FISCAL 2009 CDM/JI FEASIBILITY STUDY
PROVISIONAL REPORT
SUMMARY

Name of Study

CDM Project Study for Energy Utilization of Ammonia Plant Tail Gas in Syria

Organization

Shimizu Construction Co., Ltd.

Study Implementation Setup

Study Cooperating Agencies and Their Roles on the Japanese Side

- Osumi Co., Ltd.: Site information collection, formulation of monitoring criteria, evaluation of effect of environmental pollution countermeasures

- Climate Experts LLC.: Support for revision of the new methodology and PDD

Counterparts and other Cooperating Agencies and Their Roles on the Host Country Side

- General Fertilizer Company (G.F.C): Local counterpart – provision of local information and past operating data, etc.

1. Project Outline

The project site is an ammonia manufacturing plant located within a General Fertilizer Company (GFC) in Homs, the third largest city in Syria. The project aims to utilize purge gases (exhaust gas: CH_4 = 6~12%, H_2 = 60%, plus nitrogen, ammonia and argon, etc.), which until now has been discharged into the atmosphere, as an alternative fuel in the natural gas-fired boiler inside the plant. The baseline is maintenance of the status quo, and the project scenario entails removing ammonia from the purge gas and then using a dedicated boiler to supply steam.

The estimated reduction in greenhouse gases, obtained by combining the portion derived from the combustion and destruction of methane and the portion obtained by reducing fossil fuels, is approximately 85,000 tons (converted to CO_2) per year. In addition to realizing energy saving and GHG reductions through utilizing purge gas, this qualifies as a co-benefit-type CDM project since it will contribute to countering local pollution through preventing the atmospheric discharge of ammonia, which is a harmful substance.

Once the new methodology (NM0321) currently applied for at the United Nations is approved, the validation and UN registration process will be commenced and it is aimed to commence operation of the system from 2011.

The project owner is GFC, however, since this is a state-owned enterprise and it will take a long time to budget for the project costs, it is intended to actualize the project using the BTO system, in which the participating enterprises on the Japanese side bear the project cost and construct the facilities and the local side conducts operation. The project period is scheduled as 10 years, during which time it is estimated that greenhouse gas emissions will be reduced by 850,000 t-CO2/year.

Applied Methodology

New Methodology (NM0321, currently under application with the United Nations)

2. Contents of the Study

(1) Issues in the Study

- Combustion technology for purge gas, which is a mixture of methane and hydrogen, and know-how concerning the securing of safety. Concerning the combustion of hydrogen, domestic burner makers have know-how concerning combustion technology, however, hydrogen burners are special items of equipment. The purge gas targeted in the project is a mixture of methane and hydrogen and has similar composition to the gas that was previously used as city gas in Japan before the introduction of natural gas, however, it is necessary to confirm the technical issues that need to be overcome for stable and safe combustion and the combustion efficiency that can be achieved in the boiler.
- Technology for removing ammonia from purge gas. Since purge gas arises in the manufacture of ammonia, it contains ammonia, and since NOx is generated when this is combusted, it is essential to remove this ammonia. Moreover, since water resources are precious in Syria, the adsorption removal method using water would be expensive and also emotionally difficult to accept for the local people. Accordingly, it is necessary to examine a different removal approach other than the adsorption method which uses water.
- Examination of specifications of the boiler and ammonia removal device including purge gas combustion burner, and examination of the construction cost and construction period, taking into account the above two items
- Response to modifications, etc. in the new methodology (NM0321) currently submitted to the United Nations for approval. The new methodology will be subject to reexamination and modification depending on the conditions of review. In the case where tools are reviewed in the United Nations, the feasibility of application will need to be examined.
- Status of purge gas emissions under Syrian law; also whether or not it is necessary to conduct environmental impact assessment
- Since the DNA in Syria designates that stakeholders form the Technical Committee, it will be necessary to collect comments from the Technical Committee.

(2) Contents of the Study

Field surveys were implemented in the shape of the first field survey from August 30 to September 2 and the second field survey from November 1 to 5, 2009.

