technician. Calculations are based on coal delivery certificates (once a month)
Consumption of fuel, in terms of coal equivalent	Report of KSPU registration technician.
Consumption of electricity at KSPU	Report of the engineer of PTD responsible for electricity registration Отчет. Data are measured at Priangarskaya substation by staff of N-

	ITPP and delivered to the metrologist of N-ITPP and than to PTD of Baikalenergo

No extra training and maintenance efforts in order to put into operation and maintain of new wheels are not needed. These skills are provided and controlled by current system of training.

The above specified information will be submitted, in the established by JSC "Irkutskenergo" time, to the Department of Development of JSC «Irkutskenergo» to calculate the actual GHG emissions reductions in accordance with Section D formulas, and to prepare annual monitoring reports. JSC «Irkutskenergo» as the project operator will be responsible for all procedures of measurements, test and analysis required for obtaining the necessary data for monitoring plan execution.
The collection, transfer and archiving of data, as well as calculation of GHG emission reductions procedures are incorporated into the existing reporting system JSC "Irkutskenergo" and its affiliate organizations.

The approved Monitoring Report will be submitted to an accredited independent entity for verification.

The person responsible for application and management of the Monitoring Plan will be:

Chief of the Department of Development of JSC «Irkutskenergo»
Tel. +7 (3952) 790-682
E-mail: shumeev@irkutskenergo.ru

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

The monitoring plan has been designed by CJSC "National carbon sequestration foundation" (Moscow)
Contact person: Baydakova Evgenia, Senior expert Project Development Department
Tel. +7 (499) 788-78-35,ext 104
Fax +7 (499) 788-78-35,ext 107

e-mail: BaydakovaEV@ncsf.ru

CJSC “National carbon sequestration foundation” is not a project participant.

SECTION E. Estimation of greenhouse gas emission reductions

E.1. Estimated project emissions:

Table E.1.1

Line №	Index/year	2008 (Dec)	2009	2010	2011	2012
1	$FC_{coal\ KSPU}$ (t)	23078	175941	185 008	205675	205675
2	CAL_{coal} (Kkal/kg)	4249	3982	4007	3850	3850
3	EF_{coal} (t CO_2/t.c.e)	101				
4	$EC_{PE\ el\ KSPU}$	2 773	26 217	27534	30440	30440
5	$EC_{PE\ heat\ NL}$	39 761	243 707	237 977	190 622	210 776
6	$EC_{PE\ aux\ NL}$	443	4 813	3 436	1 925	2 129
7	$EC_{PE\ B}$	0	7 684	15 048	11 313	11 313
8	$EC_{PE\ aux\ B}$	321	2 236	2 247	5 983	1 440
9	EF_{grid} (t CO_2/MWh)	1.159				
10	PE_y (tCO_2)	91593	626 322	645 373	613 481	613 481
11	Total PE (2008-2012) ($тCO_2$)	2 590 251				

PE_y = [1] * ([2] * **(4,1868/1000) * [3]) + (([4] + [5] + [6] + [7] + [8]) * [9])**

Detailed calculation presented in original excel table.

E.2. Estimated leakage:

Table E.2.2

	2008	2009	2010	2011	2012
$тCO_2$	0	0	0	0	0

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

Table E.3.1

	2008 (Dec)	2009	2010	2011	2012
$тCO_2$	91593	626 322	645 373	613 481	613 481

E.4. Estimated baseline emissions:

The BL emissions are determined in accordance with formulas presented in Section D.1.1.4.

Table E.4.1

Line №	Index/year	2008 (Dec)	2009	2010	2011	2012
1	HO $_{BE\ KSPU}$ (Gcal)	43 091	272 511	267 785	258 601	258 601
2	SFC $_{BE\ KSPU\ heat}$ (t.c.e/Gcal)	0,199				
3	CAL_{coal} (Ccal/kg)	4249	3982	4007	3850	3850
4	$EF_{CO2coal}$ (tCO_2/TJ)	101				
5	$SEC_{BE\ el\ KSPU}$ (MWh/Gcal)	0,015				
6	HO $_{BE\ NL}$ (Gcal)	45 594	334 756	352 946	350 776	350 776
7	SEC $_{BE\ NL}$ (MWh /Gcal)	1,122				
8	SEC $_{BE\ aux\ NL}$ (MWh/Gcal)	0,016				
9	HO $_{BE\ B}$	23 949	175 834	185 389	184 248	184 248
10	SEC $_{BE\ B}$ (MWh /Gcal)	1,207				
11	SEC $_{BE\ aux\ B}$(MWh /Gcal)	0,015				
12	EF_{grid} ($t\ CO_2$/MWh)	1,159				
13	BE ($t\ CO_2$)	122 612	870633	905 250	894 680	894 680
14	Total BE (2008-2012) (tCO_2	3 687 855				

BE_y = [1] * ([2] / ([3] / 7000)) * ([3] * (4,1868/1000) * [4]) + ([5] * [1] + ([6] * ([7] + [8])) + ([9] * ([10] + [11]))) * [12]

Detailed calculation presented in original excel table.

