CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 03 - in effect as of: 28 July 2006

CONTENTS

Annexes

SECTION A. General description of project activity

A.1 Title of the project activity:

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Natural gas based Cogeneration project of Kadodara Industrial Cluster, Gujarat, India
Version 01
Date: 21/05/08

A.2. Description of the project activity:

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The proposed project involves the installation of a natural gas based cogeneration systems which are owned by the industrial users (i.e., self-owned) that consumes the project heat and electricity. Self owned project sponsors are Kadodara Power Plant, Krishna Terina Prints Pvt Ltd, Aakar Processors Ltd, Ravi Export Pvt Ltd, Venus Silks Pvt Ltd, Durga Processors Private Limited, Navnibhi Dyeing and Printing Pvt Ltd, Tribeni Processors Pvt Ltd, Niharika Dyeing and Printing Mills Pvt Ltd. These industrial facilities are textile-processing units based in the Surat District of Gujarat moved towards an enterprising system of their cogeneration facilities as one package/cluster under Clean Development Mechanism.

The proposed project hereby referred as Kadodara Power Industrial Cluster were importing power from the grid and were utilizing lignite to meet their thermal requirements of the industrial processes in the pre-project scenario.

The objective of the project is to reduce green house gas emissions through adaptation of a cogeneration system with substitution of carbon intensive fuel lignite and carbon intensive grid with comparatively cleaner natural gas based power generation and utilization of waste heat for thermal energy generation, thereby resulting in reduction of GHG emissions. The project activity thus leads to a cleaner environment through lower greenhouse gas emissions and other pollutants and greater energy security of the nation through lower fuel consumption, fossil fuel conservation for other activities. It also ensures contribution towards sustainable development through social, economic, environmental and technological innovation.

Further the project activity would also be meeting the thermal energy requirement through this waste heat recovery system thereby reducing the additional fossil fuel consumption taking place in the pre project scenario for meeting the process thermal energy requirement. The introduction of energy efficient natural gas based cogeneration system would result in reduction in the total amount of fossil fuel used to provide heat and electricity to the industrial facility thereby resulting in a significant amount of green house gas emission reductions.

The purpose of Natural Gas based cogeneration system is to primarily achieve the following objectives:

- To help in sustainable development of industries in the region by supplying the clean power through tapping of "un-utilised" natural gas.
- To reduce the green house gases emissions through generation of clean power
- Conserve fossil fuels and making them available for other purposes
- Ensure contribution towards sustainable development through social, economic environmental and technological aspects

Project's contribution towards sustainable development

Social well-being: The project is expected to create significant employment opportunities indirectly by personnel's required to operate / maintain the unit and indirectly, by generating power and thus eliminating the need to draw power from an already deficit grid. Such project, which involves energy efficiency, will certainly have long-term direct and indirect social benefits. The implementation of the project activity will bring about an increase in the business opportunities for contractors, suppliers, and erectors at different phases of its implementation. This will improve the local economic structure and hence social status of the involved people. The plant is located in a backward area and therefore the project activity will in a way help to improve the status of the local populace.

Economic well being: Ecofriendly technological option was adopted moreover the natural gas availability is lower than the demand in the country and same was the scenario in the state of Gujarat which becomes a barrier for the management in the view that if the industry isn't getting natural gas the whole investment would become futile. Further there is no special benefit or incentives to the entrepreneur for such adaptation hence the additional revenue through sale of carbon credit will make the project feasible. It will also help in creating a few ancillary industry opportunities in the vicinity of the project.

Environmental well-being: In India, a major share of the country's electricity is generated from fossil fuel sources such as coal, diesel, furnace oil etc. The proposed natural gas based cogeneration system including waste heat recovery project will displace or replace the equivalent quantity of electricity generated in the grid and fossil fuel. The project will help in sustainable development of industries in the region by supplying them clean power based on natural gas. Since this project activity generates clean power, it has positively contributed towards the reduction in (demand) use of finite natural resource like coal/oil, minimizing depletion and in turn increasing its availability to other important purposes. As sulphur content in the natural gas is very low and can be considered to be nil for any practical purpose therefore the project would result in eliminating the SOx emissions to a considerable extent. The project is also results in elimination of NOx, carbon monoxide and particulate matter emission level. Hence the project activity apart from reducing greenhouse gas emissions will be contributing towards better quality environment for the employees and the community.

Technological well-being: project activity will act as a clean technology demonstration project to encourage the development of modern and more efficient cogeneration of electricity and steam generation using natural gas, throughout the region. Moreover the project activity involves a fuel switch along with a cogeneration unit in the same facility. This is not a ubiquitous practice in the technological front in India and it is certain that project implementation would provide useful experience encouraging replication on a larger scale thereby leading to diversification of the generation sources with reduced GHG emissions compared to the baseline.

A.3. Project participants:

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Name of Party involved (*) ((Host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant

		(Yes/No)
Ministry of Environment and Forest, Government of India (Host Country)	Ravi Export Private Limited. (Private Entity, Project participant)	No

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

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A.4.1.1. Host Party(ies):

>> India

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

>> Gujarat state

A.4.1.3. City/Town/Community etc:

>> Surat District, Palsana taluka

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

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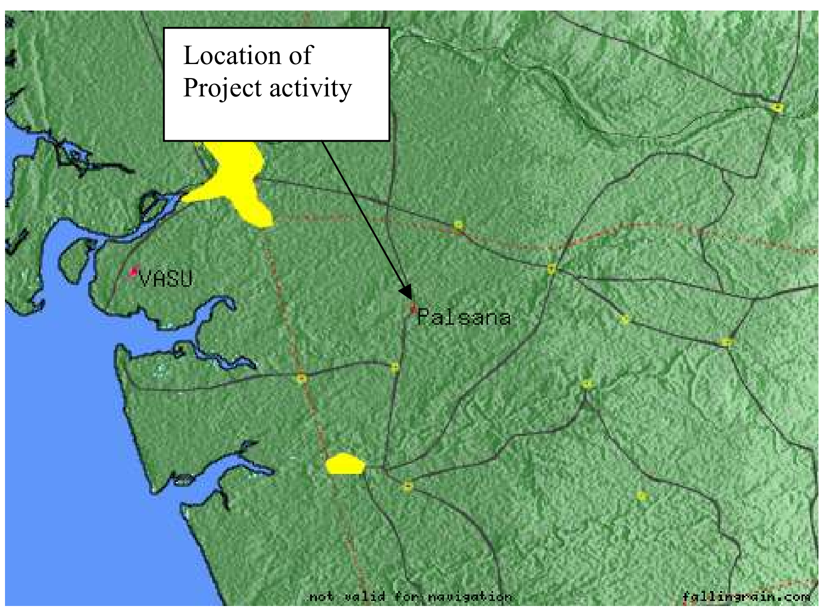
The project is carried out at different industrial facilities located in taluka of Palsana, Surat in Gujarat All the units are well connected by roads to Surat, which in turn is on the main Delhi- Mumbai road and rail transportation routes. The plants are also ideally located to nearby ports in the Gujarat state. The geographical location of the project activity is as follows:

Map showing location of Gujarat in India


Gujarat
(District Map)
N
PAKISTAN
RAJASTHAN
Map showing the District of Surat
Gulf of Kuchchh
MADHYA PRADESH
Gulf of Khambhat
ARABIAN SEA
MAHARASHTRA
Surat


Location of Project activity
VASU
Palsana
not valid for navigation
fallingrain.com

A.4.2. Category(ies) of project activity:

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The project activity may apply to the following categories as per the list of Sectoral Scopes

1. Energy industries (renewable – / non-renewable sources)
4. Manufacturing industries

A.4.3. Technology to be employed by the project activity:

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Cogeneration involves the simultaneous production of useful heat and electricity using a single fuel source. In a cogeneration system, a fuel is burnt to generate electricity, while the residual heat is applied to meet some thermal demand in the plant. The proposed project involves the installation of a cogeneration system that would consume natural gas. This cogeneration system is being set up separately in the each of the units in the cluster and therefore cannot be referred as a "package cogeneration."

