DETERMINATION REPORT

PJSC "SEMICONDUCTOR PLANT"

DETERMINATION OF THE PJSC "SEMICONDUCTOR PLANT" RECONSTRUCTION WITH EXPANSION OF POLYCRYSTALLINE SILICON PRODUCTION

BUREAU VERITAS CERTIFICATION

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Client:	**Client ref.:**
JSC «Semiconductor plant»	Hennadiy Zub

Summary:

Bureau Veritas Certification has made the determination of the "PJSC "Semiconductor plant" reconstruction with expansion of polycrystalline silicon production" project of JSC «Semiconductor plant»" located in Zaporizhzhya city, Ukraine on the basis of UNFCCC criteria for the JI, as well as criteria given to provide for consistent project operations, monitoring and reporting. UNFCCC criteria refer to Article 6 of the Kyoto Protocol, the JI rules and modalities and the subsequent decisions by the JI Supervisory Committee, as well as the host country criteria.

The determination scope is defined as an independent and objective review of the project design document, the project's baseline study, monitoring plan and other relevant documents, and consisted of the following three phases: i) desk review of the project design and the baseline and monitoring plan; ii) follow-up interviews with project stakeholders; iii) resolution of outstanding issues and the issuance of the final determination report and opinion. The overall determination, from Contract Review to Determination Report & Opinion, was conducted using Bureau Veritas Certification internal procedures.

The first output of the determination process is a list of Clarification and Corrective Actions Requests (CL and CAR), presented in Appendix A. Taking into account this output, the project proponent revised its project design document.

In summary, it is Bureau Veritas Certification's opinion that the project correctly applies Guidance on criteria for baseline setting and monitoring and meets the relevant UNFCCC requirements for the JI and the relevant host country criteria.

Report No.:	Subject Group:
UKRAINE-det/0278/2011	JI
Project title:	
PJSC "Semiconductor plant" reconstruction with expansion of polycrystalline silicon production	
Work carried out by:	
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Work reviewed by:	
Ivan Sokolov - Internal Technical Reviewer	
Work approved by:	
Flavio Gomes - Operational Manager	

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1 INTRODUCTION

PJSC "Semiconductor plant" has commissioned Bureau Veritas Certification to determine its JI project PJSC "Semiconductor plant" reconstruction with expansion of polycrystalline silicon production (hereafter called "the project") at Zaporizhzhya city, Ukraine.

This report summarizes the findings of the determination of the project, performed on the basis of UNFCCC criteria, as well as criteria given to provide for consistent project operations, monitoring and reporting.

1.1 Objective

The determination serves as project design verification and is a requirement of all projects. The determination is an independent third party assessment of the project design. In particular, the project's baseline, the monitoring plan (MP), and the project's compliance with relevant UNFCCC and host country criteria are determined in order to confirm that the project design, as documented, is sound and reasonable, and meets the stated requirements and identified criteria. Determination is a requirement for all JI projects and is seen as necessary to provide assurance to stakeholders of the quality of the project and its intended generation of emissions reductions units (ERUs).

UNFCCC criteria refer to Article 6 of the Kyoto Protocol, the JI rules and modalities and the subsequent decisions by the JI Supervisory Committee, as well as the host country criteria.

1.2 Scope

The determination scope is defined as an independent and objective review of the project design document, the project's baseline study and monitoring plan and other relevant documents. The information in these documents is reviewed against Kyoto Protocol requirements, UNFCCC rules and associated interpretations.

The determination is not meant to provide any consulting towards the Client. However, stated requests for clarifications and/or corrective actions may provide input for improvement of the project design.

1.3 Determination team

The determination team consists of the following personnel:

Oleg Skoblyk
Bureau Veritas Certification Team Leader, Climate Change Verifier

Igor Kachan
Bureau Veritas Certification Climate Change Verifier

Vyacheslav Yeriomin

Bureau Veritas Certification Climate Change Verifier

This determination report was reviewed by:

Ivan Sokolov
Bureau Veritas Certification, Internal reviewer

2 METHODOLOGY

The overall determination, from Contract Review to Determination Report & Opinion, was conducted using Bureau Veritas Certification internal procedures.

In order to ensure transparency, a determination protocol was customized for the project, according to the version 01 of the Joint Implementation Determination and Verification Manual, issued by the Joint Implementation Supervisory Committee at its 19 meeting on 04/12/2009. The protocol shows, in a transparent manner, criteria (requirements), means of determination and the results from determining the identified criteria. The determination protocol serves the following purposes:

- It organizes, details and clarifies the requirements a JI project is expected to meet;
- It ensures a transparent determination process where the determiner will document how a particular requirement has been determined and the result of the determination.

The completed determination protocol is enclosed in Appendix A to this report.

2.1 Review of Documents

The Project Design Document (PDD) submitted by The Environmental (Green) Investments Fund Ltd and additional background documents related to the project design and baseline, i.e. country Law, Guidelines for users of the joint implementation project design document form, Approved CDM methodology and/or Guidance on criteria for baseline setting and monitoring, Kyoto Protocol, Clarifications on Determination Requirements to be Checked by an Accredited Independent Entity were reviewed.

To address Bureau Veritas Certification corrective action and clarification requests, Environmental (Green) Investments Fund Ltd revised the PDD and resubmitted it on 02/09/2011.

The determination findings presented in this report relate to the project as described in the PDD version 2.0.

2.2 Follow-up Interviews

On 21/07/2011 Bureau Veritas Certification performed on-site interviews with project stakeholders to confirm selected information and to resolve issues identified in the document review. Representatives of PJSC "Semiconductor plant" were interviewed (see References). The main topics of the interviews are summarized in Table 1.

Table 1 Interview topics

Interviewed organization	Interview topics
PJSC "Semiconductor plant"	• Project history • Project approach • Project boundary • Implementation schedule • Organizational structure • Responsibilities and authorities • Training of personnel • Quality management procedures and technology • Rehabilitation/Implementation of equipment (records) • Metering equipment control • Metering record keeping system, database • Technical documentation • Monitoring plan and procedures • Permits and licenses • Local stakeholder's response.
Environmental (Green) Investments Fund Ltd	• Baseline methodology • Monitoring plan • Additionality proofs • Calculation of emission reduction.

2.3 Resolution of Clarification and Corrective Action Requests

The objective of this phase of the determination is to raise the requests for corrective actions and clarification and any other outstanding issues that needed to be clarified for Bureau Veritas Certification positive conclusion on the project design.

Corrective Action Request (CAR) is issued, where:

(a) The project participants have made mistakes that will influence the ability of the project activity to achieve real, measurable additional emission reductions;

(b) The JI requirements have not been met;

(c) There is a risk that emission reductions cannot be monitored or calculated.

The determination team may also issue Clarification Request (CL), if information is insufficient or not clear enough to determine whether the applicable JI requirements have been met.

The determination team may also issue Forward Action Request (FAR), informing the project participants of an issue that needs to be reviewed during the verification.

To guarantee the transparency of the verification process, the concerns raised are documented in more detail in the verification protocol in Appendix A.

3 PROJECT DESCRIPTION

The technical aim of the project is to reconstruct polycrystalline silicon production in accordance with modern technologies that will not only decrease specific consumption of energy resources (natural gas and electricity), but also decrease emissions of GHGs and harmful substances into the air.
The project involves reconstruction of the plant including polycrystalline silicon production expansion with the capacity 5000 tons of polycrystalline silicon per year. Two commissioning stages are planned:
1-st launching complex - with the capacity of 2500 tons per year;
2-nd launching complex - with the capacity of 2500 tons per year.
To provide the production with raw materials it is planned to build a trichlorosilane production complex with general capacity of 44000 tons per year.
In general following complexes are included in the joint implement project:
- trichlorosilane production complexes (44000 t per year)
- polycrystalline silicon production complexes (5000 t per year)
- installation of equipment for steam reforming

Manufacture of polycrystalline silicon is a multistage process consisting of separate cycles, composition and capacity of which depend on quality of final products.
Major elements are:
- Production of trichlorosilane (crushing and grinding of technical silicon, synthesis of hydrogen chloride, partition and purification of silicon chlorides);
- Production of polycrystalline silicon by trichlorosilane hydrogen recovery;

- Condensation of chlorosilanes of polycrystalline silicon production with trichlorosilane, tetrachloride of silicon, hydrogen and hydrogen chloride release;
- Disposal of production wastes;
- Quality control and measurement system for primary, intermediate and final products.

The Rutek Trading AG from Switzerland is the second Party of the project. Corresponding corrections were added to the PDD.

CAR01, CAR02, CL01, CL02 and their resolutions/conclusions are listed in the APPENDIX A: DETERMINATION PROTOCOL (Table 2) below

4 DETERMINATION CONCLUSIONS

In the following sections, the conclusions of the determination are stated.

The findings from the desk review of the original project design documents and the findings from interviews during the follow up visit are described in the Determination Protocol in Appendix A.

The Clarification and Corrective Action Requests are stated, where applicable, in the following sections and are further documented in the Determination Protocol in Appendix A. The determination of the Project resulted in 23 Corrective Action Requests and 4 Clarification Requests.

The number between brackets at the end of each section correspond to the DVM paragraph

4.1 Project approvals by Parties involved (19-20)

The project has already received Letter of Endorsement № 1193/23/7 on the JI project “PJSC “Semiconductor plant” reconstruction with expansion of polycrystalline silicon production” dated 16/05/2011 issued by National Environmental Investment Agency of Ukraine.

Bureau Veritas Certification received this letter from the project participants and does not doubt its authenticity.

As for the time being no written approvals of the project by Parties involved are available. After receiving Determination Report from the Accredited Independent Entity the project documentation will be submitted to the Ukrainian Designated Focal Point (DFP) which is State Environmental Investment Agency of Ukraine, for receiving a Letter of Approval. The written approval by another Parties involved will be obtained later on.

CAR03, and its resolution/conclusion applicable to authorization of project participants by Parties involved are listed in the APPENDIX A: DETERMINATION PROTOCOL (Table 2) below

4.2 Authorization of project participants by Parties involved (21)

The official authorization of each legal entity listed as project participant in the PDD by Parties involved will be provided in the written project approvals (refer to 4.1 above).

4.3 Baseline setting (22-26)

The PDD explicitly indicates that using a methodology for baseline setting and monitoring developed in accordance with appendix B of the JI guidelines (hereinafter referred to as JI specific approach) was the selected approach for identifying the baseline.
No applicable approved CDM methodologies are available for this project;

The PDD provides a detailed theoretical description in a complete and transparent manner, as well as justification, that the baseline is established:

a) Identifying and listing alternatives to the project activity on the basis of conservative assumptions and taking into account uncertainties.

b) Identifying the most plausible alternatives considering relevant sectoral policies and circumstances, such as economic situation in the semiconductor sector in Ukraine and other key factors that may affect the baseline. The baseline is identified by screening of the alternatives based on the technological and economic considerations for the project developer, as well as on the prevailing technologies and practices in Ukrainian semiconductor sector industry at the time of the investment decision. The alternatives have been identified based on national practice and reasonable assumptions with regard to the sectoral legislation and reform, economic situation in the country, availability of raw materials and fuel as well as technologies and logistics etc.

Alternative # 1:
Carrying out polycrystalline silicon production reconstruction including expansion at Semiconductor plant without applying the JI mechanism

Alternative # 2:
Polycrystalline silicon production reconstruction inclusively expansion on base of the existing technology

Alternative # 3:

Polycrystalline silicon production reconstruction without expansion of industrial capacities.
Alternative #1 requires more investments and is subject to impact of the technologic barrier, it cannot be considered as a baseline scenario. Alternative #3 also cannot be regarded as a baseline scenario because it is financially unprofitable. As the result, there is only Alternative #2 left.

There are no legislation acts requiring implementation of up-to-date technologies in such area.

This project is unique for Ukraine. All the enterprises that existed in Ukraine produced polycrystalline silicon according to the technology similar to the one used at the plant.

CAR04-CAR06 and their resolution/conclusion are listed in the APPENDIX A: DETERMINATION PROTOCOL (Table 2) below

4.4 Additionality (27-31)

The most recent version of the “Combined tool for baseline identification and additionality demonstration” approved by the CDM Executive Board was used, in accordance with the JI specific approach, defined in paragraph 2 (c) of the annex I to the “Guidance on criteria for baseline setting and monitoring”. All explanations, descriptions and analyses are made in accordance with the selected tool.