The following points have mainly been confirmed in the field surveys:

- The Study progress so far, situation regarding preparation of the new methodology and its application to the United Nations, the future approach and survey items, etc. were explained to the Ministry of Industry, the counterpart GFC (General Fertilizer Company) and the Ministry of State for Environment Affairs (the DNA). After understanding was obtained, future cooperation was confirmed.
- In the DNA, opinions were exchanged concerning the contents and key points of the new methodology, the method for advancing new methodology application procedure with the United Nations, and the contents of comments in the methodology panel, etc. The DNA is proud that the application for this new methodology has originated out of Syria, and it was confirmed that the DNA intends to offer the utmost support from now on.
- The DNA's policy concerning the method for collecting stakeholders' comments was confirmed. The Technical Committee is scheduled to be convened in the middle of November, and comments will be collected at this time. Moreover, concerning the project contents, it was confirmed that the contents were discussed and approved by the Technical Committee in October.
- It was confirmed with the EIA officer of the Ministry of State for Environment Affairs that an environmental impact assessment would not be required in the project. (Since the Ministry of State for Environment Affairs was newly established following reorganization of ministries this year, additional confirmation has been sought).
- In Syria, attention is being directed towards the promotion of energy saving and, since the effective utilization of purge gas will contribute to this, it was confirmed that the local side eagerly wishes to implement the project. Meanwhile, concerning the collection of ammonia, it was confirmed that the local side will not absolutely insist on its being reutilized in the production process.
- Site survey was implemented regarding the steam supply system, and confirmation was implemented regarding connections with the existing system, operating conditions of the system and specifications, etc.
- Hearing survey was implemented on recent operating conditions, and it was confirmed that there have been no changes in the purge gas flow and composition, etc.
- Syria has no prior experience of binding an MOU in a CDM project. Accordingly, discussions and adjustments concerning how to proceed have been conducted in economic ministerial meetings, and it has been decided that the minister in charge (Minister of Industry) can bind the MOU here. Consequently, the MOU was concluded.

Moreover, issues in the Study are as follows.

- Purge gas combustion technology

→ Concerning the handling of purge gas in general ammonia manufacturing plants and the characteristics of purge gas, etc., hearings were carried out with experts and the important points to

consider when combusting purge gas were confirmed. Moreover, concerning the purge gas combustion technology, upon implementing a hearing at a burner manufacturing company and ascertaining the unique issues entailed by purge gas, the following points were clarified: 1) purge gas should not be viewed as an extension of methane gas but rather as a type of hydrogen gas, and 2) care needs to be shown when selecting the diameter and material of pipes in line with the flow velocity of gas, etc. However, since the purge gas here is mixed with methane and thus has a slower combustion speed than that of pure hydrogen, it was concluded that this may be taken into consideration when deciding the equipment specifications.

- Technology for removing ammonia from purge gas

→ Hearing was conducted with an experienced engineering company in the ammonia manufacturing process field to gauge its thinking regarding the method of ammonia removal and concrete system design. Based on this, an ammonia adsorption removal system utilizing circulating water was examined, however, although recovered ammonia has some economic value, the equipment delivery lead-time and cost factors make it difficult to adopt in the project.

As an alternative method, collection based on ammonium sulphate was examined and was found to be highly feasible for application. It will be necessary to conduct discussions to determine whether the GFC side can accept this method from now on.

If the GFC side cannot accept this approach, another option may be to combust the purge gas without removing ammonia and to install a device for treating nitrogen oxides, however, this is not recommendable because it doesn't provide for the effective utilization of ammonia which is a useful resource.

- Status of purge gas emissions under Syrian law; also whether or not it is necessary to conduct environmental impact assessment

→ Ammonia discharge regulations are prescribed under Syrian environmental law, however, because purge gas is not covered by environmental regulations, the ammonia contained therein is also not targeted. However, the Syrian Ministry of State for Environment Affairs and Ministry of Industry are concerned about odor caused by ammonia in purge gas and highly regard the potential project benefits in this respect. In view of this background, the local side indicated in writing that environmental impact assessment would not be required in the project.