The Kadodara Power Industrial Cluster will comprise of nine units with a total capacity of 7.465 MW. The names of all the units within the cluster are given below:

- Kadodara Power Plant
- Aakar Processors Limited
- Krishna Terina Prints Private Limited
- Venus Silk Mills Private Limited
- Ravi Export Private Limited
- Durga Processors Private Limited
- Navnibhi Dyeing and Printing Mills Pvt. Ltd
- Tribeni Processors Pvt Ltd
- Niharika Dyeing and Printing Mills Pvt. Ltd

Each plant currently purchases electricity from the power grid and utilizes lignite to meet the plant's thermal requirements for their heating applications in their textile processing. The proposed project involves the installation of cogeneration system, which would consume natural gas and produce electricity and heat for the industrial process.

Natural gas is burnt in a pressurized combustion chamber using combustion air supplied by the compressor which is integral to the gas turbine. Hot and pressurized gas enters the turbine and is used to turn a series of turbine blades and the shaft on which they are mounted to produce mechanical energy which is converted to electrical energy in synchronous generators, while residual energy in the form of sensible heat of waste gases is used for the purpose of thermal energy generation. The turbine and drive equipment are housed in a weatherproof, insulated and sound attenuated enclosure where the sound level is maintained at an optimum level by the steel profile frame and thick wall consisting outer steel sheet with mineral wool packing and perforated inner steel plate. The entire energy of the hot gas is not utilized in generating power. With the help of a waste heat recovery system the waste heat is captured and it is used for steam generation for in-house requirements. Such a process would allow fuel savings with respect to the separate production of heat and electricity in different processes.

A.4.4 Estimated amount of emission reductions over the chosen crediting period:

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The total estimated amount of emission reductions based on the forecasted natural gas consumption throughout the crediting period (10 years) from the project is expected to be as under:

Years	**Annual estimation of emission reductions [tCO2 e]**
2009	63,926
2010	63,926
2011	63,926
2012	63,926
2013	63,926
2014	63,926
2015	63,926
2016	63,926
2017	63,926
2018	63,926
Total estimated reductions (tCO2 e)	**639,260**
Total number of crediting years	**10**
Annual average over the crediting period of estimated reductions (tCO2 e)	63,926

In the above table, the year 2009 corresponds to the period starting from 01.01.2009 to 31.12.2009. Similar interpretation shall apply for remaining years.

A.4.5. Public funding of the project activity:

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There is no public funding involved for the development of the project activity.

SECTION B. Application of a baseline and monitoring methodology

B.1. Title and reference of the approved baseline and monitoring methodology applied to the project activity:

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Title: Approved baseline methodology, "Natural gas-based package cogeneration"
Reference: http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html, AM0014, Version 04, EB 33.

B.2 Justification of the choice of the methodology and why it is applicable to the project activity:

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The project activity meets all the applicability criteria as proposed in the approved baseline methodology AM0014 version 04 "Natural gas based package cogeneration". The methodology is applicable to the project under the following conditions.

The applicability of the methodology is justified as follows:

Applicability 1: The cogeneration system is a third party cogeneration systems, i.e. not own or operated by the consuming facility that receives the project heat and electricity or the cogeneration system is owned by the industrial user (henceforth referred to as self-owned) that consumes the project heat and electricity;

Justification: Each industry in the Kadodara Power Industrial Cluster owns their natural gas based cogeneration system and therefore satisfies the criteria of self owned project facility that consumes the electricity and thermal energy required for its industrial process.

Applicability 2: The cogeneration system provides all or a part of the electricity and or heat demand of the consuming facility;

Justification: Since the owner of the cogeneration system and the user/consumer are same for each industry of the cluster, electricity generated from the project activity will be fulfilling the major part of the electrical demand of the industrial unit. Therefore the project activity satisfies the criteria of the cogeneration system that provides part of the energy demand of the consuming facility.

Applicability 3: No excess electricity is supplied to the power grid and no excess heat from the cogeneration system is provided to another user.

Justification: As the cogeneration system is designed for supplying the base load electrical demand, it rules out the possibility of wheeling the power to the regional grid. The closed loop heat recovery system is designed to supply thermal energy to the industrial facility only and hence there is no possibility of supplying excess thermal energy to any other industrial facility.

The above justification of the applicability criteria confirms the choice of the approved methodology by the project proponent.

B.3. Description of the sources and gases included in the project boundary

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The spatial extent of the project boundary encompasses all the anthropogenic emissions by sources of greenhouse gases under the control of the project participants that are significantly and reasonably attributable to the project activity.

The project activity encompasses the natural gas based cogeneration system where from no excess heat or electricity is exported outside the industrial facility. The natural gas based cogeneration system will be meeting the base load electrical demand and the heat demand in the form of steam. The spatial extent of baseline system boundary encompasses import of power from grid for meeting up of industrial electrical demand in the pre project scenario and the heat demands through combustion of lignite.

	Source	Gas	Included?	Justification / Explanation
Baseline	Combustion of baseline fuel	CO_2	Yes	Main emission source due to fuel combustion.
		CH_4	Yes	Main emission source due to fuel combustion.
		N_2O	Yes	Main emission source due to fuel combustion.
	Electricity grid replacement from the baseline	CO_2	Yes	Main emission source due to electricity grid replacement
Project Activity	Combustion of new fuel	CO_2	Yes	Main emission source due to fuel combustion.
		CH_4	Yes	Main emission source due to fuel combustion.
		N_2O	Yes	Main emission source due to fuel combustion.

B.4. Description of how the baseline scenario is identified and description of the identified baseline scenario:

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The scenario below represents the potential alternatives that presented themselves to the project proponent. The continuation of baseline activity was one of them while implementing the proposed project activity was an option. In accordance to the approved baseline methodology the determination of baseline scenario involves consideration of alternatives to the proposed project.

Baseline scenario 1: Industrial plant continues to operate with equipment replacement as needed with no change in the equipment efficiency

Kadodara Power Industrial Cluster would continue with its prevailing practice of importing power from the grid and utilizing lignite for the purpose of thermal energy generation, the situation is the common and business as usual scenario in this type of industry and also in this region moreover the utilization of lignite and grid import is in compliance with all legal and statutory norms of the state and central level apart from that there exist no such policy, directive or regulatory framework forcing the incorporation of the packaged cogeneration within the industrial facility. Apart from the above fact the proposed project activity exhibited financial unattractiveness due to heavy investment and there exist the risk of the natural gas availability which establishes the fact of continuation of the current practice. This is a considerable alternative baseline scenario.

Baseline scenario 2: Industrial plant continues to operate with improved efficiency new equipment at the time of equipment replacement using a less carbon intensive fuel.

The innovative and eco-friendly technology that the industrial facility has adopted is the latest state of art technology for its industrial energy generation and above all the equipment functioning for the above purpose are energy efficient and will remain operating within the projected manufacturer life span, this rules out the possibility of the industrial facility to operate with improved efficiency through adaptation of new equipment at the time of equipment replacement. So this scenario is not an alternative baseline scenario.

Baseline scenario 3: Industrial plant upgrades the thermal energy generating equipment and therefore increases the efficiency of boiler(s) immediately.

The boiler is running efficiently and is in line with the boiler regulation and standard and there is little feasible way out in the present day scenario for upgrading the boiler and thereby improving the efficiency and subsequent emission reduction. This rule out the possibility for consideration of the above alternative as a baseline scenario

Baseline scenario 4: The heat and or electricity demand of the industrial plant is reduced through improvements in end use efficiency.

The possibility of reduction in energy demand is less with adopted most technologically upgraded and energy efficient technology in its production process and no such possibility for consideration of this alternative as baseline scenario.

Baseline scenario 5: Installation of a cogeneration system owned by the industrial plant.

This alternative is the project scenario taking into consideration the CDM benefit. The adaptation of natural gas based cogeneration system is not prevalent in this type of industry and this region. The incorporation of the project activity incurs high capital investment moreover the industrial facility has to face serious financial problem due to the fluctuating and soaring gas price. Management and operation of the technology requires high level of training incorporating considerable amount of cost. The alternative being the project activity cannot be considered as the baseline scenario.

Baseline scenario 6: Installation of a package cogeneration system owned by a company other than the industrial plant.

Yet the concept of localized and captive cogeneration system is not a common practice in our country and the package of cogeneration system owned by a company other than the industrial plant is not prevalent in India or in the state. Therefore consideration of the alternative as the baseline scenario is not feasible.

Baseline scenario 7: Installation of a cogeneration system by a third party.