The PDD provides a justification of the applicability of the approach. Due to the fact that there is no approved CDM baseline and monitoring methodology which is applicable to the project type, the Additionality Tool is applied which is considered as a good practice for additionality justification.
Additionality proofs are provided. Three alternative scenarios to the project activity were identified and proven to be in compliance with mandatory legislation and regulations taking into account the enforcement in the region and Ukraine.

The proposed joint implementation project is not common practice. Today, similar projects not have been implemented in Ukraine. So, the program of reconstruction with expansion of producing at semiconductor plant is an integrated program that has no predecessors in Ukraine and could not be considered as a common practice. Thus, the overall conclusion is that the project activity meets all additionality criteria, is not the baseline scenario and is additional.

Additionality is demonstrated appropriately as a result of the analysis using the approach chosen.

CAR07-CAR14 and their resolutions/conclusions applicable to project additionality are listed in the APPENDIX A: DETERMINATION PROTOCOL (Table 2) below

4.5 Project boundary (32-33)

The project boundary defined in the way to cover all emissions of GHGs related to the project. With respect to organizational structure of Semiconductor plant, project boundary includes polycrystalline silicon plant (all its main and auxiliary complexes that directly provide for production of polycrystalline silicon, trichlorosilane and hydrogen). Expanded boundaries of the project also include united energy system (UES) of Ukraine, natural gas supply network and material supplies such as monocrystalline silicon production were not included in the project boundary directly; however Ukraine's typical greenhouse gas emission factors for production and/or supply of electricity and gas consumed under baseline and project scenarios have been factored in emission calculations. Thus all CO2 emissions related to project and baseline cases have been taken into account.

N_2O emissions from steelmaking process are unlikely to be significant IPCC does not provide a methodology to calculate N_2O emissions. They will not typically change from baseline to project case. CH_4 emissions are related to crystalline silicone and trichlorsilane production in this type of project and are very minor in comparison with CO2e emissions. Both types of emissions are excluded from the quantification of baseline and project emissions.

The project boundary defined in the PDD encompasses all anthropogenic emissions by sources of greenhouse gases (GHGs) that are:

(i) Under the control of the project participants such as fuels used in the project and baseline, material flow as part of production process;

(ii) Reasonably attributable to the project such as electricity used under the project and baseline scenarios; and

(iii) Significant, i.e., as a rule of thumb, would by each source account on average per year over the crediting period for more than 1 per cent of the annual average anthropogenic emissions by sources of GHGs, or exceed an amount of 2,000 tonnes of CO2 equivalent, whichever is lower.

The delineation of the project boundary and the gases and sources included are appropriately described and justified in the PDD

CAR15, CL03 and their resolutions/conclusions applicable to project boundary are listed in the APPENDIX A: DETERMINATION PROTOCOL (Table 2) below

4.6 Crediting period (34)

The PDD states the starting date of the project as the date on which the construction of the project will began, and the starting date is 07/04/2009, which is after the beginning of 2000.

The PDD states the expected operational lifetime of the project in years and months, which is 30 years or 360 months with possible expansion.

The PDD states the length of the crediting period in years and months, which is 19 years and 9 months, and its starting date as 05/04/2011, which is on the date the first emission reductions or enhancements of net removals are generated by the project.

The PDD states that the crediting period for the issuance of ERUs starts only after the beginning of 2008 and does not extend beyond the operational lifetime of the project.

The PDD states that the extension of its crediting period beyond 2012 is subject to the host Party approval, and the estimates of emission reductions or enhancements of net removals are presented separately for those until 2012 and those after 2012 in all relevant sections of the PDD.

CAR16, CL04 and their resolutions/conclusions applicable to length of crediting period are listed in the APPENDIX A: DETERMINATION PROTOCOL (Table 2) below

4.7 Monitoring plan (35-39)

The PDD, in its monitoring plan section, explicitly indicates that JI specific approach was the selected.

The monitoring plan describes all relevant factors and key characteristics that will be monitored, and the period in which they will be monitored, in particular also all decisive factors for the control and reporting of project performance, such as statistics reporting forms; quality control (QC) and quality assurance (QA) procedures; detailed guidelines regulating the monitoring procedures and responsibilities; the Investment Plan giving a schedule of construction activities; the operational and management structure that will be applied in implementing the monitoring plan.

The monitoring plan specifies the indicators, constants and variables that are reliable (i.e. provide consistent and accurate values), valid (i.e. be clearly connected with the effect to be measured), and that provide a transparent picture of the emission reductions or enhancements of net removals to be monitored such as volume of silicon production, quantity of electric energy consumed for silicon production, quantity of gas consumed for silicon producing, emission factor for electricity consumption, lower heat value of natural.

The monitoring plan draws on the list of standard variables contained in appendix B of "Guidance on criteria for baseline setting and monitoring" developed by the JISC.
The monitoring plan explicitly and clearly distinguishes:

(i) 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, such as natural gas carbon content, carbon dioxide emission factor for sodium carbonate etc.

(ii) 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, such is absent.

(iii) Data and parameters that are monitored throughout the crediting period, such as value of produced polycrystalline silicone, trichlorosilane, value of consumed electricity, gas, emission factor for electric energy consumption, etc.

The monitoring plan describes the methods employed for data monitoring (including its frequency) and recording, such as such as direct measurement with scales; gas, water, steam and electricity meters; calculations with different recording frequency such as continuously or monthly and electronic or paper recording method.

The monitoring plan elaborates all algorithms and formulae used for the estimation/calculation of baseline emissions/removals and project emissions/removals or direct monitoring of emission reductions from the project, leakage, as appropriate.

Baseline emissions

$BE_y = BE_{EI,y} + BE_{HG,y}$,

where
$BE_{EI,y}$ - Baseline emissions from electricity consumption per year, t CO_2e;
$BE_{HG,y}$ - Baseline emissions from thermal consumption, t CO_2e;
y - year for which calculations are made.

The emissions from electricity consumption are calculated according to the following formulas:

$$BE_{EI,y}=(EC_{BL,PCS,y}+EC_{BL,TCS,y}+ EC_{BL,H2,y})\times EF_{CO2,Grid,y}$$

Where:
$EC_{BL,PCS,y}$ - electricity consumption for polycrystalline silicon production in baseline scenario, MWh;
$EC_{BL,TCS,y}$ - electricity consumption for trichlorosilane production in baseline scenario, MWh;
$EC_{BL,H2,y}$ - electricity consumption for hydrogen production in baseline scenario, MWh;
$EF_{CO2,Grid,y}$ - national emission factor for the UES of Ukraine for projects aiming at a decrease of electricity consumption, t CO_2e/MWh.

The baseline electricity consumption is based on actual expenses of hydrogen, trichlorosilane and polycrystalline silicon production.

Electricity amount for polycrystalline silicon production is calculated as shown below:

$$EC_{BL,PCS,y}=SEC_{PCS}\times M_{PCS,y}$$

Where
SEC_{PCS} - specific electricity consumption for polycrystalline silicon production by traditional technology equipment, MWh/t;
$M_{PCS,y}$ - amount of the produced polycrystalline silicon in year *y*, t;

The electricity for trichlorosilane production is calculated in the same way:

$$EC_{BL,TCS,y} = SEC_{TCS}\times M_{BL,TCS,y}$$
Where

SEC_{TCS} - specific electricity consumption for trichlorosilane production by traditional technology equipment, MWh/t;
$M_{BL,TCS,y}$ - normative weight of trichlorosilane for polycrystalline silicon production by baseline technologies in year *y*, t.

The normative mass of trichlorosilane is calculated according to specific consumption of trichlorosilane for polycrystalline silicon production

$$M_{BL,TCS,y}= SMC_{TCS}\times M_{PCS,y}$$

Where

SMC_{TCS} - specific consumption of trichlorosilane per ton of polycrystalline silicon to fulfil baseline production, t/t.

Electricity consumption for hydrogen production is calculated as follows:

$EC_{BL,H2} = SEC_{H2} \times V_{BL,H2,y}$

Where

SEC_{H2} - specific electricity consumption for hydrogen production by water electrolysis equipment, kWh/m^3;

$V_{BL,H2,y}$ - normative hydrogen demand for trichlorosilane and polycrystalline silicon production, m^3.

The hydrogen demand consists of demand in hydrogen chloride synthesis (trichlorosilane production) and silicon hydrogen reduction (polycrystalline silicon production):

$$V_{BL,H2,y} = SMC_{H2,TCS} \times M_{BL,TCS,y} + SMC_{H2,PCS} \times M_{PCS,y}$$

Where

$SMC_{H2,TCS}$ - specific hydrogen consumption for trichlorosilane production, m^3/kg;

$SMC_{H2,PCS}$ - specific hydrogen consumption for polycrystalline silicon production, m^3/kg.

The emissions from heat consumption in the baseline scenario are calculated according to the following formula:

$BE_{HG,y} = FC_{BL,SG,y} \times EF_{CO2,NG}$

Where

$FC_{BL,SG,y}$ - natural gas consumption in baseline scenario for technological needs steam production per year *y*, TJ;

$EF_{CO2,NG}$ - emission factor of carbon dioxide from natural gas, t CO_2/TJ.

Natural gas consumption for steam production in baseline scenario is calculated as shown below:

$$FC_{BL,SG,y} = 1/\eta_{SG,y} \times (SSC_{PCS} \times M_{PCS,y} + SSC_{TCS} \times M_{BL,TCS,y})$$

Where

$\eta_{SG,y}$ - efficiency of the boiler-house;

SSC_{PCS} - specific steam consumption per ton of polycrystalline silicon for baseline production, GJ/t;

SSC_{TCS} - specific steam consumption per ton of trichlorosilane for baseline production, GJ/t.

The project emissions PE_y are calculated according to the following formulas:

$$PE_y = PE_{EIC,y} + PE_{HG,y} + PE_{SC,y} + PE_{SCD,y}$$

Where

$PE_{EIC,y}$ - Emissions from electricity consumption for trichlorosilane and polycrystalline silicon production, tCO2;
$PE_{HG,y}$ - Emissions from heat production for trichlorosilane and polycrystalline silicon production, tCO2;
$PE_{SC,y}$ - Emissions from steam production by steam conversion of natural gas, tCO2;
$PE_{SCD,y}$ - Emissions from soda ash consumption for primary neutralization of waste gases, tCO2;

The emissions from the electricity consumption are calculated according to the formula:

$$PE_{EIC,y} = EC_{P,PCS,y} \times EF_{CO2,Grid,y}$$

Where
$EC_{P,PCS,y}$ - consumed electricity in the project scenario for trichlorosilane and polycrystalline silicon production, MWh;
$EF_{CO2,Grid,y}$ - national emissions factor for the UES of Ukraine for projects aiming at a decrease of electricity consumption, t CO2e/MWh.

The emissions from heat production for technological process of trichlorosilane and polycrystalline silicon production are equal:

$$PE_{HG,y} = FC_{PTechn,y} \times EF_{CO2,NG} + EC_{B,y} \times EF_{CO2,Grid,y}$$

where
$FC_{PTechn,y}$ - natural gas consumption for technical needs of the plant within the project scenario, TJ;
$EC_{B,y}$ - electricity consumption in the boiler-house for auxiliaries, MWh
Conservative assumption that electricity consumption for auxiliaries of boiler-house does not depend on steam production is taken into account.

Natural gas consumption for technical needs of the plant is calculated according to the following formula:

$$FC_{PTechn,y} = 1/\eta_{SG,y} \times (HC_{SC,TCS,y} + HC_{SC,PCS,y} + HC_{SC,\ SCNG,y})$$

where
$\eta_{SG,y}$ - boiler-house efficiency;
$HC_{SC,TCS,y}$ - steam consumption for technical needs of trichlorosilane production, GJ;
$HC_{SC,PCS,y}$ - steam consumption for technical needs of polycrystalline silicon production, GJ;
$HC_{SC,\ SCNG,y}$ - steam consumption for technical needs of hydrogen production, GJ.
The efficiency of the boiler-house is determined by consumption of the natural gas and customers supply with steam

$\eta_{SG,y} = SG_y / FC_{NG,y}$

where
SG_y - steam production, TJ;
$FC_{NG,y}$ - natural gas consumption at boiler house, TJ.