- Collection of comments from the Technical Committee

→ The project was discussed in the Technical Committee based on the PDD in October 2009. As a result, it was decided to give approval for the project. In reality, after the methodology has been registered, approval by the Government of Syria will be applied for with the official PDD, and it will be understood that government approval has been obtained. Moreover, in the Technical Committee that was staged in November 2009, discussions were held on the comments of the

Technical Committee taking into account the comments of the local stakeholders, and it was decided to support the project as a result.

- United Nations response to the new methodology

→ The new methodology submitted to the United Nations was forwarded for discussion under the title of NM0321 to Round 30 of the methodology panel. Following disclosure geared to receiving public comments from September 23 to October 13, no major comments were forthcoming. Discussion was carried out in the 41st methodology panel from October 19. The received comments and countermeasures are summarized below.

Moreover, in the 'Preliminary Recommendations' received from the United Nations, since it is hinted that corrections should be implemented according to ACM0012, examination was also conducted regarding this case too, however, since this would make the methodology too complex, it was decided to advance the work based on NM0321 for the immediate future.

Item	Comment	Countermeasure
Applicable conditions	The proof that ammonia off-gas is a waste product is insufficient (past + future). It is recommended that the ACM0012 method be introduced.	Add the proof method
	Add limitation to heat utilization and applicable conditions	Add
	Add the AOG amount, composition and feasibility of discharge in terms of law and safety to the applicable conditions.	Add
	Add that no other fuel will be mixed to the applicable conditions.	Add
	Add limitation to the existing facilities to the applicable conditions	Add
Boundary	Baseline and project boundary drawings should be given	State
	Addition of technical explanation	Add
	Handling of the case where AOG only replaces part of the baseline fuel	Specify
Baseline scenario	Distinguish between the scenario of AOG use in the existing boiler and AOG use in a new boiler	Correct
	If a new boiler is adopted, it will be necessary to identify the life of the existing boiler.	State that this should be examined with consideration also given to tools.
Additionality	Illustrate with examples what should be included in the investment analysis, etc.	Illustrate with examples
	In the barrier analysis, it is necessary to state specifically and quantitatively what the DOE should review.	State
	Common practice guidance is additionally required.	Add an explanation
Baseline emissions	Measures to prevent gaming, for example, incentives to increase AOG, are required (setting a cap on the amount of methane and base unit of ammonia, etc.)	Correct

	The case where multiple boiler fuels are used in the baseline	Correct
Monitoring	Method of seeking baseline boiler efficiency: Rather than measuring over a month, the "Tool to determine the baseline efficiency of thermal or electric energy generation systems" should be used.	Correct
	Improvement of the $AOG_{total,y}$ measurement procedure	Correct
	Concerning $MD_{project,y}$, revise the written format.	Correct

→ The revised version containing the above modifications was submitted to the UN secretariat and was discussed in the 43rd methodology panel held from February 22 to 26. As a result, the following questions were voiced and it was decided to conduct ongoing review.

1. Chemical composition of gas at the ammonia reactor inlet and outlet

2. a) Chemical composition of the purge gas, b) Have steps been taken to collect hydrogen? c) Composition of the gas discharged until now

3. Considering that the purge gas has combustible and explosive properties similar to hydrogen, are there no safety issues regarding the discharge of purge gas? Are industrial safety criteria complied with?

4. Except for ammonia collection and utilization as boiler fuel, are there any other possible methods of use in this plant?

5. Add a postscript concerning prevention of AOG flaring.

6. It is important to show that purge gas was certainly discharged before the project. For this reason, give examples showing a) how this point is certified, and b) what documents should be presented to the DOE.

7. What is the composition and calorific value of the gas to be used as fuel in the new boiler?

8. How many similar plants exist in Syria, in order to a) show that 'first-of-its-kind' barriers exist or b) to implement the common practice analysis.

3. Project Actualization

(1) Setting of the Baseline Scenario and Project Boundary

The physical project boundary in the proposed new methodology is "The area of GFC where purge gas is recovered and used as boiler fuel." In the project, it is planned to recover purge gas in the ammonia plant for use as fuel in a new mixed-fuel-fired boiler installed next to the two existing natural gas fired boilers. Therefore, the project boundary is limited to this area.