Yet the concept of cogeneration system by a third party cogeneration systems, i.e. not own or operated by the consuming facility that receives the project heat and electricity is not a common in India or in the state. Therefore consideration of the alternative as the baseline scenario is not feasible.

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity (assessment and demonstration of additionality):

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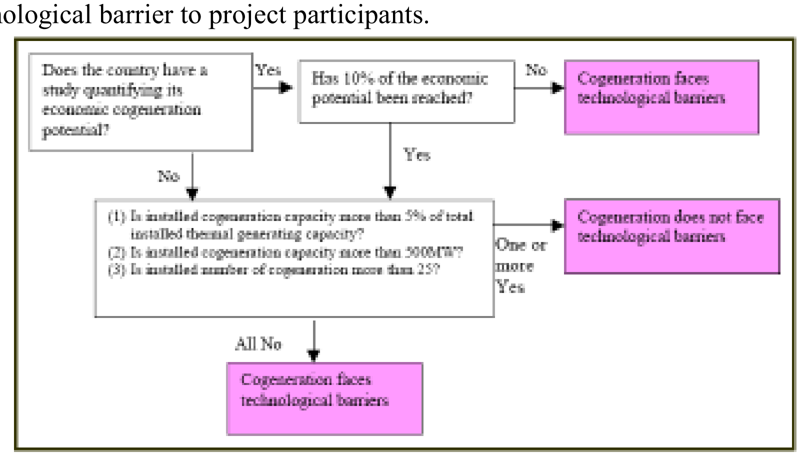
As per AM0014 version 04 (Approved baseline methodology) the project activity should posses an alternate baseline scenario from among the seven likely alternative baseline scenario as described in the methodology. The best suited alternate baseline scenario for the project activity is: Baseline scenario 1 "Industrial plant continues to operate with equipment replacement as needed with no change in the equipment efficiency".

As per AM0014 version 04 to prove the project is additional, four additionality tests are applied. The first two tests are applicable to any cogeneration ownership scenario. The third test is specific to package cogeneration case where the cogeneration system is owned by a party other than the industry using the heat and electricity from the system. The fourth test is specific to the package cogeneration case for self owned cogeneration system. In case of self owned cogeneration project activities the project activity is additional if the entire four additionality test result in the project being assessed as additional.

1. **Are there technological barriers to cogeneration in the country?**

Additionality test 1 is applied by following the flow chart below. A low market share of cogeneration means that there is insufficient infrastructure to support installation and maintenance of such systems, acting as a technological barrier to project participants.



The application of natural gas based packaged cogeneration system in Kadodara Power Industrial Cluster is not prevalent practice in similar industry in this part of the region. The low market share of cogeneration systems compared to the existing power generation capacity, and, the gap between harnessed and potential capacities strongly suggest the insufficient infrastructure to support installation and maintenance of the system acting as a technological barrier to the project participant

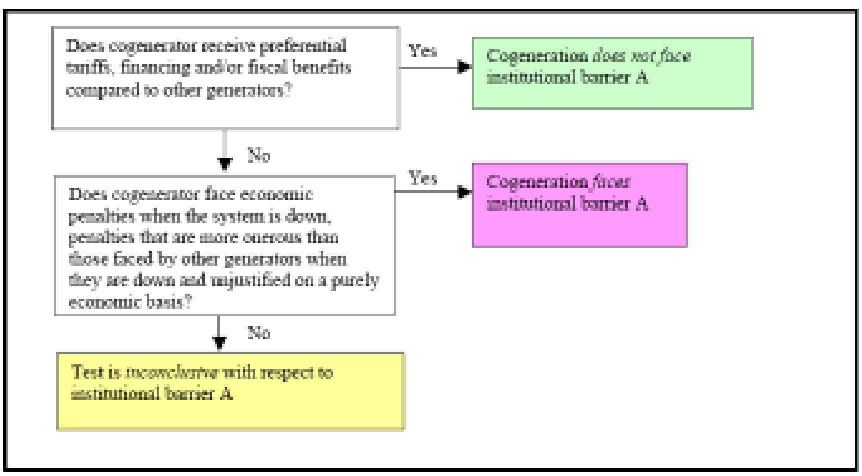
Does the country have a study quantifying its economic cogeneration potential?

The government has set a target of 15,000 MW[1] power cogeneration in core industries. The industries like sugar, fertilisers, distilleries, paper and pulp, rice mills have the potential to produce 15,000 MW through co-generation while industrial and urban wastes could generate about 2,700 MW which would increase to 7000 MW by 2017.

Has 10% of the economic potential been reached?
As on 31.03.2007 as per MNES study on potential achievements, the cumulative potential achieved in power cogeneration is 615.83MW[2], which is less then 5%. Hence the above facts and figures suggest the institutional barriers faced by the industry in adaptation of such technological barriers.

2. **A Institutional barrier: Are there institutional barriers to cogeneration in general?**

Additionality test 2A is applied by following the flow chart below.



Does the cogenerator receive preferential tariffs, financing and/or fiscal benefits compared to other generator?

Since the proposed project activity is natural gas based cogeneration system, it does not receive any preferential tariffs or fiscal benefits compared to other co generators like bagasse based. Indian

[1] http://www.terienvis.nic.in/news2006.htm
[2] http://mnes.nic.in/ach1.htm

Renewable Energy Development Agency (IREDA) – the apex financial institute for renewable energy promotion in India provides soft loans to bagasse based cogeneration system but since the cogeneration project at the industrial facility is a fossil fuel (natural gas) based system it is disadvantaged from acceptance of financial benefit compared to other electricity generation system from renewable source. This weakens the financial viability of cogeneration investment.

The industries are textile manufacturers and are therefore continuously operating ones and would meet their power and heat requirements by installing a natural gas based cogeneration. Hence any power interruption would cause heavy loss to them. When cogeneration system is not operating due to regular shutdown it will be a huge technical problem for the industries, hence project activity faces institutional barrier.

Procurement of gas procurement is a financial barrier and holdup for the industrial facility. There is huge disparity in the demand supply scenario of natural gas in this part of the country moreover the gas price is very much fluctuating[3] and elevating resulting in the project to be commercially non-viabile without additional CDM revenues. Hence revenue generated from the CDM activities would substantiate the viability of the project.

Does the co-generator face economic penalties that are more onerous than those faced by other generators when they are down and is this unjustified on a purely economic basis?

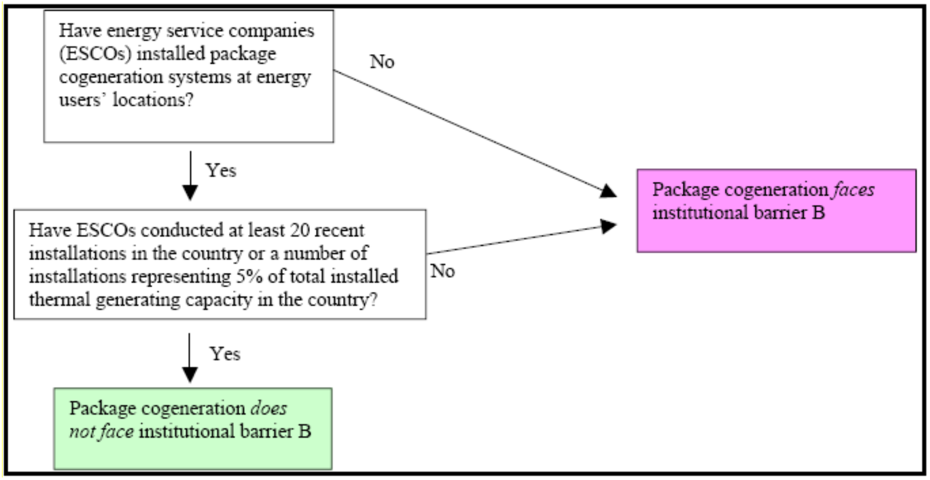
Kadodar Power Industrial Cluster prior to the project activity used to import power from the grid and generate thermal energy through lignite but as the industry is a process industry, interruption of power supply would result in huge losses. Hence the project activity faces institutional barriers.