The waste from hydrogen production includes wastes from electricity consumption by steam conversion equipment, emissions from natural gas combustion and natural gas conversion. Emissions from steam conversion of natural gases are calculated according to equation 3.17 (Vol. 3, Chapter 3 of Guidelines for National Inventory of GHG.*.

$PE_{SC,y}=EC_{SC,y}\times EF_{CO2,Grid,y}+FC_{SC,y}\times NCV_{NG,y} \times C_{NG,y} \times 44/12+FA_{NG,SC,y}\times \times NCV_{NG,y}\times C_{NG,y}\times 44/12$,
where
$EC_{SC,y}$ - electricity consumption for technical needs of hydrogen production, MWh;
$FC_{SC,y}$ - natural gas consumption for combustion for hydrogen production needs, nm3;
$FA_{SC,y}$ - natural gas consumption for steam conversion needs for hydrogen production, nm3;
$C_{NG,y}$ - carbon content in natural gas, t C/TJ;
$NCV_{NG,y}$ - net calorific value of the natural gas, TJ/m 3;
$44/12$ - proportionality factor for receiving a ton of carbon dioxide from a ton of carbon, t CO_2/t C.

The emissions from neutralization of waste gases PESCD,y by soda ash are calculated according to equation 2.12 volume 3 chapter 2 of “Guidelines for national inventory of GHG”. †

$PE_{SCD,y} = M_{Na2CO3,y} \times EF_{Na2CO3} \times F_{Na2CO3}$
where
$M_{Na2CO3,y}$ - sodium carbonate consumption for technologic needs of waste gases neutralization, t;
EF_{Na2CO3} - CO2 emission factor for sodium carbonate, tCO2/t;
F_{Na2CO3} - level of the engagement in neutralization (set to be equal to 1), fraction.

Leakages are calculated as sum of emissions related to oxygen and silicon tetrachloride production.

$LE_y = LE_{O2,y} + LE_{TS,y}$

where

$LE_{O2,y}$ - leakage from oxygen generation in accordance with the baseline, t CO_2e;
$LE_{TS,y}$ - leakage from silicon tetrachloride generation in accordance with the baseline, t CO_2e.

Leakage from oxygen generation is calculates on the basis of specific electricity consumption per m^3 of oxygen

$$LE_{O2,y} = SPC_{O2} \times OG_{BL,y} \times EF_{CO2,NG}$$

where
SPC_{O2} - specific power consumption for oxygen production, kW/m^3;
$OG_{BL,y}$ - oxygen generation in baseline scenario in year *y*, m^3.
Baseline oxygen production is calculated according to the following stoichiometric equation:

$$OG_{BL,y} = V_{BL,H2,y} \times \rho_{H2}/\rho_{O2} \times M_{O2}/2\ M_{H2}$$

where
ρ_{H2} - hydrogen density kg/m^3;
ρ_{O2} - oxygen density kg/m^3;
M_{H2} - hydrogen molar weight, g/mol;
M_{O2} - oxygen molar weight, g/mol.

Leakage from silicon tetrachloride production. Silicon tetrachloride is a co-product of trichlorosilane and polycrystalline silicon production. Manufacturing of silicon tetrachloride is possible during process of hydrochlorination. Based on conservative assumption GHG emissions from silicon tetrachloride production are calculated in accordance with expenditures for silicon trichlorosilane production in the baseline scenario.

$$LE_{TS,y} = LE_{EI,y} + LE_{HG,y}$$

The emissions from electricity consumption are calculated according to the formula:

$$LE_{EI,y} = (EC_{TS,y} + EC_{H2,TS,y}) \times EF_{CO2,NG}$$

where
$EC_{TS,y}$ - electricity consumption for silicon tetrachloride production, MWh;
$EC_{H2,TS,y}$ - electricity consumption for the hydrogen production to cover demand for silicon tetrachloride production, MWh.

The electric power consumption for silicon tetrachloride production is based on specific electricity consumption for hydrogen and silicon tetrachloride manufacture. The emissions from electricity consumption for silicon tetrachloride production are equal:

$$EC_{TS,y} = SEC_{TCS,y} \times M_{TS,y}$$

where
$SEC_{TCS,y}$ - specific electricity consumption for trichlorosilane production by traditional technology equipment, MWh/t;
$M_{TS,y}$ - mass of silicon tetrachloride that corresponds to the baseline, t.

The mass of silicon tetrachloride corresponding to the baseline is determined in accordance with the baseline polycrystalline silicon production

$$M_{TS,y} = SEC_{TS,y} \times M_{PCS,y}$$

where
$SEC_{TS,y}$ - specific silicon tetrachloride production per ton of polycrystalline silicon, t/t.

Electricity consumption for the hydrogen production equals:

$$EC_{H2,TS,y} = SEC_{H2} \times V_{H2,TS,y}$$

where
SEC_{H2} - specific electricity consumption for hydrogen production by the water electrolysis equipment, kWh/m^3;
$V_{H2,TS,y}$ - normative need of hydrogen for silicon tetrachloride production, m^3.
The normative hydrogen demand for silicon tetrachloride production is based on a hydrogen demand for trichlorosilane production:

$$V_{H2,TS,y} = SMC_{H2,TCS} \times M_{TS,y}$$

where
$SMC_{H2,TCS}$ - specific hydrogen consumption for trichlorosilane production, m^3/kg;.E

Emissions from heat consumption are also based on heat demand for trichlorosilane production:

$$LE_{HG,y} = FC_{SG,TS,y} \times EF_{CO2,NG}$$

where

$FC_{SG,TS,y}$ - natural gas consumption of steam production for silicon tetrachloride manufacture in year *y*, TJ;

Natural gas consumption for steam production for silicon tetrachloride manufacture are calculated as shown below:

$$FC_{SG,TS,y} = 1/ \eta_{SG,y} \times (SC_{TCS} \times M_{TS,y})$$

Emissions reduction is calculated as shown below:

$$ER_y = BE_y - PE_y - LE_y$$

where
ER_y - reduction of emissions in year *y*, t CO_2e;
BE_y - baseline GHG emissions in year *y*, t CO_2e;
PE_y - GHG emissions from the project activities in year *y*, t CO_2e;
LE_y - leakages in year *y* , t CO_2e.

The monitoring plan presents the quality assurance and control procedures for the monitoring process which are described in the section D.2 of the PDD. This includes, as appropriate, information on calibration and on how records on data and/or method validity and accuracy are kept.

The monitoring plan clearly identifies the responsibilities and the authority regarding the monitoring activities. The data required to monitor JI project is routinely collected within the normal operations of the PJSC "Semiconductors Plant" therefore JI monitoring is integral part of routine monitoring. Data is compiled in (i) day-to-day records, (ii) monthly records, and (iii) annual records. All records are finally stored in Planning and Economic Department.

On the whole, the monitoring report reflects good monitoring practices appropriate to the project type.

The monitoring plan provides, in tabular form, a complete compilation of the data that need to be collected for its application, including data that are measured or sampled and data that are collected from other sources (e.g. official statistics, expert judgment, proprietary data, IPCC, commercial and scientific literature etc.) but not including data that are calculated with equations

The monitoring plan indicates that the data monitored and required for verification are to be kept for two years after the last transfer of ERUs for the project.

CAR17-CAR21 and their resolutions/conclusions applicable to emission reduction monitoring are listed in the APPENDIX A: DETERMINATION PROTOCOL (Table 2) below

4.8 Leakage (40-41)

The PDD appropriately describes an assessment of the leakage of the project and appropriately explains which sources of leakage are to be calculated. Working the previous technology the plant can manufacture additional products like oxygen and silicon tetrachloride. The Semiconductor plant reconstruction is aimed at making these products beyond the project boundary. Production of these products requires fossil fuels and electric power consumption that leads to increased GHG emissions into the atmosphere. So manufacture of oxygen and silicon tetrachloride is considered as leakages.

There should be no other leakages except the mentioned ones. The emissions from installing the new equipment will not be sign transport of materials will not be significantly higher for the baseline; however this will not be taken into account to secure conservativeness of the analysis.

CAR22 and its resolution/conclusion applicable to project leakages are listed in the APPENDIX A: DETERMINATION PROTOCOL (Table 2) below

4.9 Estimation of emission reductions or enhancements of net removals (42-47)

The PDD indicates assessment of emissions or net removals in the baseline scenario and in the project scenario as the approach chosen to estimate the emission reductions or enhancement of net removals generated by the project.

The PDD provides the ex ante estimates of:

(a) Emissions for the project scenario (within the project boundary), which are 789 794 tons of CO2eq for 05/04/2011-2012 and 9 886 518 tons of CO2eq for 2013-2030 years;

(b) Leakage, as applicable, which are 327 053 tons of CO2eq for 05/04/2011-2012 and 4 017 456 tons of CO2eq for 2013-2030 years;

(c) Emissions or net removals for the baseline scenario (within the project boundary), which are 2 796 355 tons of CO2eq for 05/04/2011-2012 and 36 371 700 tons of CO2eq for 2013-2030 years;

(d) Emission reductions or enhancements of net removals adjusted by leakage (based on (a)-(c) above), which are 1 679 508 tons of CO2eq for 05/04/2011-2012 and 22 467 729 tons of CO2eq for 2013-2030 years.

The estimates referred to above are given:

(a) On a annual basis;

(b) From 05/04/2011 to 31/12/2030, covering the whole crediting period;

(c) On a source-by-source/sink-by-sink basis;

(d) For each GHG gas, which are CO_2.

(e) In tonnes of CO2 equivalent, using global warming potentials defined by decision 2/CP.3 or as subsequently revised in accordance with Article 5 of the Kyoto Protocol;

The formulas used for calculating the estimates referred above are the same as those used for project monitoring and described in the section 4.7 above. All formulae are consistent throughout the PDD.

For calculating the estimates referred to above, key factors, e.g. e.g. fuel prices and availability, expected market development, etc. influencing the baseline emissions or removals and the activity level of the project and the emissions or net removals as well as risks associated with the project were taken into account, as appropriate.

Data sources used for calculating the estimates referred to above, such as such as feasibility studies, production forecasts, actual historical monitored data, IPCC etc. are clearly identified, reliable and transparent.

Emission factors, such as emission factor of Ukraine grid, were selected by carefully balancing accuracy and reasonableness, and appropriately justified of the choice.

The estimation referred to above is based on conservative assumptions and the most plausible scenarios in a transparent manner.

The estimates referred to above are consistent throughout the PDD.

The annual average of estimated emission reductions or enhancements of net removals over the crediting period is calculated by dividing the total estimated emission reductions or enhancements of net removals over the crediting period by the total months of the crediting period, and multiplying by twelve.

CAR23 and its resolution/conclusion applicable to estimation of emission reduction are listed in the APPENDIX A: DETERMINATION PROTOCOL (Table 2) below

4.10 Environmental impacts (48)

The PDD lists and attaches documentation on the analysis of the environmental impacts of the project, including transboundary impacts, in accordance with procedures as determined by the host Party, (in line with the Laws of Ukraine UNCR A.2.2.1-2003 «Structure and contents of materials on environmental impact assessment (EIA) during design and construction of enterprises, houses and other buildings»; UNCR A.2.2-3-2004 «List of project documentation, design, endorsement, and approval procedures for construction», Law of Ukraine «On Ecological Assessment») such as EIAs (Environmental Impact Assessments) for project activities. EIAs were developed by State Enterprise "Dneprovskiy Project Institute". The documents provide assessment of impact of the project activity on various components of natural, social, and manmade environment.

The PDD provides conclusion and all references to supporting documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party, if the analysis referred to above indicates that the environmental impacts are considered significant by the project participants or the host Party.

4.11 Stakeholder consultation (49)

Law of Ukraine on environmental expertise defines the procedure of participation of citizens and public organizations in the public environmental expertise.
Public has been informed about the planned economic activities with the goal to identify public attitudes and take opinion in account during environmental impact assessment process.
Public was informed about the project, especially about the following information:

- project name, goals and site;
- legal name and address of project owner and its representative;
- approximate dates of EIAs procedures;
- deadline and formats of submission of public comments;
- when and where EIA documents can be retrieved.

