CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-SSC-PDD)
Version 03 - in effect as of: 22 December 2006

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Revision history of this document

Version Number	Date	Description and reason of revision
01	21 January 2003	Initial adoption
02	8 July 2005	• The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. • As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>.
03	22 December 2006	• The Board agreed to revise the CDM project design document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM.

SECTION A. General description of small-scale project activity

A.1 Title of the small-scale project activity:

Energy efficient Information Technology Park by India Land & Properties Limited.
Version: 01
Date : 10.10.07

A.2. Description of the small-scale project activity:

Purpose:
The purpose of the project activity is implementing various energy efficient technologies to reduce the consumption of emission intensive grid power for the operation of IT Park thereby reducing green house gas (GHG) emissions.

Project description
India Tech Park is a state-of-art-Information Technology Park being developed on 9.94 acres of land at Ambattur Industrial Estate, Chennai, India. The project is owned by M/s India Land & Properties Limited. The IT Park is being developed in two phases with Phase 1 comprising of Tower A&B and Phase 2-comprising Tower C. The IT park offers a total built-up area of 1.8 million sq. ft. with cumulative parking space of 0.7 million sq.ft in 3 basements. The IT Park is designed to accommodate all support facilities such as Food court, banks & ATMs, Fitness centre, Auditorium, cafeteria etc in the ground floor. In addition IT building comprises of helipad facility, swimming pools and VIP lifts.

The IT Park has been designed by the world renowned architect and 2004 "*Laureate Pritzker" Prize Winner – Zaha Hadid Architects,* UK with the support of a resident architect with structural and façade consultants from Singapore and experienced M& E consultants in India. The IT Park complies with both National Building Codes prescribed by the Government of India and also international standards for infrastructure facilities to suit the requirements of IT/ITES companies.

As an initiative to provide an eco-friendly and energy efficient workspace, various "Green" features have been incorporated in the design with intricate equipment/system selection procedures to ensure the maximum adherence/value engineering to the design intent. Special care has been taken to locate the utility building housing all the service equipment viz. chiller, DGs, Electrical/control panels, STP etc away from the main building to ensure minimal noise and heat effect to the building and its occupants.

The site selection, use & procurement of construction material, good construction & commissioning practices are in line with the mandatory energy savings as laid down by the United States Green Building Council (USGBC) standards that makes the IT park a prospective Gold Rated Green Building.

Contribution to sustainable development

Social well-being
Employment opportunities are increased for both skilled, unskilled & contract labours in the surrounding area due to the implementation of the project. This will increase the income level and hence will improve the living standards of the people involved. Local people in the surrounding areas are employed for civil

and mechanical works during the implementation of the project. Operation & maintenance facility providers employ local people for their works.
Electricity facilities and other infrastructural facilities like roads and communication will improve in the area due to implementation of the project activity and will contribute towards the improvement of the socio economic conditions of the local area to greater extent.

Economic well-being
The project activity will contribute to the national economy by reducing the import of electricity from the national grid thereby contributing the reduction in import of fossil fuels required generation of equivalent quantity of gird power. The project activity will encourage other IT Parks to invest in energy efficient projects/ initiatives and will contribute towards bridging the gap between the demand and supply of the power scenario in the country.

Environmental well-being
Energy efficient measures to be implemented in the project building that will house IT and ITES companies' will lead to reduced energy consumption and will draw less power from the grid hence will emit reduced green house gases into the atmosphere. This will reduce the pressure on fossil fuels required for power generation. Thus, the project will lead to overall improvement of the environment due to reduced usage of emission intensive gird power.

Technological well being
The CDM project activity will encourage other developers in the construction and in the IT sector to adopt similar energy efficiency measures to save energy and become cleaner in operations.