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

The emission reductions is determined as the difference of data presented in Tables E.4-1 (line [13]) and E.3-1 (line [11])

Table E.5.1

	2008	2009	2010	2011	2012
tCO_2	31 019	244311	259 877	281 199	281 199
Total (2008-2012)	1 097 604				

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

Table E.6.1

Year	Estimated project emissions (tones of CO_2 equivalent)	Estimated leakage (tones of CO_2 equivalent)	Estimated baseline emissions (tones of CO_2 equivalent)	Estimated emission reductions (tones of CO_2 equivalent)
2008	91593	0	122612	31019
2009	626322	0	870633	244311
2010	645373	0	905250	259877
2011	613481	0	894680	281199
2012	613481	0	894680	281199
Total (tones of CO_2 equivalent)	2590251	0	3687855	1097604

Excel table is attached in the separate file, Annex 5

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:

Materials of an environmental impact assessment (EIA) are obligatory section of the design documentation it characterize results of an influences estimation on natural, social, including population life-sustaining activity, and the technogenetics environment and prove an permissibility of planned activity.
The analysis of the project "Reconstruction of Irkutsk Lenin district heat network" environmental impact has been executed in the frame of the design documentation preparation. Containing in EIA the Analysis of detected environmental impact has shown that the organization of ecological monitoring for the separate components of an environment for the period of reconstruction and further heat system operation of the Lenin district heat system, which are reconstructed under realized activity is not expedient.
Business function under the Project do not contradict to the current planning norms, will not impact on components of environment and will not cause dangerous ecological consequences.
According to the current legislation the State Enviromental Expert Review on the given project is not required.
Increasing of coal consumption at KSPU will lead to slightly increase of dangerous pollutant emissions at KSPU. This Increasing will be within normal limits of dangerous pollutant. This confirms by the fact that in may 2010 Rostehnadzor issued the "Permission for emission of dangerous pollutant to the atmosphere" for KSPU, validity for five years. So, environmental impact assessment showed that KSPU operation under the project will not lead to the occurrence of near-by ground-level pollutant concentrations which would exceed sanitary hygienic standards.

Industrial waste and waters are directed to KSPU ash-disposal aria. There is no need to widening of existing ash-disposal aria since ash-disposal waste are sold to the building organizations which includes Irkutskenergo associated company – CJSC "Irkutskzoloproduct". Methods of waste collection, temporary storage, disposal, utilization, neutralization and landfill are met the regulatory requirements of the environmental protection from industrial and consumption waste.

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

According to the current legislation the State Enviromental Expert Review on the given project is not required.
Materials of an environmental impact assessment (EIA) are obligatory section of the design documentation it characterize results of an influences estimation on natural, social, including population life-sustaining activity, and the technogenetics environment and prove an permissibility of planned activity.

The analysis of the project “Reconstruction of Irkutsk Lenin district heat network” environmental impact has been executed in the frame of the design documentation preparation.

SECTION G. Stakeholders' comments

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

Information about the Project has been posted on a website http://www.frrio.ru/news/?135. There were no any comments.

Annex 1

CONTACT INFORMATION ON PROJECT PARTICIPANTS

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Annex 2

BASELINE INFORMATION

1. The tables with the key data and the variables used for the baseline definition is presented below:

Data/Parameter 1	**HO $_{BE\ KSPU}$**
Data unit	Gcal/year
Description	Baseline heat output from KSPU
Time of determination /monitoring	Calculated every year
Source of data	Calculated by experts of JSC "Irkutskenergo" Calculation is presented in excel file-Annex 5.
Value of data applied (for ex ante calculations/determinations)	2008 (Dec) – 43 091 2009 –272 511 2010 –267 785 2011 – 258 601 2012 – 258 601
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Calculated as the share of KSPU heat output from total heat production by 3 boiler-houses (KSPU, "Novo-Lenino" and "Bytovaya" EBH) in 2005-2007. This share is spread on the period after project realization.
QA/QC procedures (to be) Applied	All measurements will be conducted with calibrated measurement equipment according to standards in the power industry
Any comment	

Data/Parameter 2	**HO $_{BE\ NL}$**
Data unit	Gcal/year
Description	Baseline heat output from "Novo-Lenino" EHB
Time of determination /monitoring	Calculated every year
Source of data	Calculated by experts of JSC "Irkutskenergo" Calculation is presented in excel file-Annex 5.
Value of data applied (for ex ante calculations/determinations)	2008 (Dec) – 45 594 2009 – 334 756 2010 – 352 946 2011 – 350 776 2012 – 350 776

Justification of the choice of data or description of measurement methods and procedures (to be) applied	Calculated as the share of "Novo-Lenino" EBH heat output from total heat production by 3 boiler-houses (KSPU, "Novo-Lenino" and "Bytovaya" EHB) in 2005-2007. This share is constant for the period after project realization.
QA/QC procedures (to be) Applied	All measurements will be conducted with calibrated measurement equipment according to standards in the power industry
Any comment	