No negative comments from the public were received within the deadlines indicated in these publications.

4.12 Determination regarding small scale projects (50-57)

"Not applicable"

4.13 Determination regarding land use, land-use change and forestry (LULUCF) projects (58-64)

"Not applicable"

4.14 Determination regarding programmes of activities (65-73)

"Not applicable"

5 SUMMARY AND REPORT OF HOW DUE ACCOUNT WAS TAKEN OF COMMENTS RECEIVED PURSUANT TO PARAGRAPH 32 OF THE JI GUIDELINES

No comments, pursuant to paragraph 32 of the JI Guidelines, were received

6 DETERMINATION OPINION

Bureau Veritas Certification has performed a determination of the "PJSC "Semiconductor plant" reconstruction with expansion of polycrystalline silicon production" project of JSC «Semiconductor plant»" Project in Zaporizhzhya city, Ukraine. The determination was performed on the basis of UNFCCC criteria and host country criteria and also on the criteria given to provide for consistent project operations, monitoring and reporting.

The determination consisted of the following three phases: i) a desk review of the project design and the baseline and monitoring plan; ii) follow-up interviews with project stakeholders; iii) the resolution of outstanding issues and the issuance of the final determination report and opinion.

Project participant/s used the latest tool for demonstration of the additionality. In line with this tool, the PDD provides barrier analysis, investment analysis and common practice analysis, to determine that the project activity itself is not the baseline scenario.

Emission reductions attributable to the project are hence additional to any that would occur in the absence of the project activity. Given that the project is implemented and maintained as designed, the project is likely to achieve the estimated amount of emission reductions.

The determination revealed two pending issues related to the current determination stage of the project: the issue of the written approval of the project and the authorization of the project participant by the host Party. If the written approval and the authorization by the host Party are awarded, it is our opinion that the project as described in the Project Design Document, Version 2.0 meets all the relevant UNFCCC requirements for the determination stage and the relevant host Party criteria.

The review of the project design documentation (version 2.0) and the subsequent follow-up interviews have provided Bureau Veritas Certification with sufficient evidence to determine the fulfillment of stated

criteria. In our opinion, the project correctly applies and meets the relevant UNFCCC requirements for the JI and the relevant host country criteria.

The determination is based on the information made available to us and the engagement conditions detailed in this report.

7 REFERENCES

Category 1 Documents:
Documents provided by Type the name of the company that relate directly to the GHG components of the project.

/1/ Project Design Document "PJSC "Semiconductor plant" reconstruction with expansion of polycrystalline silicon production" version 1.0 dated 08/06/2011
/2/ Project Design Document "PJSC "Semiconductor plant" reconstruction with expansion of polycrystalline silicon production" version 2.0 dated 02/09/2011
/3/ Letter of Endorsement # 1193/23/7 dated 16/05/2011 issued by National Environmental Investment Agency of Ukraine
/4/ ERUs calculation model Excel File "ERUsPolysiliconPlantF"
/5/ Investment analysis Excel File "EcModel"

Category 2 Documents:
Background documents related to the design and/or methodologies employed in the design or other reference documents.

/1/ Determination and verification manual, version 1.0
/2/ Photo: Trichlorosilane production line
/3/ Photo: Produced trichlorosilane meter cutting-in
/4/ Photo: Produced trichlorosilane meter
/5/ Photo: Trichlorosilane production line control board
/6/ Photo: Trichlorosilane production line logbook
/7/ Photo: Gas pipeline to production wastes utilization line
/8/ Photo: Production wastes utilization line
/9/ Photo: Gas amount measurement box
/10/ Photo: Power meter
/11/ Photo: Gas meter cutting-in
/12/ Photo: FLOUTEC flow meters
/13/ Photo: Steam boiler ДЕ-14-16 №2
/14/ Photo: Boiler-house control panel
/15/ Photo: Boiler house operation daily data
/16/ Photo: Power meter SL7000 #36059733
/17/ Photo: Power meter SL7000 #36059735
/18/ Photo: Power meter SL7000 #36059739
/19/ Photo: Power meter SL7000 #36059745
/20/ Photo: Note on production since the period of commissioning
/21/ Note on daily power consumption
/22/ Statement on consumed active power for June 2011
/23/ Statement on reactive power turnover for June 2011
/24/ Report on fuel, heat and electric power consumption for 2010
/25/ Agreement #208м-2011 1066 on execution of metrological works and services dated 27/12/2010

/26/ Report on water consumption for 2 quarter of 2011
/27/ Report on water consumption for 4 quarter of 2011
/28/ Monthly report on gas consumption for June 2011
/29/ Note on production turnout for the period from 01/04/-19/07/2011
/30/ Raw materials and finished products turnover at shop #25 scheme
/31/ Report on water consumption for 1 quarter of 2011
/32/ Agreement #2310136600-82 a, valid from 08/04/2011 till 02/12/2015
/33/ Agreement #2310136600-82, valid from 08/04/2011 till 25/05/2014
/34/ Statement on civil hearings dated 25/05/2010
/35/ Passport and calibration certificate on pressure transmitter АИР-10ExdS #51103
/36/ Passport and calibration certificate on pressure transmitter АИР-10ExdS #50922
/37/ Passport and calibration certificate on pressure transmitter АИР-10ExdS #50917
/38/ Passport and calibration certificate on pressure transmitter АИР-10ExdS #51104
/39/ Passport and calibration certificate on resistance thermometer ТСПР-0196
/40/ Form and calibration certificate on Sich-UZV water and heat power meter
/41/ Passport and fabrication calibration certificate on power meter SL7000 #36136905
/42/ Passport and fabrication calibration certificate on power meter SL7000 #36136905
/43/ Passport and fabrication calibration certificate on power meter A1140RAL-BW-4T #05010676
/44/ Passport and fabrication calibration certificate on power meter A1140RAL-BW-4T #05010711
/45/ Calibration certificate on current transformer #955
/46/ Calibration certificate on current transformer #954
/47/ State metrological attestation certificate on current transformer #3478
/48/ State metrological attestation certificate on current transformer #3479
/49/ State metrological attestation certificate on current transformer #3480
/50/ State metrological attestation certificate on current transformer #3481
/51/ Passport and fabrication calibration certificate on power meter SL7000 #36106600
/52/ Passport and fabrication calibration certificate on power meter SL7000 #36106610
/53/ State metrological attestation certificate on current transformer #58245
/54/ State metrological attestation certificate on current transformer

#5827

/55/ State metrological attestation certificate on current transformer #47209

/56/ State metrological attestation certificate on current transformer #1865

/57/ Passport and fabrication calibration certificate on power meter SL7000 #53002090

/58/ Passport and fabrication calibration certificate on power meter A1140RAL-BW-4T #05010740

/59/ Calibration certificate on current transformer #960

/60/ Calibration certificate on current transformer #1244

/61/ Calibration certificate on current transformer #1476

/62/ Calibration certificate on current transformer #1388

/63/ State metrological attestation certificate on current transformer #17335

/64/ State metrological attestation certificate on current transformer #17547

/65/ State metrological attestation certificate on current transformer #3626

/66/ State metrological attestation certificate on current transformer #3627

/67/ State metrological attestation certificate on current transformer #10814

/68/ State metrological attestation certificate on current transformer #10778

/69/ State metrological attestation certificate on current transformer #8133

/70/ State metrological attestation certificate on current transformer #8167

/71/ Passport and calibration certificate on power meter A1140RAL-BW-4T #05011108

/72/ Passport and calibration certificate on power meter A1140RAL-BW-4T #05010677

/73/ Passport and calibration certificate on power meter A1140RAL-BW-4T #05010765

/74/ Passport and calibration certificate on power meter A1140RAL-BW-4T #05011085

/75/ Passport and calibration certificate on power meter A1140RAL-BW-4T #050110842

/76/ Passport and calibration certificate on power meter A1140RAL-BW-4T #05011060

/77/ Passport and calibration certificate on power meter A1140RAL-BW-4T #05011107

/78/ Passport and calibration certificate on power meter A1140RAL-BW-4T #05011101

/79/ Passport and calibration certificate on power meter A1140RAL-BW-4T #05011120

/80/ Passport and calibration certificate on power meter A1140RAL-BW-4T #05011080
/81/ Passport and calibration certificate on power meter A1140RAL-BW-4T #05011090
/82/ Passport and calibration certificate on power meter A1140RAL-BW-4T #05011058
/83/ Operation manual and calibration certificate on scales #1165
/84/ Operation manual and calibration certificate on scales #2318
/85/ Operation manual and calibration certificate on scales #2320
/86/ Calibration certificate on FLOUTEC measurement system, serial #1-1105
/87/ Natural gas physical and chemical parameters passport for the period 01-31/05/2011
/88/ Natural gas physical and chemical parameters passport for the period 01-30/04/2011
/89/ Natural gas physical and chemical parameters passport for the period 01-28/02/2011
/90/ Natural gas physical and chemical parameters passport for the period 01-31/01/2011
/91/ Natural gas physical and chemical parameters passport for the period 01-31/12/20110
/92/ Sanitary and epidemiological examination conclusion #02-22/233 dated 02/03/2010
/93/ Environmental impact assessment of the project “Boiler-house reconstruction…”, 226001-OBOC
/94/ Environmental impact assessment of the project “Rehabilitation with production enhancement …”, 1528/2-1-0P1-OBOC.1
/95/ Rehabilitation with production enhancement “Sanitary protection zone”, 1528/2-1-0P1-OBOC
/96/ Passport and calibration certificate on heat power meter UVRT #45
/97/ Passport and calibration certificate on heat power meter OPTISWIRL 4070
/98/ Analysis of technical water consumption by the plant for the period from 31/05/2011 till 30/06/2011
/99/ Technical water distribution for June 2011

Persons interviewed:

List persons interviewed during the determination or persons that contributed with other information that are not included in the documents listed above.

/1/ Yurii Rekov – General Director
/2/ Serhiy Sirenko – Vice Director on Technical
/3/ Yurii Savenkov - Vice Director on Safety, Environment an Fire Protection
/4/ Oleg Bochenin – Head Engineer
/5/ Serhiy Terekhov - Head Technologist
/6/ Hennadiy Zub – Head of Legal Department

APPENDIX A: COMPANY PROJECT DETERMINATION PROTOCOL

Check list for determination, according JOINT IMPLEMENTATION DETERMINATION AND VERIFICATION MANUAL (Version 01)

DVM Paragraph	Check Item	Initial finding	Draft Conclusion	Final Conclusion
General description of the project				
Title of the project				
-	Is the title of the project presented?	The title of the project is "PJSC "Semiconductor plant" reconstruction with expansion of polycrystalline silicon production"	OK	OK
-	Is the sectoral scope to which the project pertains presented?	The sectoral scope of the project are: - (3) Energy consumption - (5) Chemical industry	OK	OK
-	Is the current version number of the document presented?	The current version of the PDD is 1.0 dated 08/06/2011	OK	OK
-	Is the date when the document was completed presented?	The PDD is completed 08/06/2011	OK	OK
Description of the project				
-	Is the purpose of the project included with a concise, summarizing explanation (max. 1-2 pages) of the: a) Situation existing prior to the starting date of the project; b) Baseline scenario; and	*The aim of the project* is to reconstruct polycrystalline silicon and trichlorosilane production with introduction of energy efficiency measures that will allow reducing greenhouse gas emissions into the atmosphere and reducing specific energy losses in trichlorosilane and	OK	OK

DVM Paragraph	Check Item	Initial finding	Draft Conclusion	Final Conclusion
	c) Project scenario (expected outcome, including a technical description)?	polycrystalline silicon production. *Situation existing before the project activity* Polycrystalline silicon fabrication was entirely stopped before the project activity. However, infrastructure and equipment necessary for possible production recovery basing on old technologies remained within the area of the plant. The capacity of the plant before its reconstruction was 257 t. of polycrystalline silicon per year and 18800 t. of trichlorosilane per year. *Baseline scenario* In case of absence of the project activity, the plant would resume its operation applying previously tested technology with expansion of pure silicon output rate to 3000 t per year in order to eliminate the production deficit in Ukraine resulting from production cessation. Polycrystalline silicon manufacturing in the baseline scenario will be equal to 3000 tons per year. Trichlorosilane will be produced in amount necessary for polycrystalline silicon manufacturing. *Project scenario* The plant capacity after the reconstruction will be equal to 44000 t of trichlorosilane and 5000 t of polycrystalline silicon per year. The last will be used to meet the demand for solar energy, in		