Moreover, the gases and emission sources contained in the project boundary are as follows. Recently the price of fuel including natural gas has been rising in Syria, however, since it is mainly because of technical barriers that the project has not been implemented in the past, the baseline scenario is maintenance of the status quo.

Table Outline of Gases and Emission Sources Within the Project Boundary

	Emission Source	Target Gas	Contained or Not	Validity / Explanation
Baseline	Purge gas discharge (no flaring or other treatment)	CH_4	Contained	This is the main generation source in the baseline.
		N_2O	Not contained	Purge gas contains hardly any N_2O. This is not considered in order to be on the conservative side.
		CO_2	Not contained	CO_2 in the purge gas is a common emission source in both the baseline scenario and project activities (emissions are equal). Therefore, it is not considered.
	Combustion of the boiler baseline fuel (corresponding to the fuel substituted by the purge gas)	CO_2	Contained	This is a major generation source in the baseline.
		CH_4	Not contained	This is not considered out of interests of preserving simplicity and to be on the conservative side.
		N_2O	Not contained	This is not considered out of interests of preserving simplicity and to be on the conservative side.
Project Activities	Combustion of the purge gas utilized in the project activities	CO_2	Contained	CO_2 from destruction of hydrocarbons (almost all methane) contained in the purge gas
		CH_4	Not contained	Not considered for simplification and because the quantities are negligible
		N_2O	Not contained	Not considered for simplification and because the quantities are negligible
	Electric power consumed for removal of ammonia contained in the purge gas	CO_2	Contained	This is considered to be an important source of emissions.
		CH_4	Not contained	This is hardly contained at all following combustion. It is not considered for the sake of simplification.
		N_2O	Not contained	Purge gas contains hardly any N_2O. It is not considered for the sake of simplification.

(2) Project Emissions

Since there is no need to consider leakage in the project activities, project emissions will be calculated according to the following expression based on the proposed new methodology:

Moreover, in the hearing with the burner manufacturer it was confirmed that there is no need to consider emissions of greenhouse gases in line with the non-combustion of purge gas.

$$PE_y = Q_{AOG,y} * EF_{CO2,AOG,y} + EC_{pc,y} * CEF_{EL,y}$$

With,

$$Q_{AOG,y} = Vol_{AOG,y} * NCV_{AOG,y}$$

PE_y	Project emissions	tCO_2e

$Q_{AOG,y}$	Net heating value of purge gas (after the ammonia collection equipment) used in the project activities	GJ
$EF_{CO2,AOG,y}$	CO_2 emission coefficient of purge gas (following ammonia collection)	tCO_2/GJ
$EC_{pc,y}$	Electric power consumed in collection of ammonia, etc.	MWh
$CEF_{EL,y}$	CO_2 emission coefficient per unit amount of electric power consumed in ammonia collection, etc.	tCO_2/MWh
$Vol_{AOG,y}$	Total quantity of standard state purge gas (following ammonia collection) used in the project activities	m^3
$NCV_{AOG,y}$	Net heating value of purge gas (after the ammonia collection equipment)	GJ/m^3

(3) Monitoring Plan

Major monitoring items are assumed to be as follows.

Item	Explanation
$Vol_{AOG,y}$	Total quantity of standard state purge gas (following ammonia collection) used in the project activities
w_{CH4}	Methane content of purge gas (after the ammonia collection equipment)
T	Temperature (attached to the flow meter) of purge gas (following ammonia removal)
P	Pressure (attached to the flow meter) of purge gas (following ammonia removal)
$NCV_{AOG,y}$	Net heating value of purge gas (after the ammonia collection equipment)
$NCV_{NG,y}$	Lower heating value of natural gas combusted with purge gas
$EF_{CO2,BLf}$	Emission coefficient of CO_2 in the baseline fuel (natural gas in this project) that would be used if the project weren't implemented
$EF_{CO2,AOG,y}$	Emission coefficient of CO_2 in purge gas (after the ammonia collection equipment)
$EC_{pc,y}$	Electric power consumed in collection of ammonia
$CEF_{EL,y}$	Emission coefficient of CO_2 per unit electric energy of power consumed in the ammonia collection equipment.
$Q_{project,y}$	Net heating value of steam produced by the project fuel (purge gas after the ammonia collection equipment)
$\eta_{PJboiler}$	Thermal efficiency of the boiler (purge gas boiler) in the project scenario
$\eta_{BL,boiler}$	Thermal efficiency of the boiler in the case where the project isn't implemented

(4) Greenhouse Gas Emission Reductions

Emission reductions can be calculated as follows.