Data/Parameter 3	**$HO_{BE\,B}$**
Data unit	Gcal/year
Description	Baseline heat output from "Bitovaya" EHB
Time of determination /monitoring	Calculated every year
Source of data	Calculated by experts of JSC "Irkutskenergo" Calculation is presented in excel file-Annex 5.
Value of data applied (for ex ante calculations/determinations)	2008 (Dec) – 23 949 2009 – 175 834 2010 – 185 389 2011 – 184 248 2012 – 184 248
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Calculated as the share of "Bitovaya" EHB heat output from total heat production by 3 boiler-houses (KSPU, "Novo-Lenino" and "Bytovaya" EHB) in 2005-2007. This share is constant for the period after project realization.
QA/QC procedures (to be) Applied	All measurements will be conducted with calibrated measurement equipment according to standards in the power industry
Any comment	

Data/Parameter 4	**L_{hi}**
Data unit	%
Description	Project heat losses ratio (for new pipeline)
Time of determination /monitoring	Determined once in 2011 for the credit period
Source of data	Ratio specific heat losses calculation
Value of data applied (for ex ante calculations/determinations)	13,5%

Justification of the choice of data or description of measurement methods and procedures (to be) applied	Calculated as average heat losses ratio in 2005-2007 and difference between ratio of specific heat losses for the old heat network and for the new heat network.
QA/QC procedures (to be) Applied	Calculated according to the "Methodological instructive regulations for composition of energy characteristics for systems of transport the heat energy on the indicator "thermal losses" approved by an Ministry of Energy Order # 278 from 30.06.2003
Any comment	

Data/Parameter 5	**SFC $_{BE\ KSPU}$**
Data unit	t.c.e/Gcal
Description	Average specific coal consumption by KSPU for baseline heat production
Time of determination /monitoring	Determined once
Source of data	Initial data for calculation of this parameter is taken from yearly reports of KSPU.
Value of data applied (for ex ante calculations/determinations)	0,199 t.c.e/Gcal
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Calculated as the average specific coal consumption for baseline heat production by KSPU in 2005-2007. Calculated by experts of JSC "Irkutskenergo". Calculation is presented in excel file-Annex 5.
QA/QC procedures (to be) Applied	All measurements are made by the calibrated measuring devices according to standards in power branch.
Any comment	

Data/Parameter 6	**SFC $_{BE\ KSPU}$**
Data unit	t.c.e/Gcal
Description	Average specific coal consumption by KSPU for baseline heat production
Time of determination /monitoring	Determined once
Source of data	Initial data for calculation of this parameter is taken from yearly reports of KSPU.

Value of data applied (for ex ante calculations/determinations)	0,199 t.c.e/Gcal
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Calculated as the average specific coal consumption for baseline heat production by KSPU in 2005-2007. Calculated by experts of JSC "Irkutskenergo". Calculation is presented in excel file-Annex 5.
QA/QC procedures (to be) Applied	All measurements are made by the calibrated measuring devices according to standards in power branch.
Any comment	

Data/Parameter 7	**$SEC_{BE\ NL}$**
Data unit	MWh /Gcal
Description	Average specific electricity consumption by "Novo-Lenino" EBH for baseline heat production
Time of determination /monitoring	Determined once
Source of data	Initial data for calculation of this parameter is taken from yearly reports of e/b "Novo-Lenino".
Value of data applied (for ex ante calculations/determinations)	1,122 MWh/Gcal
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Calculated as the average specific electricity consumption for baseline heat production by "Novo-Lenino" EHB in 2005-2007. Calculated by experts of JSC "Irkutskenergo". Calculation is presented in excel file-Annex 5.
QA/QC procedures (to be) Applied	All measurements are made by the calibrated measuring devices according to standards in power branch.
Any comment	

Data/Parameter 8	**$SEC_{BE\ B}$**
Data unit	MWh/Gcal
Description	Average specific electricity consumption by "Bytovaya" EHB for baseline heat production
Time of determination /monitoring	Determined once
Source of data	Initial data for calculation of this parameter is taken from yearly reports of e/b "Bitovaya".