2. **B. Institutional barrier for ESCOs: Are there institutional barriers to the "package cogeneration" operational context? In other words, is there enough experience in which one company installs a cogeneration system at the location of a separate energy user?**

For an industrial user with continuous process the common practice is to meet their electricity and natural gas demand from grid electricity and captive steam generation. In this cogeneration system the project proponent who owns the industrial facility invests in and installs the cogeneration system at the plant site and provides internal electricity and heat demand. This institutional arrangement requires industrial facility to have special management resources and organizational capacity. Where such experience is lacking, promoting the new arrangement involves a significant institutional barrier.

Additionality test 2B is applied by following the flow chart below.

[3] http://www.gail.nic.in/gailnewsite/mediacenter/mediacenter_pressrelease17.html



Have energy service companies (ESCOs) installed package cogeneration system at energy user location

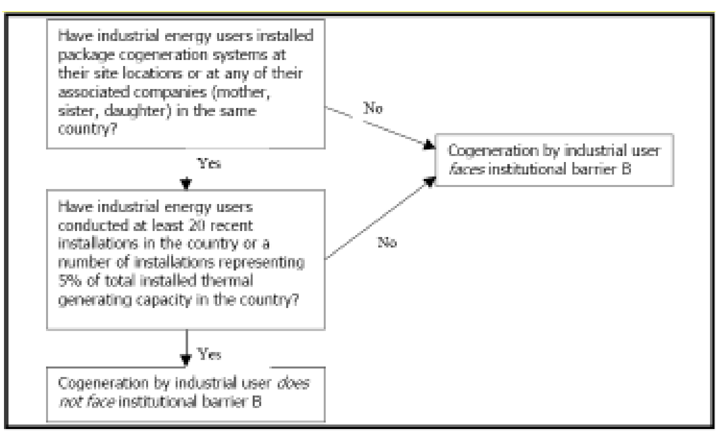
The ESCO model is still at a preliminary state in India the concept is just coming up and there is few institution that are mobilising the process. ESCOs have not installed a facility of this sort in similar type industry. This establishes the project additionality in terms of institutional barrier.

2. **C. Institutional barriers for Industrial Users:**

Are there institutional barriers to the 'package cogeneration' operational context? In other words is there enough experience in which an industrial user can install and operate a cogeneration system at it's plant premises?

Each industrial user of Kadodara Power Industrial Cluster installs and operates the cogeneration system for use at its own site. This arrangement requires the industrial user to have specific expertise and knowledge of cogeneration systems. Where such experience is lacking, promoting the new arrangement involves a significant institutional barrier.

Additionality test 2C is applied by the following flow chart below:



Have industrial energy users installed packaged cogeneration systems at their site location or at any of their associated companies (mother, sister, daughter) in the same country?

The industrial facility has no prior experience of handling of natural gas based packaged cogeneration at any of their industrial sites nor in any of their associated companies. This demonstrates the institutional barrier to the packaged cogeneration system.

Though the project activity has many barriers, Kadodara Power Industrial Cluster have undertaken the project as there is an opportunity to sell the CO2 emission reductions and gets carbon revenue through Clean Development Mechanism (CDM) stream for the project activity, which would mitigate the risks associated with project activity. Hence the project is additional and anthropogenic emissions of greenhouse gases would have been more in the absence of the project activity.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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Project emissions:

The project activity encompasses the installation of a cogeneration system whose input is natural gas from the gas pipeline, and whose outputs are electricity and heat supplied to an industry. The project activity avoids consumption of lignite for heat generation and displaces electricity from the grid.

Project emissions correspond to natural gas combustion by the cogeneration system, and includes the four components as in the baseline (CO2, CH4 and N2O emissions from combustion) and CH4 emissions from natural gas production and leaks in the transport and distribution pipeline supplying the plant and leaks in the gas distribution piping within the plant, associated with the natural gas consumption.

Emissions are then calculated as follows:

a) CO2 emissions from natural gas combustion in cogeneration system

Carbon dioxide emissions from natural gas combustion in the cogeneration system, E_{CS} (tonne CO_2/year):

E_{CS} (tonne CO2/year) = $AEC_{NG} * EF_{NG} / 10^3$

Where AEC_{NG} = annual energy consumption of natural gas in cogeneration system (GJ/year), and
EF_{NG} = CO_2 emission factor of natural gas (kg CO_2/GJ, lower heating value basis)

b) CH4 emissions from natural gas combustion in cogeneration system

Methane emissions from natural gas combustion in the cogeneration system, $E_{met\ comb}$ (tonne CH4/year), are given by:

$E_{met\ comb}$ (tonne CH4/year) = $AEC_{NG} * MEF / 10^6$

Where AEC_{NG} = annual energy consumption of natural gas in the cogeneration system (GJ/year), and
MEF = methane emission factor for natural gas combustion

In units of carbon dioxide equivalent emissions, $E_{equiv\ met\ comb}$ (tonne CO2 equiv/year)

$E_{equiv\ met\ comb}$ (tonne CO2 equiv/year) = $E_{met\ comb}$ * GWP (CH4)

where GWP (CH4) = global warming potential of methane = 21

c) Nitrous oxide emissions from natural gas combustion in cogeneration system

Nitrous oxide emissions from natural gas combustion in the cogeneration system, $E_{N2O\ comb}$ (tonne N2O/year), are given by:

$E_{N2O\ comb}$ (tonne N2O/year) = AEC_{NG} * NEF / 10^6

Where AEC_{NG} = annual energy consumption of natural gas in the cogeneration system (GJ/year), and
NEF = nitrous oxide emission factor for natural gas combustion (kg N2O/TJ, lower heating value basis)

In units of carbon dioxide equivalent emissions, $E_{equiv\ N2O\ comb}$ (tonne N2O/year) = $E_{N2O\ comb}$ * GWP (N2O)
Where GWP (N2O) = global warming potential of nitrous oxide = 310

d) Methane emissions from natural gas production and pipeline leaks in the transport and distribution of natural gas, including leakage within the industrial plant

Methane emissions from natural gas production and leakage in transport and distribution, corresponding to fuel used in cogeneration system, E_{fug} (tonne CH4/year), are given by:

E_{fug} (tonne CH4/year) = AEC_{NG} * MLR / 10^3

Where AEC_{NG} is defined as before, and
MLR = methane leakage rate in natural gas production, transport and distribution leakage, including leaks at the industrial site (kg CH4/GJ natural gas energy consumption, lower heating value basis).

Convert methane emissions to carbon dioxide equivalent emissions, $E_{equiv\ fug}$ (tonne CO2 equiv/year)
$E_{equiv\ fug}$ (tonne CO2 equiv/year) = E_{fug} * GWP (CH4)

Where GWP (CH4) = is defined as before = 21

Total project emissions are given by the sum of the components analysed above:

$$E_{total} = E_{CS} + E_{equiv\ met\ comb} + E_{equiv\ N2O\ comb} + E_{equiv\ fug}$$

<u>Baseline Emissions:</u>

Baseline emissions are those emissions that are associated with the production of heat and electricity that are offset by the output of the cogeneration system. Baseline emissions comprise five components:

a) **CO2 from combustion.** CO2 emissions corresponding to the combustion of a baseline fuel that would have been used if the cogeneration system did not provide **heat** to the plant.

b) **CH4 from combustion.** CH4 emissions corresponding to the combustion of a baseline fuel that would have been used if the cogeneration system did not provide **heat** to the plant.
c) **N2O from combustion.** N2O emissions corresponding to the combustion of a baseline fuel that would have been used if the cogeneration system did not provide **heat** to the plant.
d) **CH4 leaks during production of the baseline fuel.** If the baseline fuel is natural gas, CH4 emissions from natural gas production and leaks in the transport and distribution pipeline supplying the plant and leaks in the gas distribution piping within the plant, associated with the natural gas consumption identified in item (a) above. For other types of fuel, the baseline emissions associated with production and transportation are assumed zero for simplification and conservatism.
e) **CO2 from electricity generation.** CO2 emissions associated with the electricity that would have to be purchased from the power grid if the cogeneration system did not provide electricity to the plant.

The baseline emissions for the first four items are proportional to the amount of baseline fuel consumption in the plant that is offset by heat supplied by the natural gas cogeneration system. Each can be represented as the product of an emissions factor and an energy consumption, which depends on the heat output of the cogeneration system.