Table Results of Trial Calculation of Emissions and Emission Reductions

Year (month)	Estimated project emissions (tCO_2 e)	Estimated baseline emissions (tCO_2 e)			Estimated leakage (tCO_2 e)	Estimated total emission reductions (tCO_2 e)
		Methane destruction	Fuel reduction	Total		

2011 (1-12)	8,004	58,926	34,328	93,254	0	85,250
2012 (1-12)	8,004	58,926	34,328	93,254	0	85,250
2013 (1-12)	8,004	58,926	34,328	93,254	0	85,250
2014 (1-12)	8,004	58,926	34,328	93,254	0	85,250
2015 (1-12)	8,004	58,926	34,328	93,254	0	85,250
2016 (1-12)	8,004	58,926	34,328	93,254	0	85,250
2017 (1-12)	8,004	58,926	34,328	93,254	0	85,250
2018 (1-12)	8,004	58,926	34,328	93,254	0	85,250
2019 (1-12)	8,004	58,926	34,328	93,254	0	85,250
2020 (1-12)	8,004	58,926	34,328	93,254	0	85,250
Total (tCO_2 e)	80,040	589,260	343,280	932,540	0	852,500

(5) Project Period and Crediting Period

The service life of equipment to be introduced in the project is around 15 years, and this may also be considered as the project implementation period.

As for the crediting period, this is assumed to be 14 years (7 years x 1 renewal = 14 years) based on the project implementation period.

However, in line with the bolstering of efforts to counter global warming in the future, it is unlikely that the discharge of purge gas, i.e. maintenance of the status quo, will be the baseline in 7 years. Accordingly, it is more realistic to assume a crediting period of 10 years (10 years x no renewal = 10 years).

The next step towards project realization will be to secure United Nations approval for the new methodology. Following that, the PDD will be finished, validation will be implemented and procedures for securing United Nations registration will be conducted. When registration is completed, the equipment installation works will be implemented and the operation stage will be entered.

As soon as approval for the new methodology is given, validation and procedures for securing United Nations registration will be conducted, and it is aimed to commence operation in July 2011. Moreover, since around six months will be needed for the construction works, the project start date should be around January 2011.

Concerning this thinking, explanations have been given to the host country's DNA and Ministry of Industry and it has been confirmed that no problem exists regarding acquisition of approval in the host country.

(6) Environmental Impact and Other Indirect Impacts

In the Syrian Arab Republic, requirements concerning environmental impact analysis are prescribed according to each type of project. However, nothing is prescribed concerning this project because it is a wholly new type. Accordingly, as a result of holding discussions with the General Commission for Environmental Affairs (GCEA), which is responsible for environmental administration, it seems that

there will be no need to implement an EIA for the project. After that, since the Ministry of State for Environment Affairs was established following the reorganization of ministries, this matter was confirmed once again with the ministry and reassurance was given that no EIA will be necessary. Moreover, a letter to this effect has been received from the Minister of State of Environment Affairs.

Other indirect impacts include increased vehicle traffic, noise and vibration, etc. during the construction works, however, since construction is only scheduled to last two or three months and the amount of noise and vibration will be equivalent to that generated in ordinary construction works, this is not considered especially to be a problem.

(7) Stakeholders' Comments

The DNA in Syria is the Ministry of State for Environment Affairs. The DNA defines the stakeholders as the Technical Committee, so the committee's opinion will represent the stakeholders' opinion. The Technical Committee is composed of members from the following organizations.

a) Ministry of State for Environment Affairs.
b) Ministry of Transportation.
c) Ministry of Petroleum.
d) Ministry of Electricity.
e) National Energy Research Center (Ministry of Electricity).
f) Ministry of Industry.
g) Ministry of Local Administration.
h) Country Planning Commission.

The Technical Committee was staged in the middle of November and, based on the PDD which was prepared when the new methodology was submitted, the comments of stakeholders were compiled as follows.