Value of data applied (for ex ante calculations/determinations)	1,207 MWh/Gcal
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Calculated as the average specific electricity consumption for baseline heat production by "Bytovaya" EHB in 2005-2007. Calculated by experts of JSC "Irkutskenergo". Calculation is presented in excel file-Annex 5.
QA/QC procedures (to be) Applied	All measurements are made by the calibrated measuring devices according to standards in power branch.
Any comment	

Data/Parameter 9	**NCV_{coal}**
Data unit	Kcal/kg
Description	Net calorific value of coal used at KSPU
Time of determination /monitoring	With every fuel delivery (about 25 fuel delivery in a month)
Source of data	This parameter is provided in the fuel certificate, estimated by certified laboratory.
Value of data applied (for ex ante calculations/determinations)	3962 Kcal /kg
Justification of the choice of data or description of measurement methods and procedures (to be) applied	This parameter is provided in the fuel passport, estimated by certified laboratory.
QA/QC procedures (to be) Applied	All measurements are made by the calibrated measuring devices according to standards in power branch.
Any comment	-

Data/Parameter 10	**EF_{coal}**
Data unit	t/TJ
Description	CO_2 emission factor for coal combustion
Time of determination /monitoring	Once
Source of data	

Value of data applied (for ex ante calculations/determinations)	96.1 t /TJ
Justification of the choice of data or description of measurement methods and procedures (to be) applied	This parameter is provided in 2006 IPCC Guidelness for National Greenhouse Gas Inventories, Table 1.4.
QA/QC procedures (to be) Applied	Calculated on the basis of an inventory of greenhouse gases.
Any comment	-

Data/Parameter 11	**SEC** $_{\textbf{BE el KSPU}}$
Data unit	MWh/Gcal
Description	Average specific electricity consumption for own needs by KSPU
Time of determination /monitoring	Determined once
Source of data	Initial data for calculation of this parameter is taken from yearly reports of KSPU.
Value of data applied (for ex ante calculations/determinations)	0,016 MWh/Gcal
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Calculated as the average specific electricity consumption for own needs in KSPU in 2005-2007. Calculated by experts of JSC "Irkutskenergo". Calculation is presented in excel file-Annex 5.
QA/QC procedures (to be) Applied	All measurements are made by the calibrated measuring devices according to standards in power branch.
Any comment	-

Data/Parameter 12	**SEC** $_{\textbf{BE aux NL}}$
Data unit	MWh/Gkal
Description	Average specific auxiliaries electricity consumption by "Novo-Lenino" EBH for heat production
Time of determination /monitoring	Determined once
Source of data	Initial data for calculation of this parameter is taken from yearly reports of "Novo-Lenino" EBH.

Value of data applied (for ex ante calculations/determinations)	0,015 MWh/Gcal
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Calculated as the average specific auxiliaries electricity consumption for heat production by e/b "Novo-Lenino" in 2005-2007. Calculated by experts of JSC "Irkutskenergo". Calculation is presented in excel file-Annex 5.
QA/QC procedures (to be) Applied	All measurements are made by the calibrated measuring devices according to standards in power branch.
Any comment	

Data/Parameter 13	**$SEC_{BE\ aux\ B}$**
Data unit	MWh/Gcal
Description	Average specific auxiliaries electricity consumption by "Bytovaya" for heat production
Time of determination /monitoring	Determined once
Source of data	Initial data for calculation of this parameter is taken from yearly reports of "Bytovaya" EBH.
Value of data applied (for ex ante calculations/determinations)	0,015MWh /Gcal
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Calculated as the average specific auxilaries electricity consumption for heat production by e/b "Bitovaya" in 2005-2007. Calculated by experts of JSC "Irkutskenergo". Calculation is presented in excel file-Annex 5.
QA/QC procedures (to be) Applied	All measurements are made by the calibrated measuring devices according to standards in power branch.
Any comment	-

Data/Parameter 14	**I_{eby}**
Data unit	-
Description	Index of electricity boiler house load
Time of determination /monitoring	Calculated as proportion between real heat output to the zone of NI TPP under the project and average heat output to the zone NI TPP in 2005-2007.
Source of data	Calculated by experts of JSC "Irkutskenergo"

	Calculation is presented in excel file-Annex 5.
Value of data applied (for ex ante calculations/determinations)	2008 (Dec) – 0.136 2009 – 0.998 2010 – 1.052 2011 – 1.046 2012 – 1.046
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Calculated as proportion between real heat output to the zone of NI TPP under the project and average heat output to the zone NI TPP in 2005-2007. Calculated by experts of JSC "Irkutskenergo". Calculation is presented in excel file-Annex 5.
QA/QC procedures (to be) Applied	All measurements will be conducted with calibrated measurement equipment according to standards in the power industry
Any comment	

Data/Parameter 15	**EF_{grid}**
Data unit	tCO_2/MWh
Description	CO_2 emission factor for condensation mode of Irkutskenergo power system
Time of determination /monitoring	Determined once in 2011 for the credit period
Source of data	JSC "Irkutskenergo" software: "Program complex of automated collection, processing and fuel use analysis system of CHP-plants and Power and electrification production association"
Value of data applied (for ex ante calculations/determinations)	1.159
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Calculated according to the Regulating document 34.08-559-96 "Methodical guidance for analysis of specific fuel consumption changes at electric power stations and power associations". More detail information see in Annex 2
QA/QC procedures (to be) Applied	The result confirms by ORGRES (JSC "Engineering Center UES")
Any comment	

Data and parameters that are monitored throughout the crediting period:

Data/Parameter 16	**$HO_{PE\ KSPU}$**
Data unit	Gcal/year
Description	Project heat output from KSPU