A.3. Project participants:

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)
India (Host)	M/s India Land and Properties Ltd (ILPL)	No

A.4. Technical description of the small-scale project activity:

A.4.1. Location of the small-scale project activity:

A.4.1.1. Host Party(ies):
India

A.4.1.2. Region/State/Province etc.:
Southern region /Tamil Nadu

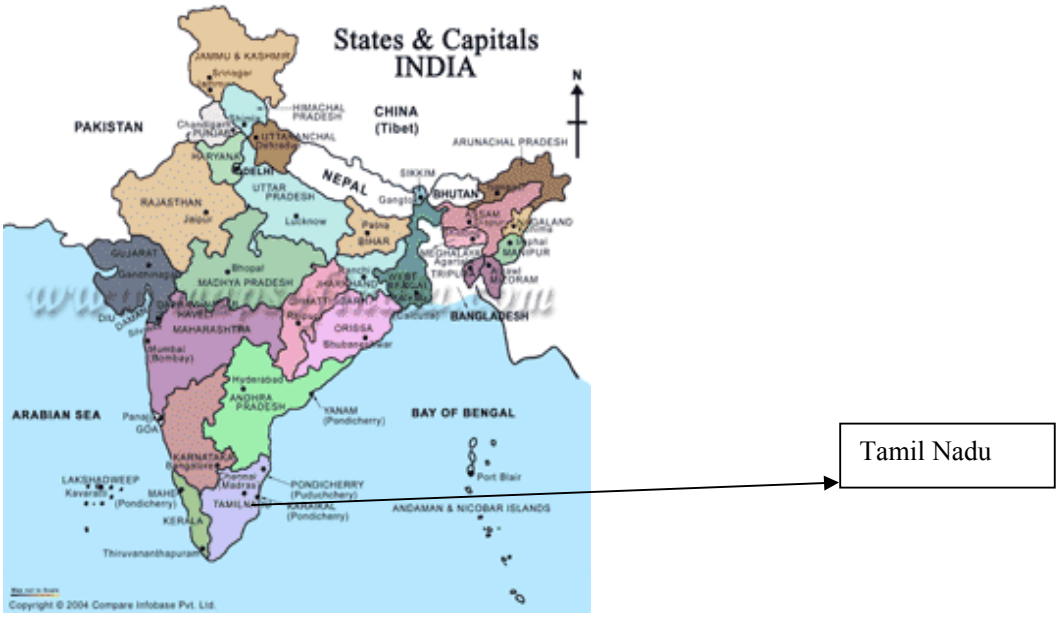
A.4.1.3.	City/Town/Community etc:

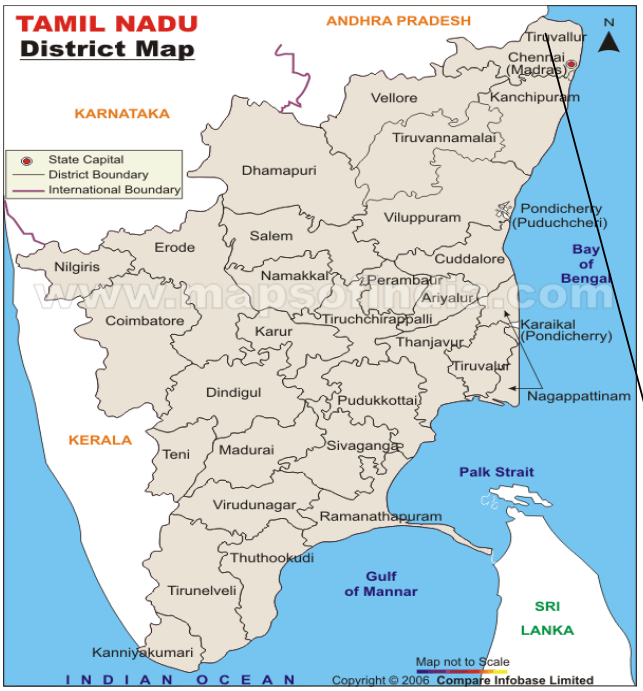
Chennai/ Ambattur

A.4.1.4.	Details of physical location, including information allowing the unique identification of this small-scale project activity :

The project is located in Ambattur, a major municipality in Thiruvallur district, north-west of Chennai in the state of Tamil Nadu, India. Ambattur is located at 13° 6′ 0″ N & 80° 9′ 36″ E. The nearest airport to the project location is Chennai airport & the nearest railway station is Ambattur, Chennai.

Map of India showing the location (state and city) of the project.