DVM Paragraph	Check Item	Initial finding	Draft Conclusion	Final Conclusion
		particular for converting into single-crystal silicon and creation of solar elements which will be components of solar panels. It is planned to put into operation 2 complexes with capacity of 2500 t each per year. In order to provide the manufacture with raw material it is planned to build a trichlorosilane production complex with general capacity of 44000 t per year.		
-	Is the history of the project (incl. its JI component) briefly summarized?	The history of the Project including JI component is briefly summarized in section A.2	OK	OK
Project participants				
-	Are project participants and Party(ies) involved in the project listed?	The project participants such as Private JSC «Semiconductor plant» and Environmental (Green) Investments Fund Ltd and the Party Involved such as Ukraine are listed in the PDD *Corrective Action Request 01* Please, identify second Party involved to this JI project	CAR 01	OK
-	Is the data of the project participants presented in tabular format?	The data of the project participants is presented in tabular format	OK	OK
-	Is contact information provided in Annex 1 of the PDD?	The contact information (PJSC “Semiconductor plant, Environmental (Green) Investments Fund Ltd) is provided in Annex 1 of the PDD	OK	OK
-	Is it indicated, if it is the case, if the Party involved is a host Party?	Yes, Ukraine is indicate as a Host Party	OK	OK
Technical description of the project				

DVM Paragraph	Check Item	Initial finding	Draft Conclusion	Final Conclusion
Location of the project				
-	Host Party(ies)	The Host Party is Ukraine	OK	OK
-	Region/State/Province etc.	Zaporizhzhskiy Region	OK	OK
-	City/Town/Community etc.	Zaporizhzhya	OK	OK
-	Detail of the physical location, including information allowing the unique identification of the project. (This section should not exceed one page)	The data of physical location of the Project is provided in the PDD *Corrective Answer Request 02* Please provide in the PDD data of physical location of the Project that it is not exceed one page *Clarification Request 01* Please add in the PDD the source of coordinates	CAR02 CL01	OK
Technologies to be employed, or measures, operations or actions to be implemented by the project				
-	Are the technology(ies) to be employed, or measures, operations or actions to be implemented by the project, including all relevant technical data and the implementation schedule described?	Polycrystalline silicon production involving use of "Centrotherm of photovoltaics AG" installation is based on a "Siemens"-technology - deposition of silicon atoms from gas on substrate-rods. Equipment providing continuous production process consists of three basic systems, namely: "Siemens"-system for deposition of polycrystalline silicon, system for conversion of silicon tetrachloride into trichlorosilane and system for gas mixture division, as well as a number of auxiliary units and equipment which enable operation of the whole complex. The system of conversion of silicon tetrachloride into	OK	OK

DVM Paragraph	Check Item	Initial finding	Draft Conclusion	Final Conclusion
		trichlorosilane allows receiving trichlorosilane from the accompanying product – silicon tetrachloride. Received trichlorosilane goes back for deposition of polycrystalline silicon for further use in the technological cycle.		
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				
-	Is it stated how anthropogenic GHG emission reductions are to be achieved? (This section should not exceed one page)	In section A.4.3.1 indicated than Existing technology is not sufficient yet. Particularly, the production cycle does not provide closed cycles (return of the waste materials, its purification and re-use.) That is why the old technology requires using more raw materials and spending more energy for its production. The proposed technology has equipment for hydrogenation of silicon tetrachloride and separation of the hydrogen and chlorine hydride from vapour-gas mixture that allows returning them into the main technological cycle and wastes spends for its production from the raw materials. The existing equipment for silicon production has low deposition rate that requires additional energy consumption. The new equipment will have much faster silicon separation from trichlorosilane that will allow reducing power consumption per 1 ton of	OK	OK

DVM Paragraph	Check Item	Initial finding	Draft Conclusion	Final Conclusion
		polycrystalline silicon.		
-	Is it provided the estimation of emission reductions over the crediting period?	In section A.4.3.1 of the PDD there is provided estimation of emission reduction over the crediting period 2011-2012 (2 416 510 tonnes CO2). Also, estimation over the crediting period 2013-2030 (22 524 714 tonnes CO2) is provided. *Clarification Request 02* Please clarify why 20 years were chosen as length of crediting period	CL02	OK
-	Is it provided the estimated annual reduction for the chosen credit period in tCO2e?	The estimated annual reduction for the period 2011-2030 is provided in tCO2 equivalent in the project design document	OK	OK
-	Are the data from questions above presented in tabular format?	The data on estimation emission reduction is presented in tabular format in the PDD	OK	OK
Estimated amount of emission reductions over the crediting period				
-	Is the length of the crediting period Indicated?	The length of the crediting period is indicated, i.e. crediting period is from 01/04/2011 for 31/12/2012 or 1 year 8 months.	OK	OK
-	Are estimates of total as well as annual and average annual emission reductions in tonnes of CO2 equivalent provided?	All required information consists in section A.4.3.1 of the PDD.	OK	OK
Project approvals by Parties				
19	Have the DFPs of all Parties listed as “Parties involved” in the PDD provided written project approvals?	Project Idea Note has been submitted to the National Environmental Investment Agency of Ukraine (NEIA). NEIA issued Letter of	OK	OK

DVM Paragraph	Check Item	Initial finding	Draft Conclusion	Final Conclusion
		Endorsement #1193/23/7 dated 16/05/2011		
19	Does the PDD identify at least the host Party as a "Party involved"?	In the PDD is identified Ukraine as a Host Party. See also CAR01	OK	OK
19	Has the DFP of the host Party issued a written project approval?	*Corrective Action Request 03* Please, provide Letter of Approval from the Host Party and the second Party involved	CAR 03	OK
20	Are all the written project approvals by Parties involved unconditional?	See section 20 of this protocol	-	-
Authorization of project participants by Parties involved				
21	Is each of the legal entities listed as project participants in the PDD authorized by a Party involved, which is also listed in the PDD, through: − A written project approval by a Party involved, explicitly indicating the name of the legal entity? or − Any other form of project participant authorization in writing, explicitly indicating the name of the legal entity?	After finishing of project determination report, the PDD with supporting documents and Determination Report will be presented to National Environmental Agency of Ukraine for receiving the Letter of Approval that will authorized project participants. Also, see section 19 and section 20 of this protocol above.	OK	OK
Baseline setting				
22	Does the PDD explicitly indicate which of the following approaches is used for identifying the baseline? − JI specific approach − Approved CDM methodology	The PDD indicates that JI specific approach is used for identifying the baseline	OK	OK

DVM Paragraph	Check Item	Initial finding	Draft Conclusion	Final Conclusion
	approach			
JI specific approach only				
23	Does the PDD provide a detailed theoretical description in a complete and transparent manner?	The PDD provides a detailed theoretical description four plausible future scenarios. *Corrective Action Request 04* Please, prove in the PDD that existing before plant renovation equipment was able to produce polycrystalline silicon and trichlorosilane in comparable with project activity amounts. *Corrective Action Request 05* Please provide more detailed sources of data in key parameters, that are determined once.	CAR04 CAR 05	OK
23	Does the PDD provide justification that the baseline is established: (a) By listing and describing plausible future scenarios on the basis of conservative assumptions and selecting the most plausible one? (b) Taking into account relevant national and/or sectoral policies and circumstance? − Are key factors that affect a baseline taken into account? (c) In a transparent manner with regard to the choice of approaches, assumptions, methodologies,	According to the information, concerning in the PDD four plausible future scenarios presented in a complete and transparent manner. First plausible future scenario was chosen as a baseline. Identified possible scenarios were analysed taking into account key factors of national and/or sectoral policies that affect the implementation of the regarded scenarios. Also, in section B.2 all baseline data and parameters are presented in a tabular format with detailed explanation of each ones.	OK	OK

DVM Paragraph	Check Item	Initial finding	Draft Conclusion	Final Conclusion
	parameters, date sources and key factors? (d) Taking into account of uncertainties and using conservative assumptions? (e) In such a way that ERUs cannot be earned for decreases in activity levels outside the project or due to force majeure? (f) By drawing on the list of standard variables contained in appendix B to "Guidance on criteria for baseline setting and monitoring", as appropriate?			
24	If selected elements or combinations of approved CDM methodologies or methodological tools for baseline setting are used, are the selected elements or combinations together with the elements supplementary developed by the project participants in line with 23 above?	As stated in the PDD, any CDM methodologies don't use for choice, justification and setting of baseline; because among the methodologies approved by the CDM Executive Board there is none fully matching the proposed JI project.	OK	OK
25	If a multi-project emission factor is used, does the PDD provide appropriate justification?	For this project there is used Carbon Emission Factor for power generation in the Integrated Electricity System of Ukraine, which is assessed by NEIA Order #43 for JI projects developed in Ukraine.	CAR06	OK

DVM Paragraph	Check Item	Initial finding	Draft Conclusion	Final Conclusion
		Corrective Action Request 06 Please, indicate relevant value of Carbon Emission Factor for each baseline year.		
Approved CDM methodology approach only				
26 (a)	Does the PDD provide the title, reference number and version of the approved CDM methodology used?	Not applicable	Not applicable	Not applicable
26 (a)	Is the approved CDM methodology the most recent valid version when the PDD is submitted for publication? If not, is the methodology still within the grace period (was the methodology revised to a newer version in the past two months)?	Not applicable	Not applicable	Not applicable
26 (b)	Does the PDD provide a description of why the approved CDM methodology is applicable to the project?	Not applicable	Not applicable	Not applicable
26 (c)	Are all explanations, descriptions and analyses pertaining to the baseline in the PDD made in accordance with the referenced approved CDM methodology?	Not applicable	Not applicable	Not applicable
26 (d)	Is the baseline identified appropriately as a result?	Not applicable	Not applicable	Not applicable
Additionality				
JI specific approach only				

DVM Paragraph	Check Item	Initial finding	Draft Conclusion	Final Conclusion
28	Does the PDD indicate which of the following approaches for demonstrating additionality is used? (a) Provision of traceable and transparent information showing the baseline was identified on the basis of conservative assumptions, that the project scenario is not part of the identified baseline scenario and that the project will lead to emission reductions or enhancements of removals; (b) Provision of traceable and transparent information that an AIE has already positively determined that a comparable project (to be) implemented under comparable circumstances has additionality; (c) Application of the most recent version of the "Tool for the demonstration and assessment of additionality. (allowing for a two-month grace period) or any other method for proving additionality approved by the CDM Executive Board".	As indicated in the project design document, the approved "Combined tool for baseline identification and additionality demonstration" version 02.2 was used for demonstration of additionality. As presented in previous sentence, the latest version of the tool was used. Consideration that the project scenario is not part of the identified baseline scenario and that the project will lead to emission reductions were performed by project developer and provided in section B.2 of the PDD.	OK	OK
29 (a)	Does the PDD provide a justification of	The developer conducts investment analysis using		OK

DVM Paragraph	Check Item	Initial finding	Draft Conclusion	Final Conclusion
	the applicability of the approach with a clear and transparent description?	the comparison analysis. The baseline and the project scenario IRR are compared in order to prove the inferior financial performance of the project activity. Taking into account the different amount of the investment required the use of the IRR as the key parameter for comparison of the two sorts of activities looks reasonable. *Corrective Action Request 07* While the actual project start has taken the place in 2007, The developer is obviously using the key data for the later periods. Please note that the Guidance for the Assessment of Investment analysis (hereinafter referred as the Guidance) requires: Input values used in all investment analysis should be valid and applicable at the time of the investment decision taken by the project participant. Thereby the forecast shall be based on the data (prices, exchange rates, interest rates, forecasts, legislation norms etc) available prior to the start of the construction/modernization. *Corrective Action Request 08* Following the requirement of the developer account for the fair value of the assets at the end of the end of assessment period which is included	CAR 07 CAR 08	