Time of determination /monitoring	Every month
Source of data	Program complex enclose to heat calculator SPT961
Value of data applied (for ex ante calculations/determinations)	2008 (Dec) – 80 243 2009 –575 410 2010 –597 726 2011 – 631 944 2012 – 631 944
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Measured by heat calculator SPT961
QA/QC procedures (to be) Applied	Measured by heat calculator SPT961 Procedure of the measuring device checking is carried out every 4 years by Federal agency on technical regulation and metrology FSI «Irkutsk centre of standardization, metrology and certification» which is accredited on technical competence in the field of checking of SI and registered in the Register under №004. All measurements are made by the calibrated measuring devices according to standards in power branch.
Any comment	

Data/Parameter 17	**$HO_{PE\ NL}$**
Data unit	Gcal/year
Description	Project heat output from “Novo-Lenino” EHB
Time of determination /monitoring	Every month
Source of data	Program complex enclose to heat calculator SPT961
Value of data applied (for ex ante calculations/determinations)	2008 (Dec) – 33 562 2009 –208 066 2010 –202 547 2011 –160 456 2012 – 160 456
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Measured by heat calculator SPT961
QA/QC procedures (to be) Applied	Measured by heat calculator SPT961 Procedure of the measuring device checking is carried

	out every 4 years by Federal agency on technical regulation and metrology FSI « Irkutsk centre of standardization, metrology and certification» which is accredited on technical competence in the field of checking of SI and registered in the Register under №004. All measurements are made by the calibrated measuring devices according to standards in power branch.
Any comment	

Data/Parameter 18	**$HO_{PE\ B}$**
Data unit	Gcal/year
Description	Project heat output from “Bytovaya” EHB
Time of determination /monitoring	Every month
Source of data	Program complex enclose to heat calculator SPT961
Value of data applied (for ex ante calculations/determinations)	2008 (Dec) – 0 2009 – 6 805 2010 – 13 219 2011 – 10 100 2012 – 10 100
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Measured by heat calculator SPT961
QA/QC procedures (to be) Applied	Measured by heat calculator SPT961 Procedure of the measuring device checking is carried out every 4 years by Federal agency on technical regulation and metrology FSI « Irkutsk centre of standardization, metrology and certification» which is accredited on technical competence in the field of checking of SI and registered in the Register under №004. All measurements are made by the calibrated measuring devices according to standards in power branch.
Any comment	

Data/Parameter 19	**$HO_{KSPU\ zone\ PE}$**
Data unit	Gcal/year
Description	heat output to the zone of KSPU under the project in year

	y
Time of determination /monitoring	Every month
Source of data	Calculation for Act of productive supply.
Value of data applied (for ex ante calculations/determinations)	2008 (Dec) – 42 678 2009 – 262 650 2010 – 260 838 2011 – 255 601 2012 – 255 601
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Calculated by an engineer of technological department of JSC "Baikalenergo" proportionally to contract loads.
QA/QC procedures (to be) Applied	Calculated by an engineer of technological department of JSC "Baikalenergo" proportionally to contract loads for preparation the Act of productive supply.
Any comment	

Data/Parameter 20	**HO** **KSPU NITPP zone PE y**
Data unit	Gcal/year
Description	heat output from KSPU to the zone of NI TPP under the project in year y
Time of determination /monitoring	Every month
Source of data	Calculation for Act of productive supply.
Value of data applied (for ex ante calculations/determinations)	2008 (Dec) – 37 152 2009 – 302 899 2010 – 329 941 2011 – 373 343 2012 – 373 343
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Calculated by an engineer of technological department of NITPP proportionally to contract loads.
QA/QC procedures (to be) Applied	Calculated by an engineer of technological department of NITPP proportionally to contract loads for preparation the Act of productive supply.

Any comment	

Data/Parameter 21	**HO** **KSPU Bitovaya PE y**
Data unit	Gcal/year
Description	heat output from KSPU to the zone of electroboiler house Bitovaya under the Project in year y
Time of determination /monitoring	Every month
Source of data	Calculation for Act of productive supply.
Value of data applied (for ex ante calculations/determinations)	2008 (Dec) – 22 080 2009 – 135 430 2010 – 139 059 2011 – 167 399 2012 – 167 399
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Calculated by an engineer of technological department of NITPP proportionally to contract loads.
QA/QC procedures (to be) Applied	Calculated by an engineer of technological department of NITPP proportionally to contract loads for preparation the Act of productive supply.
Any comment	

