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# **VALIDATION OPINION FOR REVISION OF REGISTERED MONITORING PLAN**

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**KOE Environment consultancy Inc.  
(Japan)**

**Sulige Natural Gas based Power  
Generation Project**

**UNFCCC Ref. No. 1243**

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<b>Date of Issue:</b> 14/08/2009		<b>Project Number:</b> CDM.VER0650	
<b>Project Title:</b> Sulige Natural Gas based Power Generation Project			
<b>Organisation:</b> SGS United Kingdom Limited		<b>Client:</b> KOE Environment consultancy Inc. (Japan)	
<b>Subject:</b> Validation Opinion for Revision of Registered Monitoring Plan			
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<b>Authorised Signatory:</b> Name: Siddharth Yadav Date: 21.08.2009		<input type="checkbox"/> Limited Distribution	
<b>Revision Number:</b>	<b>Date:</b>		
0	28/04/2009	11	<input type="checkbox"/> Unrestricted Distribution
1	14/08/2009	12	
2			

## Abbreviations

CAR	Corrective Action Request
CDM	Clean Development Mechanism
CEF	Carbon Emission Factor
CERs	Certified Emission Reductions
CL	Clarification Request
CO <sub>2</sub>	Carbon Dioxide
CO <sub>2</sub> e	Carbon Dioxide Equivalent
DNA	Designated National Authority
DOE	Designated Operational Entity
FAR	Forward Action Request
GHG	Green House Gas(es)
GWP	Global Warming Potential
IPCC	Intergovernmental Panel on Climate Change
MP	Monitoring Plan
MR	Monitoring Report
NCG	North China Grid
PDD	Project Design Document
PP	Project Participant
PPA	Power Purchase Agreement
SGS	Société Générale de Surveillance
UNFCCC	United Nations Framework Convention on Climate Change
VVM	Validation and Verification Manual

**Table of Content**

1. Validation Opinion.....5

2. Introduction .....6

    2.1 Objective.....6

    2.2 Scope.....6

    2.3 GHG Project Description .....6

    2.4 The Names and Roles of the Validation Team Members .....6

3. Methodology .....7

    3.1 Review of CDM-PDD and Additional Documentation .....7

    3.2 Findings .....7

    3.3 Internal Quality Control .....7

4. Validation Findings .....8

    4.1 Application of Monitoring Methodology and Monitoring Plan .....8

        4.1.1 Description of Revision of Registered Monitoring Plan .....8

        4.1.2 Validation of Revision of Registered Monitoring Plan.....9

    4.2 Findings of Previous Verification Reports.....10

5. Document References.....12

## 1. Validation Opinion

Paragraph 57 of the modalities and procedures for the CDM allows project participants to revise monitoring plans in order to improve accuracy and/or completeness of information, subject to the revision being validated by a Designated Operational Entity.

SGS United Kingdom Ltd has been contracted by KOE Environment consultancy Inc. (Japan) to perform a validation of the revision of monitoring plan according to the procedure detailed in annex 34 to EB 26 meeting report; the original monitoring plan is part of the PDD of registered CDM project: Sulige Natural Gas based Power Generation Project (UNFCCC ref. no 1243). The purpose of a validation is to have an independent third party assessment of the revision of monitoring plan. In particular, the level of accuracy and/or completeness in the proposed revision of the monitoring plan, and the conformity with approved monitoring methodology applicable to the project activity.

By applying the proposed revision of monitoring plan:

1. The volume of natural gas combusted in the project plant is measured by the ultrasonic natural gas flow meter(s) installed at Changqing Gas Field (Gas supplier end), recorded daily and the total volume for the monitoring period is cross checked against the monitoring results of the natural gas flow meter(s) installed at the Gas Pressure regulation Station (Project end). The accuracy level of the gas flow meter(s) at gas supplier end will be not lower than 1.0 and the accuracy level of the gas flow meter(s) at project end will be not lower than 0.5. The calibration of flow meters will be carried out in accordance with the relevant local/national standards or manufacturer specifications.
2. The monitoring of parameter  $EF_{BM,y}$ ,  $BE_y$  and  $LE_y$  has been added in accordance with applied methodology.

This revision improves the accuracy of information provided and consistency in the registered PDD and the monitoring plan.