The consumption of the fuel avoided in the baseline for the supply of heat is determined as follows:

Annual energy consumption for heat supply at baseline plant, $ABEC_{BF}$ (GJ/year):

$ABEC_{BF}$ (GJ/year) = CAHO / e_b

Where CAHO = annual heat output from cogeneration system (GJ/year), and
e_b = industrial boiler efficiency (fraction, lower heating value basis).

The annual heat output from the cogeneration system (CAHO) is estimated on the basis of the heat output rate of the cogeneration system (*CHOR*) and an estimate of annual operating hours (*AOH*) of the cogeneration system. The formula is described below:

Annual baseline energy consumption for heat supply, $ABEC_{BF}$ (GJ/year):

$ABEC_{BF}$ (GJ/year) = CHOR * AOH / e_b

Where;
CHOR = cogeneration system heat output rate (GJ/h),
AOH = Annual operating hours (h/year), and
e_b = boiler efficiency (fraction, lower heating value basis)
In order to be conservative, a high value of eb is chosen. The methodology proposes a default value of 0.90

The value of CHOR may be determined from the specifications of the cogeneration system. A value of AOH should be determined from an engineering study of the proposed cogeneration system. Once the boiler energy consumption has been quantified, the four GHG emissions components (a to d, above) can be determined, as indicated below.

a) Baseline CO_2 emissions from combustion of baseline fuel for heat supply

Baseline CO2 emissions from combustion of baseline fuel for heat supply, BE_{th} (tonnesCO2/year):

BE_{th} (tonnesCO2/year) = $ABEC_{BF} * EF_{BF}$

Where:
$ABEC_{BF}$ = annual energy consumption for heat supply at baseline plant (GJ/year), and
EF_{BF}=CO2 emission factor of the fuel used to generate heat (t-CO2/GJ)

A value of EF_{BF} needs to be estimated from the following data sources. The numbers indicate a hierarchy in data to be used, with #1 being the best. If #1 data are not available, #2 data should be chosen. If these are not available, #3 data should be chosen.
1. National GHG inventory
2. IPCC, fuel type and technology specific
3. IPCC, near fuel type and technology

b) Baseline methane emissions from combustion of baseline fuel for heat supply to plant

Baseline methane emissions from combustion of baseline fuel for heat supply, $BE_{met\ comb}$ (tonne CH4/year):

$BE_{met\ comb}$ (tonne CH4/year) = $ABEC_{BF} * MEF_{BF} / 10^6$

Where
$ABEC_{BF}$ = annual baseline energy consumption for heat supply (GJ/year), and
MEF_{BF} = methane emission factor for baseline fuel combustion (kg CH4/TJ), lower heating value basis)

In units of carbon dioxide equivalent, $BE_{equiv\ met\ comb}$ (tonne CO2 eq/year)

$BE_{equiv\ met\ comb}$ (tonne CO2 − equiv / year) = $BE_{met\ comb}$ * GWP(CH4)
where GWP (CH4) = global warming potential of methane = 21

The value of MEF needs to be estimated from the following data sources. The numbers indicate a hierarchy in data to be used, with #1 being the best. If #1 data are not available, #2 data should be chosen.
1. IPCC, fuel type and technology specific
2. IPCC, near fuel type and technology

c) Baseline nitrous oxide emissions from combustion of baseline fuel for heat supply to plant

Baseline nitrous oxide emissions from combustion of baseline fuel for heat supply, $BE_{N2O\ comb}$ (tonne N2O/year):
$BE_{N2O\ comb}$ (tonne N2O/year) = $ABEC_{BF} * NEF_{BF} / 10^6$
Where
$ABEC_{BF}$ = annual baseline energy consumption for heat supply (GJ/year), and
NEF_{BF} = nitrous oxide emission factor for fuel combustion (kg N2O/TJ, lower heating value basis)

In units of carbon dioxide equivalent, $BE_{equiv\ N2O\ comb}$ (tonne CO2 equiv/year)

$BE_{equiv\ N2O\ comb}$ (tonne CO2 equiv/year) = $BE_{N2O\ comb}$ * GWP (N2O)

Where
GWP (N2O) = global warming potential of nitrous oxide = 310

The value of NEF needs to be estimated the following data sources. The numbers indicate a hierarchy in data to be used, with #1 being the best. If #1 data are not available, #2 data should be chosen.
1. IPCC, fuel type and technology specific
2. IPCC, near fuel type and technology

d) Baseline methane emissions from natural gas production and pipeline leaks in the transport and distribution

This section is applicable only for projects that displace natural gas in the baseline for heat generation. For baseline fuel other than natural gas, BE_{th_fug} is assumed zero for simplification and to be conservative. The value of MLR needs to be estimated from the following data sources. The numbers indicate a hierarchy in data to be used, with #1 being the best. If #1 data are not available, #2 data should be chosen.
1. National estimates (if available)
2. IPCC estimates of fugitive emissions from oil and natural gas activities.

Baseline methane emissions from natural gas production and leakage in transport and distribution, corresponding to heat supply, BE_{th_fug} (tonne CH4/year):

BE_{th_fug} (tonne CH4/year) = $ABEC_{NG}$ * MLR / 10^3

Where
MLR = methane leakage rate in natural gas production, transport and distribution leakage, including leaks at the industrial site (kg CH4 /GJ natural gas energy consumption, lower heating value basis).
$ABEC_{NG}$ = annual baseline natural gas energy consumption for heat supply (GJ/year)

In units of carbon dioxide equivalent emissions, $BE_{th\ equiv\ fug}$ (tonne CO2 equiv/year):
$BE_{th\ equiv\ fug}$ (tonne CO2 equiv/year) = $BE_{th\ fug}$ * GWP (CH4)
where GWP (CH4) is defined as before = 21

e) Baseline emissions of CO2 from electricity supply to industrial plant, which is offset by electricity supplied from cogeneration system

The final item of GHG emissions in the baseline arises from electricity, corresponding to the emissions avoided at the power plants supplying the public grid, The relevant formula is described below:

Baseline carbon dioxide emissions for electricity supplied, BE_{elec} (tonne CO2/year):
BE_{elec} (tonne CO2/year) = BEF_{elec} * CEO / 10^3
Where
CEO = cogeneration electricity output (MWh/year), and
BEF_{elec} = baseline CO2 emissions factor for electricity from public supply (kg CO2/MWh)

The actual baseline emissions are determined by monitoring cogeneration electricity output (CEO) and calculating BE_{elec}. For an a priori estimation of the baseline CO2 emissions for electricity supply to the plant, CEO is determined by the cogeneration electric power output (CPO) and annual operating hours (AOH), in a manner similar to Equation for heat output, and is described below.

Annual electricity generation from the cogeneration system, CEO (MWh/year):
CEO (MWh / year) = CPO * AOH
where CPO = cogeneration system net power output capacity (MWe), and
AOH = annual operating hours of cogeneration system (h/year)

Total baseline emissions are given by the sum of the components analyzed above:

$$BE_{total} = BE_{th} + BE_{equiv\ met\ comb} + BE_{equiv\ N2O\ comb} + BE_{th\ equiv\ fug} + BE_{elec}$$

Emission Reductions
Emission reductions are calculated as the difference between baseline and project emissions, taking into account any adjustments for leakage.