DVM Paragraph	Check Item	Initial finding	Draft Conclusion	Final Conclusion
		to the cash flow for the final year of the financial model. Please note that the project lifespan is indicated to be 30 years. Thereby the calculation of the residual assets value shall be based on the actual lifespan, not 10 years period which is currently applied in the financial model.	CAR 09	
		Corrective Action Request 09 Please indicate whether tariffs, costs and investment values are indicated with VAT included or not. Please note that the general approach is to make calculations using all input values (investment costs, tariffs and prices) with VAT excluded. In case if the company is not VAT payer calculations shall include VAT.	CAR 10	
		Corrective Action Request 10 Please provide the reference for the source of electricity and heat energy tariff data as well as the price of the products manufactured. Please provide the source for data regarding investment costs for the baseline scenario.	CAR 11	
		Corrective Action Request 11 Please indicate clearly which type of the by product is sold in the base line scenario		

DVM Paragraph	Check Item	Initial finding	Draft Conclusion	Final Conclusion
		(trichlorsilane or silicone tetrachloride). Please explain the formula used for conversion of the tetrachlorsilane to silicone tetrachloride volumes and hydrogen to oxygen). *Corrective Action Request 12* Please clarify why the sale of byproducts is not foreseen in the project scenario. *Corrective Action Request 13* Please clarify the nature of the increase of the production costs for the project scenario during 2012-2017. Please note that the baseline calculations are made in fixed prices, thereby the project inputs shall be fixed for the whole period. *Corrective Action Request 14* Sensitivity analysis provides reasonable review of possible variations of the input data. Please submit the spreadsheets with calculation of deviation scenarios indicating formulas in order the reader could reproduce and check your results.	CAR 12 CAR 13 CAR 14	
29 (b)	Are additionality proofs provided?	Additionality proofs are regarded in the PDD. Refer to 29 (a) above.	OK	OK
29 (c)	Is the additionality demonstrated	Additionality of given JI project are justified in the	OK	OK

DVM Paragraph	Check Item	Initial finding	Draft Conclusion	Final Conclusion
	appropriately as a result?	PDD. Also, please, see section 29 (a) and section 29 (b) of this determination protocol.		
30	If the approach 28 (c) is chosen, are all explanations, descriptions and analyses made in accordance with the selected tool or method?	"Combined tool for baseline identification and additionality demonstration" version 02.2 is followed by the JI project developer during additionality proofs.	OK	OK
Approved CDM methodology approach only				
31 (a)	Does the PDD provide the title, reference number and version of the approved CDM methodology used?	Not applicable	Not applicable	Not applicable
31 (b)	Does the PDD provide a description of why and how the referenced approved CDM methodology is applicable to the project?	Not applicable	Not applicable	Not applicable
31 (c)	Are all explanations, descriptions and analyses with regard to additionality made in accordance with the selected methodology?	Not applicable	Not applicable	Not applicable
31 (d)	Are additionality proofs provided?	Not applicable	Not applicable	Not applicable
31 (e)	Is the additionality demonstrated appropriately as a result?	Not applicable	Not applicable	Not applicable
Project boundary (applicable except for JI LULUCF projects				
JI specific approach only				

DVM Paragraph	Check Item	Initial finding	Draft Conclusion	Final Conclusion
32 (a)	Does the project boundary defined in the PDD encompass all anthropogenic emissions by sources of GHGs that are: (i) Under the control of the project participants? (ii) Reasonably attributable to the project? (iii) Significant?	*Corrective Action Request 15* Ukrainian national grid, natural gas delivering system and sodium carbonate plant are not controlled by project participants, so exclude "Extended Project Boundary" from the figure 6. *Clarification Request 03* Please, divide the emission sources for three groups, i.e. which are under the control of the JI project participants, reasonably attributable to the project, and significant to the JI project and clarify these information in section B.3 of the PDD.	CAR 15 CL 03	OK
32 (b)	Is the project boundary defined on the basis of a case-by-case assessment with regard to the criteria referred to in 32 (a) above?	See section 32 (a) of this table.	-	-
32 (c)	Are the delineation of the project boundary and the gases and sources included appropriately described and justified in the PDD by using a figure or flow chart as appropriate?	The delineation of the project boundary and sources included are described in the PDD by using figure 6 Emission sources located within the project boundary.	OK	OK
32 (d)	Are all gases and sources included explicitly stated, and the exclusions of any sources related to the baseline or the project are appropriately justified?	In section B.3 of the PDD all gases and sources included are explicitly stated; the information presented in table B.3.1.	OK	OK
Approved CDM methodology approach only				
33	Is the project boundary defined in	Not applicable	Not	Not

DVM Paragraph	Check Item	Initial finding	Draft Conclusion	Final Conclusion
	accordance with the approved CDM methodology?		applicable	applicable
Crediting period				
34 (a)	Does the PDD state the starting date of the project as the date on which the implementation or construction or real action of the project will begin or began?	The starting date of the project is 04/12/08. *Corrective Action Request 16* Please indicate why 04/12/08 was chosen as the project's start	CAR 16	OK
34 (a)	Is the starting date after the beginning of 2000?	Concerned JI Project started in 2008	OK	OK
34 (b)	Does the PDD state the expected operational lifetime of the project in years and months?	Expected operational lifetime of the Project equipment is 30 years (360 months) with possible expansion	OK	OK
34 (c)	Does the PDD state the length of the crediting period in years and months?	The length of the crediting period is provided in years and months, namely 19 years and 9 months (237 months) from 01/04/2011 to 31/12/2030	OK	OK
34 (c)	Is the starting date of the crediting period on or after the date of the first emission reductions or enhancements of net removals generated by the project?	*Clarification Request 04* Please indicate in the PDD why 01/04/2011 was chosen as the beginning of the crediting period	CL 04	OK
34 (d)	Does the PDD state that the crediting period for issuance of ERUs starts only after the beginning of 2008 and does not extend beyond the operational lifetime of the project?	In the PDD stated that crediting period has began after 2008 i.e. 01/04/2011 and does not extend beyond the operational lifetime of the project.	OK	OK

DVM Paragraph	Check Item	Initial finding	Draft Conclusion	Final Conclusion
34 (d)	If the crediting period extends beyond 2012, does the PDD state that the extension is subject to the host Party approval? Are the estimates of emission reductions or enhancements of net removals presented separately for those until 2012 and those after 2012?	The estimation of emission reduction due to the JI project is provided for the period 2008-2022. As a fact, in the PDD the values of emission reductions during the period 2011-2012 are presented in table A.2. In addition, the values of emission reductions for the period 2013-2022 are presented separately in table A.3 of the PDD.	OK	OK
Monitoring plan				
35	Does the PDD explicitly indicate which of the following approaches is used? − JI specific approach − Approved CDM methodology approach	The PDD indicate that the monitoring plan is developed on the basis of a specific JI approach in accordance with “Guidance on criteria for baseline setting and monitoring” (version 02).	OK	OK
JI specific approach only				
36 (a)	Does the monitoring plan describe: − All relevant factors and key characteristics that will be monitored? − The period in which they will be monitored? − All decisive factors for the control and reporting of project performance?	The Monitoring Plan describes relevant factor and parameters to be monitored, such as emission factor for Ukraine national grid, volume of produced crystalline silicon, quantity of supplied gas and electricity, etc. Period in which relevant factor and parameters will be monitored is established.	OK	OK
36 (b)	Does the monitoring plan specify the indicators, constants and variables used that are reliable, valid and provide transparent picture of the emission	The monitoring plan specifies the constants, such as oxygen and hydrogen density, oxygen and hydrogen molar weight. *Corrective Action Request 17*	CAR 17	OK

DVM Paragraph	Check Item	Initial finding	Draft Conclusion	Final Conclusion
	reductions or enhancements of net removals to be monitored?	Please indicate oxygen and hydrogen density conditions in which them used for calculations		
36 (b)	If default values are used: − Are accuracy and reasonableness carefully balanced in their selection? − Do the default values originate from recognized sources? − Are the default values supported by statistical analyses providing reasonable confidence levels? − Are the default values presented in a transparent manner?	Accuracy and reasonableness of default values are carefully balanced in their selection. The sources of default values are clearly described and transparent.	OK	OK
36 (b) (i)	For those values that are to be provided by the project participants, does the monitoring plan clearly indicate how the values are to be selected and justified?	In monitoring plan oxygen and hydrogen density used as default value. The source of this value is clarified in section B.2 of the PDD.	OK	OK
36 (b) (ii)	For other values, − Does the monitoring plan clearly indicate the precise references from which these values are taken? − Is the conservativeness of the values provided justified?	The monitoring plan clearly indicates the source from which monitoring data that needed for calculations are taken.. Moreover, there are presented first primary sources of monitoring data of this JI project (e.g. refer to Figure 7 Diagram of CO2 emission monitoring system at PJSC “Semiconductors plant” provided in the PDD).	OK	OK
36 (b) (iii)	For all data sources, does the monitoring plan specify the procedures	*Corrective Action Request 18* Please specify in the section D of the PDD the	CAR 18	OK

DVM Paragraph	Check Item	Initial finding	Draft Conclusion	Final Conclusion
	to be followed if expected data are unavailable?	procedures to be followed if expected data are unavailable		
36 (b) (iv)	Are International System Unit (SI units) used?	All values through the PDD are not presented in accordance to International System Units, but some of them are used.	OK	OK
36 (b) (v)	Does the monitoring plan note any parameters, coefficients, variables, etc. that are used to calculate baseline emissions or net removals but are obtained through monitoring?	The monitoring plan doesn't note any parameters, coefficients, variables, etc that are to be obtained though monitoring in order to calculate baseline emissions	OK	OK
36 (b) (v)	Is the use of parameters, coefficients, variables, etc. consistent between the baseline and monitoring plan?	According to the monitoring plan and the PDD, the use of parameters and variables are consistent between the baseline and monitoring plan.	OK	OK
36 (c)	Does the monitoring plan draw on the list of standard variables contained in appendix B of "Guidance on criteria for baseline setting and monitoring"?	The monitoring plan is established taking into account the list of standard variables contained in appendix B of "Guidance on criteria for baseline setting and monitoring". For instance, Carbon Emission Factor for electricity (EF_{CO2}) is used in given JI project	OK	OK
36 (d)	Does the monitoring plan explicitly and clearly distinguish: (i) 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	Corrective Action Request 19 Please, clearly indicate in the monitoring plan of the PDD division of the parameters into three groups, such as: (i) Data and parameters that are not monitored throughout the crediting period, but are determined only once (and thus remain fixed throughout the	CAR 19	OK

DVM Paragraph	Check Item	Initial finding	Draft Conclusion	Final Conclusion
	already at the stage of determination? (ii) 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? (iii) Data and parameters that are monitored throughout the crediting period?	crediting period), and that are available already at the stage of determination; (ii) 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; (iii) Data and parameters that are monitored throughout the crediting period. If any group is not applicable to parameters and data of given JI project, please, state so in the PDD.		
36 (e)	Does the monitoring plan describe the methods employed for data monitoring (including its frequency) and recording?	Methods for data monitoring and establish frequency of the last ones are specified in the monitoring plan described in the PDD.	OK	OK
36 (f)	Does the monitoring plan elaborate all algorithms and formulae used for the estimation/calculation of baseline emissions/removals and project emissions/removals or direct monitoring of emission reductions from the project, leakage, as appropriate?	Monitoring plan elaborates the formulae used for calculation and estimation of baseline emissions, project emissions and leakages due to the JI project implementation.	OK	OK
36 (f) (i)	Is the underlying rationale for the algorithms/formulae explained?	The underlying rationale for the formulae is presented	OK	OK
36 (f) (ii)	Are consistent variables, equation formats, subscripts etc. used?	All variables and equation formats are consistent and used in appropriately way.	OK	OK