2. Baseline emissions are calculated according to the JI specific approach, presented below:

№ formula	Formula	Parameter	Description
Formula An 1-1	$\mathbf{BE = BE_{coal\ KSPU,y} + BE_{el\ KSPU,y} + BE_{el\text{-}heat\ NL,y} + BE_{el\ aux\ NL,y} + BE_{el\text{-}heat\ B,y} + BE_{el\ aux\ B,y}}$	Baseline emissions (tCO_2)	**$BE_{coal\ KSPU}$** – baseline emissions from fuel burning for heat production by KSPU, t CO_2 **$BE_{el\ KSPU}$** - baseline emissions from auxiliaries electricity consumption by KSPU, t CO_2 **$BE_{el\text{-}heat\ NL}$** –baseline emissions from electricity consumption for heat production by e/b "Novo-Lenino", t CO_2 **$BE_{el\ aux\ NL}$** –baseline emissions from auxiliaries electricity consumption by e/b "Novo-Lenino", t CO_2 **$BE_{el\text{-}heat\ B}$** -baseline emissions from electricity consumption for heat production by e/b "Bitovaya", t CO_2 **$BE_{el\ aux\ B}$** -baseline emissions from auxiliaries electricity consumption by e/b "Bitovaya", t CO_2
Formula An 1-2 **Formula An 1-3** **Formula An 1-4**	$\mathbf{BE_{coal\ KSPU,y} = FC_{BE\ coal\ KSPU} * COEF_{coal}}$ $\mathbf{FC_{coal\ KSPU} = HO_{BE\ KSPU} * SFC_{BE\ KSPU\ heat}}$ $\mathbf{SFC_{BE\ KSPU\ heat} = \sum(HO_{i\ KSPU}/FC_{i\ KSPU})/3}$	Baseline emissions from fuel burning for heat production by KSPU, t CO_2;	**$FC_{BE\ coal\ KSPU}$** – Baseline quantity of coal burned by KSPU, t.c.e/year; **$COEF_{coal}$** – CO_2 emission factor for coal, t CO_2/t.c.e **$HO_{BE\ KSPU}$** - Baseline heat production by KSPU, Gkal/year **$SFC_{BE\ KSPU\ heat}$** - Average specific coal consumption by KSPU for baseline heat production, t.c.e/Gcal

			$HO_{i\ KSPU}$ – heat production by KSPU in year i before project realization, Gkal/year $FC_{i\ KSPU}$ – quantity of coal burned by KSPU in year i before project realization, t/year
Formula An 1-5 **Formula An 1-6**	$BE_{el\ KSPU} = EC_{BE\ el\ KSPU} * EF_{grid}$ (1) $EC_{BE\ el\ KSPU} = HO_{BE\ KSPU} * SEC_{BE\ el\ KSPU}$ (2) $SEC_{BE\ el\ KSPU} = \sum(EC_{i\ KSPU}/HO_{i\ KSPU})/3$	Baseline emissions from auxiliaries electricity consumption by KSPU, t CO_2	где, $EC_{BE\ el\ KSPU}$ – baseline auxiliaries electricity consumption by KSPU, MWh/year EF_{grid} – Emission factor for condensation mode of Irkutskenergo power system, tCO_2/MWh $SEC_{BE\ el\ KSPU}$ – Average specific auxiliaries electricity consumption by KSPU for heat production ,MWh/Gkal $EC_{i\ KSPU}$ – auxiliaries electricity consumption by KSPU in year i before project realization;
Formula An 1-7 **Formula An 1-8** **Formula An 1-9** **Formula An 1-10**	$BE_{el\text{-}heat\ NL} = EC_{BE\ heat\ NL} * EF_{grid}$ $EC_{BE\ heat\ NL} = HO_{BE\ NL} * SEC_{BE\ heat\ NL}$ $SEC_{BE\ heat\ NL} = \sum(EC_{i\ NL}/HO_{i\ NL})/3$ $HO_{BE\ NL} = (HO_{PE\ KSPU} + HO_{PE\ NL} + HO_{PE\ B}) * (HO_{i\ NL}/(HOi_{KSPU} + HO_{i,NL} + HO_{i,B}))$	baseline emissions from electricity consumption for heat production by e/b "Novo-Lenino", t CO_2	$EC_{BE\ heat\ NL}$ – baseline electricity consumption for heat production by e/b "Novo-Lenino", MWh/year $HO_{BE\ NL}$ - baseline heat production by e/b "Novo-Lenino", Gkal/year $SEC_{BE\ heat\ NL}$- Average specific electricity consumption by e/b "Novo-Lenino" for baseline heat production,MWh/Gkal $HO_{i\ NL}$ – heat production by e/b "Novo-Lenino" in year i before project realization, Gkal/year $EC_{i\ NL}$ – electricity consumption by e/b "Novo-Lenino" in year i before