B.6.2. Data and parameters that are available at validation:

(Copy this table for each data and parameter)

Data / Parameter:	**EF_{NG}**
Data unit:	$kgCO_2/GJ$
Description:	CO_2 emission factor of natural gas
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied:	56.1
Justification of the choice of data or description of measurement methods and procedures actually applied :	This data is used to estimate the emissions of Carbon di oxide from the combustion of natural gas in the cogeneration system. Standard value recommended by UNFCCC
Any comment:	-

Data / Parameter:	**MEF**
Data unit:	kgCH4/TJ
Description:	Methane emission factor for natural gas combustion
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied:	1
Justification of the choice of data or description of measurement methods and procedures actually applied :	This data is used to estimate the emissions of methane from the combustion of natural gas in the cogeneration system. Standard value recommended by UNFCCC
Any comment:	

Data / Parameter:	GWP (CH4)
Data unit:	-
Description:	Global Warming Potential of methane
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied:	21
Justification of the choice of data or description of measurement methods and procedures actually applied :	Global Warming Potential of methane is used to calculate the equivalent CO2 emissions. Standard value recommended by UNFCCC
Any comment:	

Data / Parameter:	NEF
Data unit:	kgN2O/TJ
Description:	Nitrous oxide emission factor for natural gas combustion
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied:	0.1
Justification of the choice of data or description of measurement methods and procedures actually applied :	This data is used to estimate the emissions of nitrous oxide from the combustion of natural gas in the cogeneration system. Standard value recommended by UNFCCC
Any comment:	

Data / Parameter:	GWP (N2O)
Data unit:	-
Description:	Global Warming Potential of Nitrous oxide
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied:	310
Justification of the choice of data or description of measurement methods and procedures actually applied :	Global Warming Potential of Nitrous oxide is used to calculate the equivalent CO2 emissions. Standard value recommended by UNFCCC
Any comment:	

Data / Parameter:	MLR
Data unit:	Kg CH4/ GJ
Description:	Leakage of natural gas from production, transportation, distribution
Source of data used:	IPCC: 1996 revised guidelines Ref. Manual vol3 energy - page 1.131 table 1.64of the rest of the world
Value applied:	0.3
Justification of the	Standard value recommended by UNFCCC

choice of data or description of measurement methods and procedures actually applied :	
Any comment:	-

Data / Parameter:	**EF_{BF}**
Data unit:	$kgCO_2/GJ$
Description:	CO_2 emission factor of baseline fuel (Lignite)
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied:	101
Justification of the choice of data or description of measurement methods and procedures actually applied :	This data is used to estimate the baseline emissions of Carbon di oxide from the combustion of baseline fuel in the cogeneration system. Standard value recommended by UNFCCC
Any comment:	-

Data / Parameter:	**MEF_{BF}**
Data unit:	kgCH4/TJ
Description:	Methane emission factor for baseline fuel combustion (Lignite)
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied:	1
Justification of the choice of data or description of measurement methods and procedures actually applied :	This data is used to estimate the emissions of methane from the combustion of baseline fuel in the cogeneration system. Standard value recommended by UNFCCC
Any comment:	

Data / Parameter:	**NEF_{BF}**
Data unit:	kgN2O/TJ
Description:	Nitrous oxide emission factor for baseline fuel combustion
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied:	1.5
Justification of the choice of data or description of measurement methods and procedures actually applied :	This data is used to estimate the emissions of nitrous oxide from the combustion of baseline fuel in the cogeneration system. Standard value recommended by UNFCCC
Any comment:	

Data / Parameter:	BEF_{elec}
Data unit:	tCO_2e/GWh
Description:	**Baseline Emission Factor**
Source of data used:	CO2 Baseline Data base (CEA)
Value applied:	831.39
Justification of the choice of data or description of measurement methods and procedures actually applied :	CEA CO2 baseline database is used for estimated the baseline emissions from avoiding the grid electricity replacement. The value is standard value published by Central Electricity Authority.
Any comment:	-

B.6.3 Ex-ante calculation of emission reductions:

>>

Calculation of Project emissions:

a) **CO2 emissions from natural gas combustion in cogeneration system (E_{CS})**

$AEC_{NG\ (GJ/yr)}$	$EF_{NG\ (kgCO2/GJ)}$	$E_{CS\ (tCO2/yr)}$
77656.86167	56.1	4356.549939

b) **CH4 emissions from natural gas combustion in cogeneration system($E_{equiv\ met\ comb}$)**

$AEC_{NG\ (GJ/yr)}$	$MEF_{\ (kgCH4/TJ)}$	$E_{met\ comb}$	$E_{equiv\ met\ comb(tCO2e/yr)}$
77656.86167	1	0.077656862	1.630794095

c) **Nitrous oxide emissions from natural gas combustion in cogeneration system ($E_{equiv\ N2O\ comb}$)**

$AEC_{NG\ (GJ/yr)}$	NEF (kgN2O/TJ)	$E_{N2O\ comb}$	$E_{equiv\ N2O\ comb(tCO2e/yr)}$
77656.86167	0.1	0.007765686	2.407362712

d) **Methane emissions from natural gas production and pipeline leaks in the transport and distribution of natural gas, including leakage within the industrial plant ($E_{equiv\ fug}$)**

$AEC_{NG\ (GJ/yr)}$	MLR (kgCH4/GJ)	E_{fug}	$E_{\ equiv\ fug(tCO2e/yr)}$
77656.86167	0.3	23.2970585	489.2382285

Total project emissions are given by the sum of the components analysed above:

$$E_{total} = E_{CS} + E_{equiv\ met\ comb} + E_{equiv\ N2O\ comb} + E_{equiv\ fug} = 4{,}850\ tCO2e/yr$$

Calculation of Baseline Emissions:

Annual energy consumption for heat supply at baseline plant, $ABEC_{BF}$ (GJ/year):

CHOR (GJ/yr)	AOH(hrs/yr)	eb	$ABEC_{BF}$ (GJ/year)
26.874	7920	0.9	236491.2

a) Baseline CO_2 emissions from combustion of baseline fuel for heat supply (BE_{th})

$ABEC_{BF\ (GJ/yr)}$	$EF_{BF\ (kgCO2/GJ)}$	$BEth_{\ (tCO2/yr)}$
236491.2	101.2	23932.90944

b) Baseline methane emissions from combustion of baseline fuel for heat supply to plant ($BE_{equiv\ met\ comb}$)

$ABEC_{BF\ (GJ/yr)}$	$MEF_{BF\ (kgCH4/TJ)}$	$E_{met\ comb}$	$E_{equiv\ met\ comb(tCO2e/yr)}$
236491.2	1	0.2364912	4.9663152

c) Baseline nitrous oxide emissions from combustion of baseline fuel for heat supply to plant ($BE_{equiv\ N2O\ comb}$)

$ABEC_{BF\ (GJ/yr)}$	NEF_{BF} (kgN2O/TJ)	$E_{N2O\ comb}$	$E_{equiv\ N2O\ comb(tCO2e/yr)}$
236491.2	1.5	0.3547368	109.968408

d) Baseline methane emissions from natural gas production and pipeline leaks in the transport and distribution ($BE_{th\ equiv\ fug}$)

$ABEC_{ng\ (GJ/yr)}$	MLR (kgCH4/GJ)	E_{fug}	$E_{\ equiv\ fug(tCO2e/yr)}$
77656.86167	0.3	23.2970585	489.2382285

e) Baseline emissions of CO2 from electricity supply to industrial plant, which is offset by electricity supplied from cogeneration system (BE_{elec})

$BEF_{elec(kgCO2/MWh)}$	CEO (MWh/yr)	BE_{elec} (tCO2e/yr)
831.39	53210.52	44238.69422

Total baseline emissions are given by the sum of the components analyzed above:

$BE_{total} = BE_{th} + BE_{equiv\ met\ comb} + BE_{equiv\ N2O\ comb} + BE_{th\ equiv\ fug} + BE_{elec}$ = 68,776 tCO2e/yr

Emission Reductions

Emission reductions are calculated as the difference between baseline and project emissions, taking into account any adjustments for leakage.

B.6.4 Summary of the ex-ante estimation of emission reductions:

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Year	Estimation of project activity emissions	Estimation of baseline emissions	Estimation of overall emissions reductions

	(tCO2e)	(tCO_2e)	(tCO2e)
2009	4,850	68,776	63,926
2010	4,850	68,776	63,926
2011	4,850	68,776	63,926
2012	4,850	68,776	63,926
2013	4,850	68,776	63,926
2014	4,850	68,776	63,926
2015	4,850	68,776	63,926
2016	4,850	68,776	63,926
2017	4,850	68,776	63,926
2018	4,850	68,776	63,926

In the above table, the year 2009 corresponds to the period starting from 01.01.2009 to 31.12.2009. Similar interpretation shall apply for remaining years.