DVM Paragraph	Check Item	Initial finding	Draft Conclusion	Final Conclusion
36 (f) (iii)	Are all equations numbered?	Equations needed for calculations described in section D and section E of the PDD. All equations are numbered.	OK	OK
36 (f) (iv)	Are all variables, with units indicated defined?	All variables with units indicated are defined	OK	OK
36 (f) (v)	Is the conservativeness of the algorithms/procedures justified?	The conservativeness of the procedures is justified	OK	OK
36 (f) (v)	To the extent possible, are methods to quantitatively account for uncertainty in key parameters included?	Uncertainty level in key parameters identified as low in table D.2 “Quality control and quality assurance procedures undertaken for data monitored”.	OK	OK
36 (f) (vi)	Is consistency between the elaboration of the baseline scenario and the procedure for calculating the emissions or net removals of the baseline ensured?	There is consistency between the elaboration of the baseline scenario and the procedure for calculating the emissions of the baseline scenario.	OK	OK
36 (f) (vii)	Are any parts of the algorithms or formulae that are not self-evident explained?	Used formulae are explained.	OK	OK
36 (f) (vii)	Is it justified that the procedure is consistent with standard technical procedures in the relevant sector?	In the PDD project developer describes the monitoring procedure that is in compliance with technical procedure at PJSC “Semiconductor plant”.	OK	OK
36 (f) (vii)	Are references provided as necessary?	References to the national environmental legislation in relevant sectors are provided in the PDD.	OK	OK

DVM Paragraph	Check Item	Initial finding	Draft Conclusion	Final Conclusion
36 (f) (vii)	Are implicit and explicit key assumptions explained in a transparent manner?	Key assumptions are explained in the PDD.	OK	OK
36 (f) (vii)	Is it clearly stated which assumptions and procedures have significant uncertainty associated with them, and how such uncertainty is to be addressed?	In the project design document there is not stated any information about significant uncertainty level of assumptions and procedures.	OK	OK
36 (f) (vii)	Is the uncertainty of key parameters described and, where possible, is an uncertainty range at 95% confidence level for key parameters for the calculation of emission reductions or enhancements of net removals provided?	In the PDD project developer described the uncertainty level of key parameters. Uncertainty level of concerned data was assessed as low. Measuring devices for monitoring of key parameters are calibrated/verified in compliance with the state regulation, PJSC “Semiconductors plant” standards and approved methodologies in order to assure quality control of monitoring data.	OK	OK
36 (g)	Does the monitoring plan identify a national or international monitoring standard if such standard has to be and/or is applied to certain aspects of the project? Does the monitoring plan provide a reference as to where a detailed description of the standard can be found?	No national or international monitoring standard are used for monitoring of the JI project implementation.	OK	OK
36 (h)	Does the monitoring plan document	Not applicable for given JI project.	OK	OK

DVM Paragraph	Check Item	Initial finding	Draft Conclusion	Final Conclusion
	statistical techniques, if used for monitoring, and that they are used in a conservative manner?			
36 (i)	Does the monitoring plan present the quality assurance and control procedures for the monitoring process, including, as appropriate, information on calibration and on how records on data and/or method validity and accuracy are kept and made available upon request?	In monitoring plan section D.2 and D.3 of the quality assurance and control procedures, including information about calibration and how monitoring data are to be recorded and collected. *Corrective Action Request 20* Please, provide Calibration plan of JI project measurement equipments.	CAR 20	OK
36 (j)	Does the monitoring plan clearly identify the responsibilities and the authority regarding the monitoring activities?	The responsible departments and persons regarding monitoring activities of the JI project are clearly identified in section D.2 and section D.3 of the PDD.	OK	OK
36 (k)	Does the monitoring plan, on the whole, reflect good monitoring practices appropriate to the project type? If it is a JI LULUCF project, is the good practice guidance developed by IPCC applied?	According to the section B.2 of the PDD, no similar activity to this project not identified in Ukraine, so good monitoring practice to this type project is unavailable.	OK	OK
36 (l)	Does the monitoring plan provide, in tabular form, a complete compilation of the data that need to be collected for its application, including data that are	Presented in the PDD monitoring plan provides a complete compilation of the data that need to be collected for its application, including data that are measured or sampled and data that are collected	OK	OK

DVM Paragraph	Check Item	Initial finding	Draft Conclusion	Final Conclusion
	measured or sampled and data that are collected from other sources but not including data that are calculated with equations?	from other sources. Data connected with baseline scenario and emission reduction calculation are stated in tabular format in section D of the PDD.		
36 (m)	Does the monitoring plan indicate that the data monitored and required for verification are to be kept for two years after the last transfer of ERUs for the project?	The monitoring plan doesn't indicate that the data monitored and required for verification are to be kept for two years after the last transfer of ERUs for the project. *Corrective Action Request 21* Please provide any document which indicate that the data monitored and required for verification will be kept for two years after the last transfer of ERUs for the project	CAR 21	OK
37	If selected elements or combinations of approved CDM methodologies or methodological tools are used for establishing the monitoring plan, are the selected elements or combination, together with elements supplementary developed by the project participants in line with 36 above?	Not any selected elements or combinations of approved CDM methodologies was used for establishing the monitoring plan	OK	OK
Approved CDM methodology approach only				
38 (a)	Does the PDD provide the title, reference number and version of the approved CDM methodology used?	Not applicable	Not applicable	Not applicable
38 (a)	Is the approved CDM methodology the	Not applicable	Not	Not

DVM Paragraph	Check Item	Initial finding	Draft Conclusion	Final Conclusion
	most recent valid version when the PDD is submitted for publication? If not, is the methodology still within the grace period (was the methodology revised to a newer version in the past two months)?		applicable	applicable
38 (b)	Does the PDD provide a description of why the approved CDM methodology is applicable to the project?	Not applicable	Not applicable	Not applicable
38 (c)	Are all explanations, descriptions and analyses pertaining to monitoring in the PDD made in accordance with the referenced approved CDM methodology?	Not applicable	Not applicable	Not applicable
38 (d)	Is the monitoring plan established appropriately as a result?	Not applicable	Not applicable	Not applicable
Applicable to both JI specific approach and approved CDM methodology approach				
39	If the monitoring plan indicates overlapping monitoring periods during the crediting period: (a) Is the underlying project composed of clearly identifiable components for which emission reductions or enhancements of removals can be calculated independently? (b) Can monitoring be performed	The monitoring plan doesn't indicate overlapping monitoring periods during the crediting period	OK	OK

DVM Paragraph	Check Item	Initial finding	Draft Conclusion	Final Conclusion
	independently for each of these components (i.e. the data/parameters monitored for one component are not dependent on/effect data/parameters to be monitored for another component)? (c) Does the monitoring plan ensure that monitoring is performed for all components and that in these cases all the requirements of the JI guidelines and further guidance by the JISC regarding monitoring are met? (d) Does the monitoring plan explicitly provide for overlapping monitoring periods of clearly defined project components, justify its need and state how the conditions mentioned in (a)-(c) are met?			
Leakage				
JI specific approach only				
40 (a)	Does the PDD appropriately describe an assessment of the potential leakage of the project and appropriately explain which sources of leakage are to be calculated and which can be neglected?	Working the previous technology the plant can manufacture additional products like oxygen and silicon tetrachloride. Since the project implementation does not foresee manufacture of these products, they are considered as leakages. GHG emissions connected with construction works and production reconstruction (emissions from		OK

DVM Paragraph	Check Item	Initial finding	Draft Conclusion	Final Conclusion
		transportation of equipment and materials, and energy resources consumption during construction and mounting works) are not taken into account *Corrective Action Request 22* Please explain in the section B.1 of the PDD how additional products such as oxygen and silicon tetrachloride may have influence on emission reductions, or remove them from the PDD and recalculate value of emission reductions	CAR 22	
40 (b)	Does the PDD provide a procedure for an ex ante estimate of leakage?	See section 40(a) of this protocol	-	-
Approved CDM methodology approach only				
41	Are the leakage and the procedure for its estimation defined in accordance with the approved CDM methodology?	Not applicable	Not applicable	Not applicable
Estimation of emission reductions or enhancements of net removals				
42	Does the PDD indicate which of the following approaches it chooses? (a) Assessment of emissions or net removals in the baseline scenario and in the project scenario (b) Direct assessment of emission reductions	The PDD indicates that assessment of emissions in baseline scenario and in the project scenario	OK	OK
43	If the approach (a) in 42 is chosen, does the PDD provide ex ante	The PDD provides ex ante estimates for the project scenario, leakages, project scenario and	OK	OK

DVM Paragraph	Check Item	Initial finding	Draft Conclusion	Final Conclusion
	estimates of: (a) Emissions or net removals for the project scenario (within the project boundary)? (b) Leakage, as applicable? (c) Emissions or net removals for the baseline scenario (within the project boundary)? (d) Emission reductions or enhancements of net removals adjusted by leakage?	emission reduction adjusted by leakage.		
44	If the approach (b) in 42 is chosen, does the PDD provide ex ante estimates of: (a) Emission reductions or enhancements of net removals (within the project boundary)? (b) Leakage, as applicable? (c) Emission reductions or enhancements of net removals adjusted by leakage?	Not applicable	Not applicable	Not applicable
45	For both approaches in 42 (a) Are the estimates in 43 or 44 given: (i) On a periodic basis? (ii) At least from the beginning until the end of the crediting period?	The estimation of baseline emissions and emission reduction are made on a periodic basis from beginning to the end of the crediting period for each year. Estimations of emission reductions are carried out	OK	OK

DVM Paragraph	Check Item	Initial finding	Draft Conclusion	Final Conclusion
	(iii) On a source-by-source/sink-by-sink basis? (iv) For each GHG? (v) In tones of CO2 equivalent, using global warming potentials defined by decision 2/CP.3 or as subsequently revised in accordance with Article 5 of the Kyoto Protocol? (b) Are the formula used for calculating the estimates in 43 or 44 consistent throughout the PDD? (c) For calculating estimates in 43 or 44, are key factors influencing the baseline emissions or removals and the activity level of the project and the emissions or net removals as well as risks associated with the project taken into account, as appropriate? (d) Are data sources used for calculating the estimates in 43 or 44 clearly identified, reliable and transparent? (e) Are emission factors (including default emission factors) if used for	for CO2 as greenhouse gas. Calculations are regarded in t CO_2 equivalent. Formulae used for calculating the estimates concerning in section D and section E are consistent throughout the PDD. Data sources used for calculating the estimates are clearly identified. Among key factors influencing the baseline emissions or the activity level of the project as well as risks associated with the project is taken into account. Conservative assumptions are taken into account while estimating emission reduction. In the PDD there are provided tables with calculation results of CO2 emission reductions. As a fact, estimated total value of CO2 emission reductions for the first crediting period is 2 416 510 t CO2 equivalent; moreover, estimated total value of CO2 emission reductions for the period 2013-2030 22 524 714 t CO2 equivalent.		