			project realization,MWh/year **HO** $_{PE\ KSPU}$ – heat production by KSPU after project realization, Gkal/year **HO**$_{PE\ NL}$ – heat production by e/b "Novo-Lenino" after project realization, Gkal/year **HO**$_{PE\ B}$ - heat production by e/b "Bitovaya"after project realization, Gkal/year **HO**$_{i,B}$ – heat production by e/b "Bitovaya" in year i before project realization, Gkal/year.
Formula An 1-11 **Formula An 1-12** **Formula An 1-13** **Formula An 1-14**	**BE**$_{el\text{-}heat\ B}$**=EC**$_{BE\ heat\ B}$***** **EF**$_{grid}$ **EC** $_{BE\ heat\ B}$ = **HO** $_{BE\ B}$ ***SEC** $_{BE\ heat\ B}$ **SEC** $_{BE\ heat\ B}$ = ∑(**EC**$_{i\ B}$ **/HO**$_{i\ B}$ **)/3** **HO** $_{BE\ B}$ **= (HO** $_{PE\ KSPU}$ **+ HO**$_{PE\ NL}$ **+HO**$_{PE\ B}$**) * (HO**$_{i\ B}$**/(HOi**$_{KSPU}$**+HO**$_{i,NL}$**+HO**$_{i,B}$**))**	Baseline emissions from electricity consumption for heat production by e/b "Bitovaya", t CO_2	**EC** $_{BE\ heat\ B}$ – baseline electricity consumption for heat production by e/b "Bitovaya", MWh/year **HO** $_{BE\ B}$ - Baseline heat production by e/b "Bitovaya", Gkal/year
Formula An 1-15 **Formula An 1-16** **Formula An 1-17** **Formula An 1-18**	**BE**$_{el\ aux\ NL}$**=** **EC** $_{BE\ aux\ NL}$***** **EF**$_{grid}$ **EC** $_{BE\ aux\ NL}$ **= HO** $_{BE\ NL}$ ***SEC** $_{BE\ aux\ NL}$ **SEC** $_{BE\ aux\ NL}$ **=** ∑(**EC**$_{i\ aux\ NL}$ **/HO**$_{i\ NL}$ **)/3** **HO** $_{BE\ NL}$ **= (HO** $_{PE\ KSPU}$ **+ HO**$_{PE\ NL}$ **+HO**$_{PE\ B}$**) * (HO**$_{i\ B}$**/(HOi**$_{KSPU}$**+HO**$_{i,NL}$**+HO**$_{i,B}$**))**	baseline emissions from auxiliaries electricity consumption by e/b "Novo-Lenino", t CO_2	**EC** $_{BE\ aux\ NL}$- baseline auxiliaries electricity consumption by e/b "Novo-Lenino" for heat production, MWh/year **SEC** $_{BE\ aux\ NL}$ – Average specific auxiliaries electricity consumption by e/b "Novo-Lenino" for heat production, MWh/Gkal **EC**$_{i\ aux\ NL}$ – auxiliaries electricity consumption by e/b "Novo-Lenino" in year i before project realization,

			MWh/year.
Formula An 1-19 **Formula An 1-20** **Formula An 1-21** **Formula An 1-22**	$\mathbf{BE_{el\ aux\ B}= EC_{BE\ aux\ B}* EF_{grid}}$ $\mathbf{EC_{BE\ aux\ B} = HO_{BE\ B} *SEC_{BE\ aux\ B}}$ $\mathbf{SEC_{BE\ aux\ B} = \sum(EC_{i\ aux\ B} /HO_{i\ B})/3}$ $\mathbf{HO_{BE\ B} = (HO_{PE\ KSPU} + HO_{PE\ NL} +HO_{PE\ B}) * (HO_{i\ B}/(HOi_{KSPU}+HO_{i,NL}+HO_{i,B}))}$	baseline emissions from auxiliaries electricity consumption by e/b "Bitovaya", t CO_2	$\mathbf{EC_{BE\ aux\ NL}}$- baseline auxiliaries electricity consumption by e/b "Bitovaya" for heat production, MWh/year $\mathbf{SEC_{BE\ aux\ NL}}$ – Average specific auxilaries electricity consumption by e/b "Bitovaya" for heat production ,MWh/Gkal $\mathbf{EC_{i\ aux\ NL}}$ – auxiliaries electricity consumption by e/b "Bitovaya" in year i before project realization, MWh/year.

3. Calculation of emission factor for Irkutskenergo

The calculation was carried out according to the following steps:

Step 1. Determine the corresponding power system:

The appropriate power system was determined as Irkutskenergo: the system is energy-redundant; there are connected power systems with which exchange of electricity takes place but Irkutskenergo's export stably and significantly exceeds imports. The price of Irkutskenergo electricity is one of the most cheap in Russian Federation (http://www.irkutskenergo.ru/news/712.html).

Step 2. Description of the EFgrid calculation methodology.

EF_{grid} – emission factor for condensation mode of Irkutskenergo power system (tCO_2/MWh).
The Emission factor is calculated as the generation-weighted average CO2 emissions per unit net electricity generation (tCO2/MWh) of all generating power plants of JSC "Irkutskenergo" serving the system in condensation mode.
For EF calculating "plant by plant" data on fuel consumption at condensation mode and its low heat calorific value, net electricity generation, etc. for the last 3 years is used.
$EF_{grid,}$ calculates using the formula:

$$EF_{grid,} = \frac{\sum_{im} FC_{i,m,y} \times NCV_{i,y} \times EF_{CO2,i,y}}{\sum_{m} EG_{m,y}} \qquad \text{(formula An. 2-1)}$$

where:

FC – fuel consumption for condensation cycle, (g.c.e)
NCV – net calorific value (kCal/kg.c.e)
EF_{CO2} – fuel emission factor (kg CO_2/TJ)
EG – net electricity generation in condensation cycle (kWh)
y – year
i – fuel (type)
m – refers to all electric power stations of the power system.