Prior to this, the Ministry of Industry gave explanations to the local residents (local stakeholders), and it was reported to the Technical Committee that the local stakeholders are in favor of the project.

In response, the Technical Committee has issued concrete comments in support of the project, and so far no voices have been raised in opposition.

(8) Project Implementation Setup

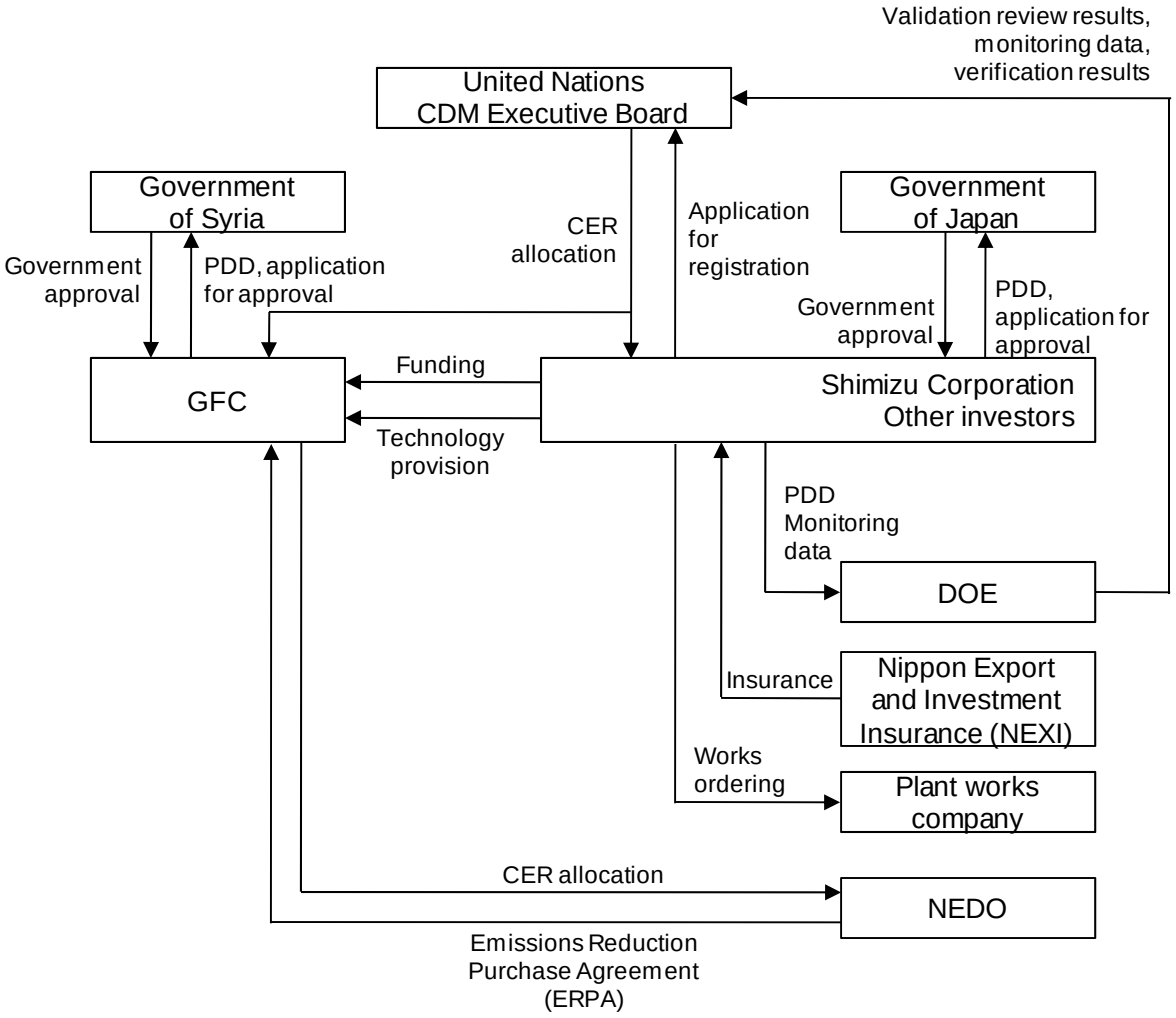

Figure Project Implementation Setup

The project implementation setup remains unchanged from the results of last year's study. That is, in the project, the participants on the Japanese side will carry out the initial project investment (ordering of construction works), however, the GFC will bear full responsibility for all other project operation and management (monitoring, facilities operation and maintenance, accounting, CER management, subcontracting, personnel affairs, reporting, etc.). The main duties of the Japanese participants will be composition of the project (including funding), planning of implementation and transfer of technology.