B.7 Application of the monitoring methodology and description of the monitoring plan:

B.7.1 Data and parameters monitored:

(Copy this table for each data and parameter)

Data / Parameter:	**Q_{NG}**
Data unit:	M3
Description:	The volume of the gas consumed by the industrial facility during the crediting period .The above data will be essential for estimating of the project emission there by the emission reduction.
Source of data to be used:	Natural gas consumption in the industrial unit is measured by flow meter present in the cogeneration unit which is also depicted from the gas invoice present with the industrial facility.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	The amount of natural gas to be consumed by the industrial facility in a year will be in the range of 4272788 metre cube of gas annually
Description of measurement methods and procedures to be applied:	The volume of natural gas consumed by the cogeneration unit will be measured by the flow meter present in the cogeneration unit. The meter will be calibrated as per the manufacturer specification and requirement felt on the part of the gas distribution company.
QA/QC procedures to be applied:	Quality control and quality assurance procedures are planned for monitoring of the project related data as the data will be used as a supporting documentation to calculate emission reduction by the project activity. Moreover the consumption of natural gas as depicted in the meter can also be cross checked with natural gas purchase invoice.
Any comment:	The data measured will be periodically (monthly) archived both in paper and electronic spreadsheet whereby the paper documentation will be kept with the industrial facility for the period of one year and the electronic data will be kept

	for a period of Crediting period + 2years

Data / Parameter:	CEO
Data unit:	MWh
Description:	The electrical energy obtained from the cogeneration unit is required for estimation of the net electricity generated which in turn is required for estimation of baseline emission from the grid in the absence of the project activity.
Source of data to be used:	The data will be obtained from the project developer. The amount of the electricity generated is reflected from the energy meter present with the cogeneration unit.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	It is expected that the cogeneration facility will be generating 53,210 MWh of electrical energy every year
Description of measurement methods and procedures to be applied:	The electricity generated by the cogeneration unit will be measured through appropriate energy metering system present with the cogeneration unit.
QA/QC procedures to be applied:	Quality control and quality assurance procedures are planned for monitoring of the project related data as the data will be used as a supporting documentation to calculate emission reduction by the project activity.
Any comment:	The data measured will be periodically (monthly) archived both in paper and electronic spreadsheet whereby the paper documentation will be kept with the industrial facility for the period of one year and the electronic data will be kept for a period of Crediting period + 2years

Data / Parameter:	Heat production
Data unit:	GJ
Description:	The industrial facility will be installing appropriate metering system for measurement of the steam generated form the project activity. The meter will be calibrated as per the manufacturer specification.
Source of data to be used:	Plant
Value of data applied for the purpose of calculating expected emission reductions in section B.5	-
Description of measurement methods and procedures to be applied:	From the steam flow meter the amount of heat produced is noted and the data will be recorded continuously (along with steam pressure and temperature and feed water temperature).
QA/QC procedures to be applied:	Quality control and quality assurance procedures are planned for monitoring of the project related data as the data will be used as a supporting documentation to calculate emission reduction by the project activity.

Any comment:	The data measured will be periodically (monthly) archived both in paper and electronic spreadsheet whereby the paper documentation will be kept with the industrial facility for the period of one year and the electronic data will be kept for a period of Crediting period + 2 years.

B.7.2 Description of the monitoring plan:

>>
Each of the nine industrial facilities has a representative person responsible for documenting the monitored data. Ravi Export Private Limited —as a bundling agent— also has a person responsible for the CDM project activity, who is responsible to collect all the information that will be entered in a database, and to carry out internal audits of the industries in order to guarantee the quality of the registries, prior to Verification by the Operational Entity.

In the CDM team, a special group of operators will be formed who will be assigned responsibility of monitoring of different parameters and record keeping as per the monitoring plan (Refer Annex 4). On a daily basis, the monitoring reports will be checked and discussed by the senior CDM team members/managers. In case of any irregularity observed by any of the CDM team members, the concerned person will be informed for necessary action. On a weekly basis, these reports will be forwarded to the management.

The monitoring methodology involves monitoring of the following data for estimation of emission reduction calculation:
• The natural gas consumption at the cogeneration system
• Heat production at the cogeneration system
• Electricity production at the cogeneration system
In order to verify data quality, the industries will work in accordance with Quality Assurance System, which intends to organize the information through data codification and internal audits.

B.8 Date of completion of the application of the baseline study and monitoring methodology and the name of the responsible person(s)/entity(ies)

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Date of completion of baseline study: 01/01/08

Person/ entity determining the baseline: Ravi Export Private Limited.

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

>>

02/10/2005

C.1.2. Expected operational lifetime of the project activity:

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25y-0m

C.2 Choice of the crediting period and related information:

C.2.1. Renewable crediting period

C.2.1.1. Starting date of the first crediting period:

>>

Not Applicable

C.2.1.2. Length of the first crediting period:

>>

Not Applicable

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>

01/01/2009 (or starts on the date of registration)

C.2.2.2. Length:

>>

10y-0m

SECTION D. Environmental impacts

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D.1. Documentation on the analysis of the environmental impacts, including transboundary impacts:

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The Environmental Impact Assessment is not required by the Environmental Impact Assessment notification under Environment Protection Act 1986 (Government of India) and hence not conducted as per the requirement of guidelines there under. This assessment is conducted by Kadodara Industrial Cluster, as a voluntary initiative to understand the impacts and mitigate any additional impacts that may arise due to the proposed project activity.

The installation of natural gas based cogeneration system at the industrial facility has been done keeping in consideration of all the environmental norms of the country. The cogeneration system utilizing natural gas replaces lignite for thermal energy generation and power import from grid with higher carbon and sulphur content.

Air pollution mitigation

- Natural gas containing negligible amount of sulphur will reduce the level of SOx pollution to a considerable extent which was emitted in the pre project scenario from burning of the lignite/carbon intensive grid for electricity generation.
- The manufacturer also provide guarantee on the emission level from the gas turbine w.r.t NOx emission and CO emissions
- The project activity will also result in mitigation of emission of suspended particulate matter.
- The project activity will also reduce the effect of thermal pollution owing to efficient waste heat recovery module.

Noise pollution mitigation

The total noise level would be below 85 dBA as the turbine and its accessories are enclosed within a sound attenuated structure made up of steel and mineral wool.

To keep the noise level much lower than that could be attained through the turbo generator set the industrial facility have constructed high and thick wall to reduce the noise level from the project activity below 70 dBA

Water Pollution mitigation

The industrial facility have adopted measures that result in zero blow down for the steam generating boiler and is within the permissible limit of waste water disposal regulation of the state pollution control board.

Contribution towards Social Environment

The company has created employment opportunities for local people. Moreover the project itself has resulted in an employment generation for more than thirty personals. Since its inception, it has enhanced the industrial activities of the city and encouraged setting up of many more industries in the region thus driving economic growth in this region.

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

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The State Pollution Control Board does not recommend any environmental impact assessment for this activity. The industrial facilities thus applied to the State Pollution Control Board and have been given a go ahead with No Objection Certificate for the project activity.

SECTION E. Stakeholders' comments

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E.1. Brief description how comments by local stakeholders have been invited and compiled:

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The stakeholders identified for the present project are as under:

Village Panchayat (local stakeholder review)
Gujarat Pollution Control Board
Gujarat Gas Company

Stakeholders list includes various governmental organizations and the local populace, which are involved in the project at various stages. All clearances from the above stakeholders are on the way and they would be reported to the validators during validation stage.

E.2. Summary of the comments received:

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The **Village Panchayat** / local elected body of representatives administering the local area are a true representation of the local population in a democratic country like India and hence their consent / permission to set up the project are essential. The Kadodara Industrial Cluster has conducted the necessary consultation process and waiting for approval.

Gujarat Pollution Control Board (GPCB) has prescribed standards of environmental compliance and monitor the adherence to the standards. The project activity is in the process of receiving the No Objection Certificate (NOC) from GPCB.

Gujarat Gas Company (GGC) the company that supplies gas for the project entities. A suitable purchase agreement with GGC for supply of natural gas has been executed.

All clearances from the stakeholders are in process and would be supplied in the final phase of the validation. The project promoters are expecting the comments from the stakeholders as positive.