Furthermore, we confirm that:

- (a) the proposed revision of the monitoring plan ensures that the level of accuracy or completeness in the monitoring and verification process is not reduced as a result of the revisions;
- (b) the proposed revision of the monitoring plan is in accordance with the approved monitoring methodology applicable to the project activity.
- (c) this is the first verification and there are no previous findings.

**Signed on Behalf of the Validation Body by Authorized Signatory**

Signature: 

Name: Siddharth Yadav

Date: 21.08.2009

## 2. Introduction

### 2.1 Objective

Paragraph 57 of the modalities and procedures for the CDM allows project participants to revise monitoring plans in order to improve accuracy and/or completeness of information, subject to the revision being validated by a Designated Operational Entity.

SGS United Kingdom Ltd has been contracted by KOE Environment consultancy Inc. (Japan) to perform such a validation of the revision of monitoring plan according to the procedure detailed in annex 34 to EB 26 meeting report; the original monitoring plan is part of the PDD of registered CDM project: Sulige Natural Gas based Power Generation Project (UNFCCC ref. no 1243) The purpose of a validation is to have an independent third party assessment of the revision of monitoring plan. In particular, the level of accuracy or completeness in the proposed revision of the monitoring plan, and the conformity with the approved monitoring methodology applicable to the project activity.

The Validation was performed in accordance with the UNFCCC criteria for the Clean Development Mechanism (CDM) and the host country criteria, as well as criteria given to provide for consistent project operations, monitoring and reporting.

SGS reviewed the project design documentation, using a risk based approach and conducted follow-up interviews.

### 2.2 Scope

The scope of the validation is defined as an independent and objective review of the project design document, the project baseline study and monitoring plan and other relevant documents. The information in these documents is reviewed against the Kyoto Protocol requirements, the UNFCCC rules and associated interpretations. SGS has employed a risk-based approach in the validation, focusing on the identification of significant risks for project implementation and the generation of CERs.

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

### 2.3 GHG Project Description

Sulige Natural Gas based Power Generation Project (UNFCCC ref. no 1243) was registered on 21/07/2008. The first crediting period for the project is from 21/07/2008 to 20/07/2015.

### 2.4 The Names and Roles of the Validation Team Members

Name	Role	Affiliate
Niclo Deng Wei	Lead Assessor	SGS CN
Ginger Jiang Yuan	Assessor	SGS CN
Grace Han Huijuan	Local Assessor	SGS CN

Niclo Deng Wei is a Lead Assessor in scopes 1 and 5 for the SGS Climate Change with extensive experience in the validation and verification of CDM and VCS2007 projects in China. He is based in Beijing and has been assigned on the verification of this project.

Ginger Jiang Yuan is an assessor/trainee lead assessor for the SGS Climate Change. She is based in Shanghai and has been assigned on the verification of this project.

Grace Han Huijuan is a local assessor/trainee assessor for the SGS Climate Change. She is based in Shanghai and has been assigned on the verification of this project.

### 3. Methodology

#### 3.1 *Review of CDM-PDD and Additional Documentation*

The validation is performed primarily as a document review of the publicly available project documents. The assessment is performed by trained assessors using a validation protocol.

A site visit is usually required to verify assumptions in the baseline.

#### 3.2 *Findings*

As an outcome of the validation process, the team can raise different types of findings

In general, where insufficient or inaccurate information is available and clarification or new information is required the Assessor shall raise a **Clarification Request (CL)** specifying what additional information is required.

Where a non-conformance arises the Assessor shall raise a **Corrective Action Request (CAR)**. A CAR is issued, where:

- I. Non-conformities with the monitoring plan or methodology are found in monitoring and reporting, or if the evidence provided to prove conformity is insufficient;
- II. Mistakes have been made in applying assumptions, data or calculations of emission reductions which will impair the estimate of emission reductions;
- III. Issues identified in a FAR during validation to be verified during verification have not been resolved by the project participants.

A Forward Action Request (FAR) is raised during verification for actions if the monitoring and reporting require attention and/or adjustment for the next verification period.

The validation process may be halted until this information has been made available to the assessors' satisfaction. Failure to address a CL/FAR may result in a CAR. Information or clarifications provided as a result of a CL/FAR may also lead to a CAR.

Corrective Action Requests, Clarification Requests and Forward Action Requests are detailed in a separate form (Findings Overview). In this form, the Project Developer is given the opportunity to address and "close" outstanding CARs and respond to CLs and FARs.