Project composition includes the securing of approval for the new methodology, preparation of the PDD and United Nations registration, etc. which are essential for implementing the project as a CDM undertaking.

The actual operating body in the project will be the GFC company. This company will be wholly responsible for the project operation and management (monitoring, facilities operation and maintenance, accounting, CER management, subcontracting, personnel affairs, reporting, etc.). At this time, the Japanese project participants will conduct technical guidance and so on.

Moreover, concerning the site installation works for equipment and auxiliary instruments, it is scheduled to order work to local subcontractors.

(9) Fund Plan

Concerning the fundraising method, this remains unchanged from the results of last year's study. In other words, since initial investment in this project is relatively small at around 300 million yen, direct investment (fundraising) by investors is the most viable alternative. The project participating companies including Shimizu Corporation are willing to raise funds for the project, and it will be possible to secure the necessary funding from these sources.

Accordingly, it is expected that funds will be provided at the start of the construction works, and that project development expenses up to that point will be borne by the participating enterprise.

Running costs following the start of operation will be covered through selling off credits.

(10) Economic Analysis

Concerning the project initial investment cost, as a result of conducting due diligence in consultation with the burner manufacturer, etc., the initial cost was estimated a little higher at approximately 300 million yen. The economic analysis was carried out based on this.

Moreover, concerning the maintenance cost, this includes the cost of recovering ammonia. Moreover, reflecting the price of natural gas in GFC, revision was carried out on revenue derived from fuel substitution.

(11) Demonstration of Additionality

Concerning demonstration of additionality, a number of additions became necessary as a result of review of the methodology, however, the basic thinking remains the same.

As was indicated earlier, the baseline scenario is expected to be maintenance of the status quo.

The baseline scenario will basically be demonstrated through grasping how things have actually been within GFC from the past to present and presenting reasons and evidence to support this.

Conditions so far can be summarized as follows:

- Purge gas is currently not effectively utilized but is entirely discharged into the atmosphere.
- GFC has tried to make effective use of purge gas, however, these efforts have been unsuccessful for various reasons.

Various reasons specifically refer to the following:

- Lack of technical capacity within GFC itself: it doesn't possess the technology for appropriately combusting low calorie purge gas, neither does it have more sophisticated membrane separation technology. Moreover, it does not possess technology for dealing with ammonia combustion or removing NOx from the purge gas.

- Kellogg Co., which is seeking the provision of technology from external sources, has been unilaterally suspended due to economic sanctions imposed by the United States, and it has not received cooperation from any other advanced countries either.
- The price of natural gas is artificially held to a lower level than in other countries, thereby making it difficult to secure economic incentives.

Regarding existence of barriers like those described above, evidence is being collected and a chronological table is being compiled with a view to tracking the decision making by the GFC.

Concerning actual proof, a number of baseline scenarios different from maintenance of the status quo are presented and the most likely one (in the case where the CDM project is not implemented) is selected as the baseline scenario. In this case, the project is divided into two major components, and the separate scenarios (combinations) are examined within these:

- Method of purge gas treatment/utilization
  - > Project activities
  - > Maintenance of status quo
  - > Flaring
  - > Uses other than for steam
  - > Utilization as raw materials
  - > Sale of purge gas
- Supply source of heat (produced in the project)
  - > Project activities
  - > Maintenance of status quo
  - > Utilization of fossil fuels not used at present

As was described earlier, maintenance of the status quo is the baseline scenario and it can be demonstrated that the project is additional.

(12) Prospects for and Issues in Project Realization

The Government of Syria has already finalized its setup and procedure for giving approval to CDM projects, and state approval has already been granted to two such undertakings.