E.3. Report on how due account was taken of any comments received:

>>

The proponents have approached the respective authorities for obtaining the necessary clearances and are expecting positive comments.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Ravi Export Private Limited
Street/P.O.Box:	301,302, Kadodara Bardoli Road,
Building:	Dhanlaxmi Complex
City:	Kadodara
State/Region:	Gujarat ;Taluka: Palsana District: Surat
Postfix/ZIP:	394327
Country:	India
Telephone:	91 02622 309583
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E-Mail:	ckkoth@rediffmail.com , projectmanager@palsanaenviro.com
URL:	
Represented by:	
Title:	Mr.
Salutation:	
Last Name:	Kothari
Middle Name:	
First Name:	Chandrakanth
Department:	
Mobile:	09824149410
Direct FAX:	
Direct tel:	
Personal E-Mail:	ckkoth@rediffmail.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

This is a unilateral CDM project activity undertaken by the project proponent for which no public funding has been used

Annex 3

BASELINE INFORMATION

Baseline Information of the data considered for estimation of Methane and Nitrous oxide emission factor is being obtained from revised 2006 IPCC guidelines for National Green house Gas Inventories: Reference Manual

Data for estimation of leakage from natural gas production and distribution is being obtained from revised 2006 IPCC guidelines for National Green house Gas Inventories: Reference Manual

Data for grid emission factor for the grid replacement is being obtained from the CEA CO2 baseline database

Annex 4

MONITORING INFORMATION

The Monitoring and Verification (M&V) procedures define a project-specific standard against which the project's performance (i.e. GHG reductions) and conformance with all relevant criteria will be monitored and verified. The aim is to enable this project have a clear, credible, and accurate set of monitoring, evaluation and verification procedures. The purpose of these procedures would be to direct and support continuous monitoring of project performance/key project indicators to determine project outcomes, Greenhouse Gas (GHG) emission reductions.

The M&V Protocol provides a range of data measurement, estimation and collection options/techniques in each case indicating preferred options consistent with good practices to allow project managers and operational staff, auditors, and verifiers to apply the most practical and cost-effective measurement approaches to the project. It includes developing suitable data collection methods and data interpretation techniques for monitoring and verification of GHG emissions with specific focus on technical / efficiency / performance parameters. It also allows scope for review, scrutinize and benchmark all this information against reports pertaining to M & V protocols.

The project revenue is based on the power and heat generated by the project activity (equivalent units displaced in the in fuel replacement and from the Gujarat state electricity grid). The monitoring and verification system would mainly comprise meters as far as power generation is concerned. The natural gas input is also to be monitored.

The measurement of the quantity of natural gas used produces evidence that the energy is being generated with associated onsite CO_2 emissions. The project would employ latest state-of-the-art monitoring and control equipment that will measure, record, report, and monitor and control various key parameters.

Parameters monitored will be quantity and quality of natural gas fuel used, total power generated, etc. All monitoring and control functions will be done as per the internally accepted standards and the project proponent.

The quantity of emission reduction units claimed by the project will depend on the actual generation mix of the grid in a particular year. CEA publishes yearly reports regarding the performance of all power generation units (which include private sector generation units and GSEB's own generation units).

Hence, authentic data related to the measurements, recording, monitoring and control of the generation mix of the GSEB network is ensured. The CEA report contains all information regarding type of generation like hydro, thermal, renewable etc., installed capacity, de-rated capacity, performance of generating unit, actual generation, capacity additions during the year, etc. which can be used for verification of generation mix and emission factors for baseline calculation for a particular year.

Project Parameters affecting Emission Reduction

Monitoring Approach

The general monitoring principles are based on:

- Frequency

- Reliability
- Registration and reporting

As the emission reduction units from the project are determined by the number of units replaced by the project activity at the regional grid (and then multiplying with appropriate emission factor), it becomes important for the project to monitor the net generation and captive consumption of power on a real time basis.

Frequency of monitoring
The project developer will install all metering and check metering facilities within the plant premises and will be record and monitor them on a continuous basis. The environmental monitoring will be undertaken periodically (quarterly) and will be undertaken by self / third party.

Reliability
The amount of emission reduction units is proportional to the net energy displaced in the grid and the amount of lignite displaced. The final kWh meter reading is the final value from project side. Since the reliability of the monitoring system is governed by the accuracy of the measurement system and the quality of the equipment to produce the result all power measuring instruments must be calibrated once a year for ensuring reliability of the system. All instruments would carry tag plates, which indicate the date of calibration and the date of next calibration. Therefore the system will ensure that the final generation is highly reliable.

Registration and reporting
Registration of data will be on-line in the control cabin through a microprocessor. However, hourly data logging will be there in addition to software memory. Daily, weekly and monthly reports will be prepared stating the generation, which will also be audited for statutory financial audit. The other major factors, which need to be ensured and monitored, are use of only natural gas fuel for power and heat generation and the parameters that would ensure smooth and regular operation of the plant. No other project specific indicators are identified that affect the emission reductions claims.

Natural Gas Requirement and Utilization

Availability of Natural Gas
The primary fuel used by the project activity is natural gas. The project proponent has entered into an agreement with Gujarat Gas Company Limited (GGCL) for the supply of natural gas for the project activity. The details of fuel along with the analysis report will be registered at the plant from which the emission can be computed.

Quantity of fuel used in the engine
The project proponent has entered into an agreement with GGCL for the supply of natural gas for the project activity. The net power generation is directly proportional to the fuel consumption and hence can be cross-verified. As it is mandatory for industries to submit yearly financial performance record (Statutory audit), which includes the net consumption of fuel and generation to the government, these figures can be crosschecked from respective records. The amount of purchased fuel, if any, will be based on invoices / receipts from gas companies. In case any other fossil fuel is purchased, will be reflected in the audit report. However the purchase agreement between SISL and GGCL clearly indicates that the quantity of natural gas agreed for purchase will be sufficient for the planned generation.

Quantity of the additional fuel purchased
Kadodara Industrial Cluster will maintain proper records of additional fuel if procured and will be kept open for verification. The quantity of the fuel received / purchased will be measured, recorded and monitored from starting point in the project i.e. at the entry of the project premises. Kadodara Industrial Cluster will install measuring /weighing system to record any additional fuel used. GGCL receipts will also indicate the quantity of fuel used.

Calorific value of fuel used in the engine
The main fuel to be used by the project activity for power generation is natural gas. The properties and composition of the natural gas are already established and will be consistent in the region. However, it is proposed to monitor various properties of natural gas by taking samples at random from the fuel lots from the processed fuel so that in case of any drastic change in the properties, corrective actions can be taken.

The measurement of fuel properties will be done at reputed laboratories as per international practices and data or documents will be kept open for verifiers. The data will also be computerized and monitored through management information system.

Operational Parameters of the power plant Unit
Total Power Generated
The total power generated by the "project activity" will be measured to the best accuracy in the plant premises and will be recorded & monitored. All instruments will be calibrated at regular intervals. All instruments carry tag plates, which indicate the date of calibration and the date of next calibration. The parameter will substantiate the smooth operations of the power plant. During verification the total power generated would be verified.

Power consumed by the plant auxiliaries
The power consumed by plant auxiliaries will be recorded to the best accuracy. All instruments will be calibrated at regular intervals. All instruments carry tag plates, which indicate the date of calibration and the date of next calibration. The total quantum of power consumed by the auxiliaries would affect the total power exported to the plant (grid power replacement) and therefore the amount of GHG reductions. Therefore any increase in the consumption pattern of the auxiliary system would be attended to.

Power consumption within plant premises
The project developer will install all metering and check metering facilities within the plant premises where power is consumed. The measurement will be recorded and monitored on a continuous basis by the project developer. All instruments will be calibrated at regular intervals. All instruments carry tag plates, which indicate the date of calibration and the date of next calibration.

Efficiency of the power plant project activity
Highly efficient engine is used by the project. Rotor directly coupled with the crankshaft to generate power. Quantity with major quality parameters of the fuel, engine pressure, and vibration will be measured. Based on the measured input and output parameters, power plant system efficiency will be calculated and monitored. In case of any irregularity, the root cause of the deviations would be identified and the necessary corrective actions will be taken. All the above parameters / factors will demonstrate the performance of the project at any point of time.

Verification
The performance of the "project activity" determines the quantum of CO_2 emission reductions. In other words, the longer the power plant runs, more would be the emission reductions. The project control system measures, collects the information about various process parameters, records, monitors and controls on a continuous basis, so that accessing and verification of actual data are possible at any point of time. The major activities to be verified are as under:

- Verification of various measurement and monitoring methods
- Verification of instrument calibration methods
- Verification of measurement accuracy

Like above activities, following major project parameters which affects the emission claims need to be verified, based on the available operating data is as under

- Fuel entry at the project activity premises
- Quantity of the natural gas/fuel along with the additional fuel purchased if any
- Type of fuels used in the engine
- Efficiency of power plant system
- Total generation of power and captive & auxiliary power requirements

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