Step 3. Calculate EF

Such indicator as the fuel rate per 1 kWh of electricity output by condensation cycle.
1 kg of fuel equivalent has NCV_b = 7000 kCal/kg or 29.33 MJ/kg. It is expressed for TPP using the above presented designations as:

$$b = \frac{FC \times NCV}{EG \times NCV_b} \quad \text{(g c.e./kWh)} \qquad \text{(formula An. 2-2)}$$

This indicator for each TPP of JSC "Irkutskenergo" is included in the internal registers form of JSC "Irkutskenergo. Its use will simplify substantially the calculations not affecting accuracy of calculations. For the purpose of calculation used average value for the JSC "Irkutskenergo".
It constitutes according to the Company's reports :

2006= 403.8 g c.e./kWh
2007 = 399.9 g c.e./kWh
2008 =392.4 g c.e./kWh

In this case the above presented formula is transformed into:

$$EF_{grid} = b_{cp,y} \times EF_{CO2,cp,y} * 29{,}33 \text{ MJ/kg.c.e} * 10^{-9} \qquad \text{(formula An. 2-3)}$$

where $EF_{CO2,cp,y}$ – weighted (for the different types of fuel) emission factor. It is calculated as:

$$EF_{CO2,cp,y} = d_{coal,y} \times EF_{CO2,coal} + d_{gas,y} \times EF_{CO2,gas} + d_{mazut,y} \times EF_{CO2,mazut}, \qquad \text{(formula An. 2-4)}$$

where d_y is a share of coal, gas and residual fuel oil (mazut) at TPPs of Irkutskenergo per year ***y***.

2006: coal = more than 99%, residual oil (mazut) = less than 1%, gas = 0%

2007: coal = more than 99%, residual oil (mazut) = less than 1%, gas = 0%
2008: coal = more than 99%, residual oil (mazut) = less than 1%, gas = 0%

EF_{CO2} – IPCC default emission factor expressed in appropriate units for the present calculation:

- brown coal (lignite) = 2.962 tCO_2/t c.e. (101 tCO_2/TJ) – 80% of consumption (statistic form 6-tp)
- bituminous coal = 2.775 tCO_2/t c.e. (94.6 tCO_2/TJ) - 20% of consumption (statistic form 6-tp)
- residual oil = 2.27 tCO_2/t c.e. (77.4 tCO_2/TJ)

Taking into account the above presented fuel balance average weighted $EF_{CO2,cp}$ = 2,925 tCO_2/t c.e..

Table for calculation of EF

Indicator	2006	2007	2008
(1) $EF_{CO2,cp,y}$, (tCO_2/tce)	2.925	2.925	2.925
(2) b, (tce/MWh)	0.403	0.399	0.392
(3) EF_{grid} (tCO_2/MWh) [calculated as: (1)x(2)]	1,181	1,170	1,148
(4) Electricity output (by condensation cycle), 10^3 MWh	2177	3179	7561
(5) 3 years average electricity weighted EF_{OM} (tCO_2/MWh) [calculated as∑ [(4)*(5)]/∑(4)]		**1. 159**	

Original excel table is attached in Annex 8

In the nearest future there will be no any new capacity introduce in the regional power system. And if it will happens, the characteristics of its capacities won't be much different from existence plants and it won't be any influence at emission factor of the whole regional power system.

Monitoring

The emission factor value is determined once in 2009 for the credit period (2008-2012)

In accordance with Regulating document 34.08.552-95 " Methodical guidance for drawing up the thermal profitability of the equipment report for electric power station and joint-stock company of power and electrification", JSC "Irkutskenergo" fill in the form, composed of 70 indexes.

On the base of this data, with use of Regulating document 34.08-559-96 "Methodical guidance for analysis of specific fuel consumption changes at electric power stations and power associations" generation at condensation cycle and specific fuel consumption for electricity output by condensation cycle are determine. For calculating simplification at the base of this regulating document developed bundled software: "Program complex of automated collection,

processing and fuel use analysis system of CHP-plants and Power and electrification production association"

Calculating results of this complex unloads in *txt files and goes to ORGRES (JSC "Engineering Center UES"). Condensate cycle data takes form this program complex.

Annex 3

MONITORING PLAN

The information is provided at section D of the PDD.

Annex 4

DETAILS OF CALCULATION OF FINANCIAL/ECONOMICAL INDICATORS (attached in a separate excel file)

Annex 5
EXCEL TABLES WITH INITIAL DATA AND CALCULATIONS