#### 3.3 *Internal Quality Control*

Following the completion of the assessment process and a recommendation by the Assessment team, all documentation will be forwarded to a Technical Reviewer. The task of the Technical Reviewer is to check that all procedures have been followed and all conclusions are justified. The Technical Reviewer will either accept or reject the recommendation made by the assessment team.

## 4. Validation Findings

### 4.1 Application of Monitoring Methodology and Monitoring Plan

Monitoring methodology AM0029 version 01 and ACM0002 Version 06 (/10/, /11/) is applied to the monitoring plan.

#### 4.1.1 Description of Revision of Registered Monitoring Plan

The modifications to the registered MP (/1/) are as follow:

1. Table FC<sub>NG,y</sub> under B.7.1, Page 35 of registered PDD

In the registered PDD, it was:

*Daily measured continuously by natural gas flow meters and monthly recording by the project owner.*

*The total volume of natural gas combusted in the project plant in year(s) ‘ y’ will be monitored by the natural gas flow meter at the Changqing Gas Field, and double checked against the monitoring results of the natural gas flow meter installed by the supplier at the Gas Pressure Regulating Station.*

*Precision of orifice meter used in the Project is 0.5s. The flow meter will be maintenance and testing in accordance with stipulation of the meter supplier to ensure accuracy. The readings will be double checked by the gas supply company.*

In the revised MP, words are changed to:

*Measured continuously by natural gas flow meters and daily recording by the project owner.*

*The total volume of natural gas combusted in the project plant in year(s) ‘ y’ will be measured by the natural gas flow meter(s) installed at the Changqing Gas Field, and cross checked against the monitoring results of the natural gas flow meter(s) installed at the Gas Pressure Regulating Station.*

*Precision of the ultrasonic gas flow meter(s) installed at the Gas Pressure Regulating Station shall not be lower than 0.5. Precision of the ultrasonic gas flow meter(s) installed at the Changqing Gas Field shall not be lower than 1.0. The gas flow meter(s) will be maintained and calibrated in accordance with relevant local/national standards or manufacturer specifications.*

2. Paragraph 3 under section B.7.2.3, Page 39 of registered PDD

In the registered PDD, it was:

*Consumption of natural gas by the Project: consumption of natural gas will be daily monitored by natural gas flow meters at the inlet of gas turbine, monthly recorded and cross-checked by the monitoring results of the natural gas flow meter installed by the supplier at the endpoint of the gas transmission pipeline of the Project, natural gas metering handover receipt and natural gas purchase record.*

In the revised MP, words are changed into:

*Consumption of natural gas by the Project: The total volume of natural gas combusted will be measured by natural gas flow meter(s) installed at the Changqing gas field, daily recorded and cross-checked by the monitoring results of the natural gas flow meter(s) installed at the Gas Pressure Regulating Station.*

3. Section 7.2.5 Page 39 of registered PDD

In the registered PDD, it was:

*Calibration of Meters & Metering should be implemented according to relevant national and local standards and rules.*

In the revised MP, words are changed into:

*Calibration of meter(s) & metering should be implemented according to relevant local/national standards or manufacturer specifications.*

4. Table  $EF_{BM,y}$ , Table  $BE_y$  and Table  $LE_y$  under B.7.1

In the registered PDD, there were no information about the monitoring of  $EF_{BM,y}$ ,  $BE_y$  and  $LE_y$ .

In the revised MP, monitoring procedure of  $EF_{BM,y}$ ,  $BE_y$  and  $LE_y$  has been added.

**4.1.2 Validation of Revision of Registered Monitoring Plan**

The aforementioned revision 1, 2 and 3 relates to the monitoring equipments, procedures of  $FC_{NG,y}$  and calibration procedures. Orifice gas flow meters with accuracy class of 0.5 were designed to be installed at both the Changqing Gas Field (Gas supplier end) and Gas Pressure Regulating Station (project end). By on site observation, it is confirmed by the verification team that two sets of ultrasonic flow meters have been installed at Changqing Gas Field and Gas Pressure Regulating Station in the plant respectively. The meter(s) at Changqing Gas Field are in compliance with accuracy class of 1.0 and the meter(s) at Gas Pressure Regulating Station are in compliance with accuracy class of 0.5. The meter(s) installed at supplier end are specified as main meters for trading and the meter(s) installed at project end are also recorded for cross check as per NG purchase agreement (/7/). The revision of MP was proposed to reflect the actual situation and it has been validated as follows:

- 1) According to the applied methodology AM0029 Version 01, it is required that  $FC_{NG,y}$  shall be daily measured by the fuel flow meter at project boundary, and the total fuel consumption will be monitored both at supplier and project end for cross-verification. In the revised MP, the  $FC_{NG,y}$  will be monitored by the ultrasonic gas flow meters installed at the Changqing Gas field (supplier end) and the total volume of  $FC_{NG,y}$  over the monitoring period will be cross checked by the data monitored by meter(s) installed at Gas Pressure Regulating Station (project end). The readings of meter(s) installed at supplier end and project end are all recorded daily. The compliance to the applied methodology by the revised MP has been validated.
- 2) Orifice flow meter(s) can not reach the designed accuracy class under the operation condition of the proposed project activity, however ultrasonic flow meter(s) can.

The principal of an orifice gas flow meter is described as “when natural gas flows through a throttle device, the flow beam contracts locally at the orifice-plate, resulting in increase in flow speed and decrease in static pressure. Then, the flow of natural gas passes through the throttle device could be evaluated via measurement on the difference in static pressure (pressure difference) before and after the orifice” (/5/). Conduction of orifice flow meters requires that

- i. The fluid should be single-phase, homogeneous Newtonian fluid. Phase transition and impurity precipitation do not happen when the fluid passes through the throttle device. Any form of material adhesion or conglomeration is not allowed in the throttle device;
- ii. the pipeline should be round. There is also limitation on the pipe diameter. There should be long straight pipe segments both upstream and downstream. Roughness and roundness of the inner surface of the 10D straight pipe segment upstream and 4D straight pipe segment downstream the throttling element should strictly satisfy specific regulations;
- iii. the stream should be continuous and stable, rather than impulsive.

However, the natural gas consumed in the Project contains a small quantity of liquid and impurity in transportation, thus it does not satisfy the above requirement i. The liquid may freeze and accumulate at the front of the orifice-plate flow meter, thus the pressure difference before and after the orifice-plate is not reliable.

According to the on-site data of natural gas consumption, the natural gas transported from Changqing Gas Field to the Project is neither continuous nor stable, thus not satisfying the above requirement iii. Due to the impurity of gas component and the unstable gas flow rate, the maximum uncertainty can reach 2%~3% in the actual practice.

- (b) Unlike orifice flow meters, ultrasonic wave flow meters employ the method of absolute digital time difference and the theory of the time difference between co-current and counter-current transmission of high-frequency acoustic impulse is proportional to the gas flow speed to measure the gas flow. They are velocity-type flow meters. Precision of ultrasonic wave flow meters could hardly be affected by the liquid or impurity contained in the measured fluid, thus ensuring the accuracy.

The above statements can be supported by the “Response letter regarding Sulige Gas Power Plant’s request for the replacement on natural gas flow meters” (hereinafter referred to as REPLY) issued by the gas supplier. The document evidence (/3/) has been validated by SGS assessors. Such arguments have also been supported by the academic paper published in Natural Gas Industry (/4/).

- 3) Installation of ultrasonic flow meters with accuracy class of 1.0 or higher (e.g. 0.5, 0.2) in this project is in compliance with the national standard GB/T18604-2001.

By checking GB/T18604-2001 (/6/), it is verified that the maximum uncertainty of ultrasonic flow meters installed at pipes with a diameter smaller than DN300 shall not be lower than 1.0% according to page 5 of GBT18604-2001. During the on site visiting, it is confirmed that the diameter of the pipes where the ultrasonic flow meters were installed is either DN250 or DN200. Therefore, either 0.5 or 1.0 accuracy class is in compliance with the national standard.

- 4) Installation of ultrasonic flow meter(s) with accuracy class of 1.0 at Changqing Gas Field is out of control of the PP.

By checking against the signed Natural Gas Purchase Agreement (/7/) and interviewing the gas supplier staff, it has been confirmed that the meters at Changqing Gas Field are owned, maintained and operated by the gas supplier, and it is assigned as the gate way meter for trading. PP has no control over the installation and maintenance of the meters. Since the practice of Changqing Gas Field is in compliance with the applied national standard, it is unlikely for the gas supplier to change the flow meter(s) due to the additional costs of more accurate meters. Although PP tried to negotiate with the gas supplier, the request was turned down by the gas supplier which is shown in the REPLY.