The project in hand is highly regarded by the government and the MOU has been concluded with the Minister of Industry. Also, the project counterpart GFC welcomes project implementation because of the environmental improvement and overseas investment it will bring.

In the project, it is expected to secure CERs from 2011 and, providing that the price of CERs is 10US$/$tCO_2$ or more, the project should be economically viable.

However, it will be necessary to obtain approval from the United Nations for new methodology in the project. Since clerical procedures starting from application for registration are extremely conservative in the

United Nations, there is concern that this could hold up the project implementation schedule. It is hoped that United Nations procedures are speeded up in the aftermath of COP15.

4. Realization of Co-benefit in the Host Country

(1) Evaluation of Pollution Prevention in the Host Country

The project site of GFC is one of the sources of atmospheric pollution in Homs City. Moreover, the purge gas targeted by the project contains ammonia which is harmful to human health, and the treatment of this is needed from the viewpoint of pollution prevention.

Although the concentration of ammonia in purge gas is less than 3%, the smell of ammonia pervades inside and outside the plant and it cannot be denied that this is having an adverse impact on the surrounding environment.

Since it has been confirmed in past studies that ammonia removal equipment can achieve a removal rate of almost 100%, the quantity of ammonia that will be circumvented from atmospheric discharge (= amount baseline emissions) is calculated as follows:

- Quantity of purge gas = 7850Nm^3/h (dry gas) (7680 hours operation per year)
- Concentration of ammonia = 2.9%
- Weight of ammonia = 0.759 kg/Nm^3

  Circumvented ammonia emissions= 7850 x 7680 x 2.9% x 0.759÷1000=1,327 t/year

Since it can be assumed that emissions during project implementation will be zero, it is estimated that the atmospheric discharge of approximately 1,300 tons of ammonia will be circumvented every year.

Concerning monitoring of the ammonia concentration during project implementation, it is assumed that the ammonia concentration and purge gas flow rate will be measured at the ammonia removal equipment inlet and that monitoring will be conducted while the facilities are in operation.

(2) Proposal of Co-benefit Indicators

Concerning proposal of co-benefit indicators, examination was conducted on preparing an indicator for converting the GHG reduction and ammonia emissions reduction to currency value based on lifecycle cost.

Regarding the currency conversion of GHG emission reductions, it should be possible to set an indicator based on the economic value of carbon credits (10US$/tCER).

An indicator is being examined so that the reduction in ammonia emissions can be evaluated based on the lifecycle cost of the ammonia collection equipment and the con-benefit effect can be assessed in unison with the amount of GHG reductions. In other words, the initial cost and running cost of the ammonia collection equipment is equalized as the lifecycle cost during the operating period, and the cost that would have been needed in the event where only ammonia collection is performed without implementing the project is calculated. If the project is implemented, it will be possible to both reduce

GHG and ammonia emissions and, since the lifecycle cost of the ammonia collection equipment will be rendered unnecessary, this can be added as an economic co-benefit.

5. Study Results on Contribution to Sustainable Development

The project will lead to the following environmental improvements in GFC and contribute to sustainable development.

- Environmental improvement effect through limitation of emissions of ammonia contained in purge gas

- Employment creation effect through project realization (construction, operation)

- Effect in terms of development of human resources through introduction of new technology (monitoring techniques, etc.)

In Syria, as in other developing countries, growing demand for energy such as electricity and gasoline, etc. has become a major issue, and the impact of recent inflation in fossil fuel prices has extended to GFC.

For the agricultural country of Syria, GFC is the only chemical fertilizer plant in the country and since the limitation of fertilizer prices is an important thing in terms of farm policy, the effective utilization of purge gas (a clean energy) will not only help mitigate air pollution and aid energy saving, but it will also contribute to the sustainable development needs of Syria through stabilizing fertilizer prices and thus stabilizing civil lifestyles.

Moreover, since Syria has relatively fewer energy resources than other countries in the Middle East, promotion of energy saving including the use of renewable energy is a highly important issue, and this project, which proposes to utilize purge gas that could not previously be used for technical reasons, can also contribute to sustainable development from the viewpoint of technology transfer from an advanced nation.