DVM Paragraph	Check Item	Initial finding	Draft Conclusion	Final Conclusion
	calculating the estimates in 43 or 44 selected by carefully balancing accuracy and reasonableness, and appropriately justified of the choice? (f) Is the estimation in 43 or 44 based on conservative assumptions and the most plausible scenarios in a transparent manner? (g) Are the estimates in 43 or 44 consistent throughout the PDD? (h) Is the annual average of estimated emission reductions or enhancements of net removals calculated by dividing the total estimated emission reductions or enhancements of net removals over the crediting period by the total months of the crediting period and multiplying by twelve?			
46	If the calculation of the baseline emissions or net removals is to be performed ex post, does the PDD include an illustrative ex ante emissions or net removals calculation?	The calculation of baseline emissions is to be performed ex post. In the PDD there are provided ex ante calculation of emissions. All estimated values are presented in section E of the PDD and Excel spreadsheets. *Corrective Action Request 23* Please provide numeration of tables in sub-section E.6 of the PDD	CAR 23	OK

DVM Paragraph	Check Item	Initial finding	Draft Conclusion	Final Conclusion
Approved CDM methodology approach only				
47 (a)	Is the estimation of emission reductions or enhancements of net removals made in accordance with the approved CDM methodology?	Not applicable	Not applicable	Not applicable
47 (b)	Is the estimation of emission reductions or enhancements of net removals presented in the PDD: − On a periodic basis? − At least from the beginning until the end of the crediting period? − On a source-by-source/sink-by-sink basis? − For each GHG? − In tones of CO2 equivalent, using global warming potentials defined by decision 2/CP.3 or as subsequently revised in accordance with Article 5 of the Kyoto Protocol? − Are the formula used for calculating the estimates consistent throughout the PDD? − Are the estimates consistent throughout the PDD? − Is the annual average of estimated	Not applicable	Not applicable	Not applicable

DVM Paragraph	Check Item	Initial finding	Draft Conclusion	Final Conclusion
	emission reductions or enhancements of net removals calculated by dividing the total estimated emission reductions or enhancements of net removals over the crediting period by the total months of the crediting period and multiplying by twelve?			
Environmental impacts				
48 (a)	Does the PDD list and attach documentation on the analysis of the environmental impacts of the project, including transboundary impacts, in accordance with procedures as determined by the host Party?	The project design document includes description of the environmental impact assessment of the JI project that performed in accordance with procedure determined in Ukraine. Referenced environmental documents are listed in section F.1 of the PDD. Positive opinion #02-22/233 dated 02/03/2010 of the polycrystalline silicon production PJSC "Semiconductors plant" issued by Zaporizhzhya sanitary and epidemiological station has been obtained.	OK	OK
48 (b)	If the analysis in 48 (a) indicates that the environmental impacts are considered significant by the project participants or the host Party, does the PDD provide conclusion and all references to supporting documentation of an environmental	The PDD provides conclusion and references to supporting documentation of an environmental impacts assessment undertaken in accordance with the procedures required by the host Party.	OK	OK

DVM Paragraph	Check Item	Initial finding	Draft Conclusion	Final Conclusion
	impact assessment undertaken in accordance with the procedures as required by the host Party?			
Environmental impacts				
49	If stakeholder consultation was undertaken in accordance with the procedure as required by the host Party, does the PDD provide: (a) A list of stakeholders from whom comments on the projects have been received, if any? (b) The nature of the comments? (c) A description on whether and how the comments have been addressed?	The Host Party doesn't require stakeholder consultation process for the JI projects. During the project realization, interested parties are citizens of Zaporizhzhya city informed by mass media about the project implementation. There were be held public hearings. Information on the project and related public hearings was published in a local newspaper "Zaporizhska Sich". No comments connected with JI project implementation were received. Also, stakeholder's comments will be collected during determination procedure.	OK	OK
Determination regarding small-scale projects (additional elements for assessment)				
Determination regarding land use, land-use change and forestry projects (additional/alternative elements for assessment)				
Determination regarding programmes of activities (additional/alternative elements for assessment)				

Table 2 Resolution of Corrective Action and Clarification Requests

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 1	Summary of project participant response	Determination team conclusion
Corrective Action Request 01 Please, identify second Party involved to this JI project	-	The Rutek Trading AG from Switzerland is the second Party of the project. Corresponding corrections were added to the PDD.	The issue is closed
Corrective Answer Request 02 Please provide in the PDD data of physical location of the Project that it is not exceed one page	-	Corresponding corrections were made in the PDD.	The issue is closed
Corrective Action Request 03 Please, provide Letter of Approval from the Host Party	19	Letter of Approval will be obtained after submission of PDD and Determination report to the NFPs.	The CAR is pending. Letter of Approval from the Hast Party will be obtained during first verification

Corrective Action Request 04 Please, prove in the PDD that existing before plant renovation equipment was able to produce polycrystalline silicon and trichlorosilane in comparable with project activity amounts.	23	The capacity of the plant before its reconstruction was 257 tons of polycrystalline silicon per year and 18800 tons of trichlorosilane per year. The baseline foreseen expansion of the old plant capacity up to 52560 tons per year of trichlorosilane and 3000 tons of polycrystalline silicon. The capacity of 52560 tons of trichlorosilane per year allows the old technology to produce amount of polycrystalline silicon equal to the project activity. Respective corrections were added to the PDD.	The issue is closed
Corrective Action Request 05 Please provide more detailed sources of data in key parameters that are determined once.	23	Corresponding corrections were added to the section B.1.	The issue is closed

Corrective Action Request 06 Please, indicate relevant value of Carbon Emission Factor for each baseline year.	25	In accordance with the Order #75* of the National Environmental Investment Agency of Ukraine from May 12, 2011 concerning approval of specific factors of carbon dioxide emissions for 2011, the national grid emission factor is used to calculate emissions reduction due to decrease of electricity consumption. Carbon Emission Factor used to calculate emissions under the baseline and project scenario is equal to 1.090 t CO_2/MWh and was used for ex-ante estimation. Corresponding changes was added to the PDD.	The issue is closed

* http://www.neia.gov.ua/nature/doccatalog/document?id=127498

Corrective Action Request 07 While the actual project start has taken the place in 2007, The developer is obviously using the key data for the later periods. Please note that the Guidance for the Assessment of Investment analysis (hereinafter referred as the Guidance) requires: Input values used in all investment analysis should be valid and applicable at the time of the investment decision taken by the project participant. Thereby the forecast shall be based on the data (prices, exchange rates, interest rates, forecasts, legislation norms etc) available prior to the start of the construction/modernization.	29(a)	Investment decision regarding reconstruction was taken in 2008. The privatization of Semiconductor plant took place in 2007.	The issue is closed
Corrective Action Request 08 Following the requirement of the developer account for the fair value of the assets at the end of the end of assessment period which is included to the cash flow for the final year of the financial model. Please note that the project lifespan is indicated to be 30 years. Thereby the calculation of the residual assets value shall be based on the actual lifespan, not 10 years period which is currently applied in the financial model.	29(a)	Calculation of the residual assets value corrected for 30 years.	The issue is closed

Corrective Action Request 09 Please indicate whether tariffs, costs and investment values are indicated with VAT included or not. Please note that the general approach is to make calculations using all input values (investment costs, tariffs and prices) with VAT excluded. In case if the company is not VAT payer calculations shall include VAT.	29(a)	For tariffs, costs and investment values VAT is not included.	The issue is closed
Corrective Action Request 10 Please provide the reference for the source of electricity and heat energy tariff data as well as the price of the products manufactured. Please provide the source for data regarding investment costs for the baseline scenario.	29(a)	Investment costs and values of payment for electricity and other material for project and baseline scenario are obtained from the Semiconductor plant.	The issue is closed
Corrective Action Request 11 Please indicate clearly which type of the by product is sold in the base line scenario (trichlorsilane or silicone tetrachloride). Please explain the formula used for conversion of the tetrachlorsilane to silicone tetrachloride volumes and hydrogen to oxygen).	29(a)	In the baseline scenario the oxygen and silicone tetrachloride are sold. For hydrogen to oxygen conversion the formula 19 from section D.1.3.2.of the PDD and for trichlorsilane to silicone tetrachloride conversion the formula 23 from section D.1.3.2.of the PDD are used.	The issue is closed
Corrective Action Request 12 Please clarify why the sale of byproducts is not foreseen in the project scenario.	29(a)	Byproducts (silicone tetrachloride and oxygen) will not be produced in the new technological scheme of polycrystalline silicon production.	The issue is closed

Corrective Action Request 13 Please clarify the nature of the increase of the production costs for the project scenario during 2012-2017. Please note that the baseline calculations are made in fixed prices, thereby the project inputs shall be fixed for the whole period.	29(a)	Production costs for the project scenario and calculation were corrected for the fixed prices.	The issue is closed
Corrective Action Request 14 Sensitivity analysis provides reasonable review of possible variations of the input data. Please submit the spreadsheets with calculation of deviation scenarios indicating formulas in order the reader could reproduce and check your results.	29(a)	Corresponding sheets were added to the financial analysis.	The issue is closed
Corrective Action Request 15 Ukrainian national grid, natural gas delivering system and sodium carbonate plant are not controlled by project participants, so exclude "Extended Project Boundary" from the figure 6.	32(a)	Yes, the natural gas delivering system and sodium carbonate plant are not under control of project participants and were not included in project boundary. The arrows at figure 6 just show the material flows that generate GHG emissions at the plant. Ukrainian national grid is included in the extended project boundary since emissions from electric power generation by Ukrainian fossil fuel power plants are included in the project.	The issue is closed

Corrective Action Request 16 Please indicate why 04/12/08 was chosen as the project's start	34(a)	The permission for preparing building works was issued 07/04/09. Corresponding document is attached.	The issue is closed
Corrective Action Request 17 Please indicate oxygen and hydrogen density conditions in which them used for calculations	36(b)	Respective corrections were added to the PDD.	The issue is closed

Corrective Action Request 18 Please specify in the section D of the PDD the procedures to be followed if expected data are unavailable	36 (b) (iii)	Natural gas consumption is measured at the entrance to the plant. The technical flow meters can be used to control the consumption in the boiler house and at the shop of hydrogen production. The gas volume registration is held by meters that are calibrated and checked by the natural gas supplier. Certificates of NCV of the natural gas supplier are issued monthly. The total electricity consumption is being recorded by electric meters belonging to the electricity supplier. Consumption at the shops is registered by technical meters. The power balance is based on indications of technical meters. Measurement of steam consumption is being performed by flow meters. In the absence of data the steam consumption value can be retrieved through the balance of steam production. The mass of polycrystalline silicon production is measured by two systems. Weighting system includes general weighing after growing silicon reactors and second system is used for weighing finished products.	The issue is closed

Corrective Action Request 19 Please, clearly indicate in the monitoring plan of the PDD division of the parameters into three groups, such as: (i) 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; (ii) 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; (iii) Data and parameters that are monitored throughout the crediting period. If any group is not applicable to parameters and data of given JI project, please, state so in the PDD.	36(d)	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 are presented in section B.1. The group of 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 are not applicable in the PDD. Data and parameters that are monitored throughout the crediting period are presented in D.1.1.1. and D.1.1.3. The summarized tables of data and all key parameters used in emission calculation are presented in Annex 2.	The issue is closed

Corrective Action Request 20 Please, provide Calibration plan of JI project measurement equipments.	36(i)	The calibration period for electric meters is 6 years, other meters are calibrated annually. Corresponding corrections were added to the table D.2. Detailed information regarding dates of the last and next calibration of each certain meter will be presented in monitoring reports.	The issue is closed
Corrective Action Request 21 Please provide any document which indicate that the data monitored and required for verification will be kept for two years after the last transfer of ERUs for the project	36(m)	The decree of the Semiconductor plant # 1807 regulates the storage of the data monitored and required for verification. Corresponding document is attached.	The issue is closed
Corrective Action Request 22 Please explain in the section B.1 of the PDD how additional products such as oxygen and silicon tetrachloride may have influence on emission reductions, or remove them from the PDD and recalculate value of emission reductions	40(a)	The Semiconductor plant reconstruction is aimed at making these products beyond the project boundary. Production of these products requires fossil fuels and electric power consumption that leads to increased GHG emissions into the atmosphere. So manufacture of oxygen and silicon tetrachloride is considered as leakages. These corrections are added to section B.1 of PDD	The issue is closed

Corrective Action Request 23 Please provide numeration of tables in sub-section E.6 of the PDD	46	Respective numeration of tables was added to the section E.6 of the PDD.	The issue is closed
Clarification Request 01 Please add in the PDD the source of coordinates	-	The geographical coordinates were measured by GPS-navigator at the plant side.	The issue is closed
Clarification Request 02 Please clarify why 20 years were chosen as length of crediting period	-	The lifetime of the renovated equipment under the baseline scenario will not exceed 20 years	The issue is closed

Clarification Request 03 Please, divide the emission sources for three groups, i.e. which are under the control of the JI project participants, reasonably attributable to the project, and significant to the JI project and clarify these information in section B.3 of the PDD.	32(a)	The GHG emissions that are under control of the project participants, reasonably attributable to the project, significantly include: 1) CO_2 emissions from natural gas combustion for technological process needs in existing boiler-house; 2) CO_2 emissions from electricity consumption for purified trichlorosilane and polycrystalline silicon production 3) CO_2 emissions from hydrocarbon conversion 4) Emissions from neutralization of waste gases by sodium carbonate (soda ash) Other GHG emissions such as emissions from use of fossil fuel for electricity and heat generation for oxygen and silicon tetrachloride production, fugitive methane emissions from natural gas production and distribution as well as sodium carbonate production are not under control of the project participants and aren't included into the project boundary.	The issue is closed

Clarification Request 04 Please indicate in the PDD why 01/04/2011 was chosen as the beginning of the crediting period	34(c)	Beginning of the crediting period was corrected to the 05/04/2011 in accordance with the date of conformance certificate signing. Corresponding document is attached.	The issue is closed