- 5) Cross check of data provided by both gas supplier and project owner will ensure the accuracy of monitoring of  $FC_{NG,y}$ .

Following the applied methodology, two sets of flow meters have been installed on site. The manual of flow meters and calibration certificates (/8/, /9/, /10/) indicated that the accuracy class of the meters at Changqing Gas Field is not lower than 1.0 and the ones at Gas Pressure Regulating Station keeps not lower than 0.5 which is the same as registered PDD. Compared to two sets orifice flow meters with accuracy class of 0.5, it is deemed by the verification team that the accuracy of monitoring can be ensured if the data provided by both sets of meters are available for cross check.

Above 2)~5) has indicated that the overall accuracy of the monitoring and verification of  $FC_{NG,y}$  is not reduced although the metering system specified in revised MP is different from the one in the registered PDD.

- 6) The meter(s) installed at both the Changqing Gas Field and Gas Pressure Regulating Station will be calibrated in accordance with the relevant local/national standards or the manufacturer specifications. This is in compliance with the applied methodology.

Thus, it can be concluded that the level of accuracy or completeness in the monitoring and verification is not reduced as a result of the revision of the MP.

The aforementioned revision 4 of MP relates to the monitoring procedure of  $EF_{BM,y}$ ,  $BE_y$  and  $LE_y$ . According to applied methodology AM0029 version 01 and ACM0002 Version 06 and the registered PDD,  $EF_{BM,y}$  shall be annually calculated over recently built power plants as defined in the baseline methodology,  $BE_y$  and  $LE_y$  shall be calculated based on other parameters monitored. The monitoring for these three parameters in the revised MP is validated to be in accordance with the applied methodology.

## 4.2 Findings of Previous Verification Reports

This is the first monitoring period and there is no previous verification report.

Rest of the monitoring plan remains the same as mentioned in the registered PDD (/11/) available at UNFCCC website <http://cdm.unfccc.int/Projects/DB/TUEV-SUED1184339707.46/view> and revised monitoring plan is attached with the revised validation opinion.

There is no other change in the Validation Report (/12/) by TUV-SUD, dated 09/07/2008 available on UNFCCC webpage <http://cdm.unfccc.int/Projects/DB/TUEV-SUED1184339707.46/view>.

In compliance with Annex34 to EB26 meeting report and relevant sections in the VVM, it has been validated that this revision of monitoring plan improves the accuracy and completeness of information needed,



consistency in the registered PDD and the monitoring plan. The revision of monitoring plan is in accordance with the approved monitoring methodology applicable to the project activity, AM0029 Version 01 (/13/).

## 5. Document References

Category 1 Documents (documents provided by the Client that relate directly to the GHG components of the project, (i.e. the CDM Project Design Document, confirmation by the host Party on contribution to sustainable development and written approval of voluntary participation from the designated national authority):

- /1/ Revision of Monitoring Plan, version 01 dated 24/04/2009 and version 02 dated 14/08/2009
- /2/ Statement of meter change, provided by PP
- /3/ Response letter regarding Sulige Gas Power Plant's request for the replacement on natural gas flow meters, issued by Gas supplier on 26/12/2008
- /4/ Application of gas ultrasonic flow meter in Changqing Gas Field, Wang D, Zhao Y.G, Bai Y. Yuan W.J, Natural Gas Industry, Vol. 27, No.5, 2007
- /5/ <http://www.gongkong.com/Forum/ForumTopic.aspx?Id=5-BBFC-A461EEC83FD9>
- /6/ GB/T18604-2001 Measurement of natural gas flow by ultrasonic flow meter
- /7/ NG purchase agreement
- /8/ Manual of FLOWSIC600 (flow meters installed at the Gas Pressure Regulating Station)
- /9/ Calibration certificates of meter(s) installed at the Gas Pressure Regulating Station dated 17/10/2005
- /10/ Calibration certificates of meter(s) installed at the Changqing Gas Field dated dated 09/06/2007

Category 2 Documents (background documents used to check project assumptions and confirm the validity of information given in the Category 1 documents and in validation interviews):

- /11/ Registered PDD version 5 dated 01/12/2007
- /12/ Validation Report, 09/07/2008
- /13/ AM0029 Version 01 dated 19/05/2006

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