Tiruvallur district

A.4.2. Type and category (ies) and technology/measure of the small-scale project activity:

According to the simplified modalities and procedures described in Appendix B for small-scale CDM project activities, the project activity falls under the following:

Type	*Category*	*Sectoral Scope*
II – Energy Efficiency Improvement Projects	E – Energy efficiency and fuel switching measures for buildings	03

Technology/measure of the small-scale project activity

Heating Ventilation and Air-Conditioning (HVAC) system

Heating Ventilation and Air-Conditioning system of the project building will comprise of centralized energy efficient chillers with a capacity of 4500 TR capacity. Building Management System will provide automated control and monitoring system for HVAC. The secondary chilled water pumping system is provided with Variable Frequency Drives (VFDs) for better energy efficiency. The system is provided with energy efficient Air Handling Units (AHU) and innovative hybrid chillers which is a combination of Euro Vent certified air cooled and water cooled chillers. It optimizes net kilowatt energy per ton of AC to 0.97 KW / TR (as per equipment design) from the conventional air cooled chiller energy consumption of 1.40 KW / TR (as per ASHRAE 90.1, 1999), i.e., an effective reduction in chiller energy consumption by ~ 18%.Dedicated treated fresh air machine is provided in each AHU room. The system is designed for an average occupancy level at 70 sq ft/person. Heat Recovery wheel (HRW) efficient both in sensible as well

as latent loads, both above 65% (as per equipment design) is provided in each AHU rooms. Thermal storage system contributes around 15% of the peak air-conditioning demand. AHUs and TFAs are fitted with high efficient EFF1 motors. (According to Indian Electrical & Electronics Manufacturers Association, IEEMA, specifications, motors are categorized as EFF1, EFF2 & EFF3, of which EFF1 is the highest efficient motor).

Heat Recovery Ventilators: A heat recovery ventilator (HRV) is provided in the project building that can make mechanical ventilation more cost effective by reclaiming energy from exhaust airflows. HRVs use heat exchangers to heat or cool the incoming fresh air, recapturing 60 to 80 percent (as per system design) of the conditioned air that would have otherwise lost. HRVs play a major role in climate zones like Chennai where cooling loads place strong demands on HVAC systems.

Lighting system

Energy efficient lighting system is provided in the common areas. Lighting is generally designed based on IS 3646 standards. Lighting design is based on room dimensions, colours of wall/ceiling, height of ceiling, type of false ceiling and type of activity in the rooms. Based on design factors like room index, utilization factor, maintenance factor etc., suitable light source and fittings are selected for different areas. Environment-friendly Compact Fluorescent Lamps (CFL) are used in most of the areas of the building. Since the tenants / occupant of the building are responsible for the interior electrification, it is proposed to illuminate only common areas of the building.

Occupancy sensors are provided in toilets, plant rooms etc. Energy efficient LEDs are provided in the panel control lamps. Photo sensors and timers are provided in the common area lighting system.

The type of fittings selected and average level of illumination maintained in various areas are as given below:

Pantry Electrical Room, AHU Room : 200Lux.
Passages : 100 – 150Lux.
Basement : 100Lux
Exterior Lighting : 20Lux.

Type of fittings installed in various areas
Passages :Decorative Fitting with CFL Lamps.
Electrical / AHU Rooms / Utility Building: Florescent Lamp with HF Ballast.

The design parameters shall be fine-tuned based on the type/technology/efficiency of the fixtures and the lighting level adequacy in the proposed locations to reduce the lighting loads. Use of renewable energy based lighting for peripheral and interior lighting will be considered based on the constructability & commercial feasibility.

Integrated Building Management system

The building management system consists of the following features:

- Access control through HID Proximity System
- IP based closed circuit TV monitoring and recording.
- Boom barrier and turnstile to control traffic
- Lighting scheduling and controlling
- AHU, Heat Recovery Unit temperature controlling and scheduling
- Chiller plant monitoring and controlling

- Lift supervisory station.
- Electrical power monitoring and controlling
- Energy monitoring & billing for electrical and air-conditioning
- CO_2, CO monitoring and controlling
- Water system monitoring and controlling
- Fuel system Monitoring and controlling
- Fire detection, alarm and suppression system monitoring.

Façade Design

The glass envelopes used in the building are with reduced "Relative Solar Heat gain" at 145 watts / sq.m (as per design specifications) that is achieved by optimizing glass U-value and solar co-efficient, which in turn will reduce the solar load on AC system. The design also considers achieving maximum "day light" effect. Nearly 40% (average) glass area as per architectural calculations is fritted with ceramic material to reduce solar load on AC system and also reduces glaring without affecting the day-light effect. Majority of services are located in the southern side of the building to reduce south solar gain and air-conditioning energy.

Green building features

The building is registered with US Green Building Council for LEED Certification. The building is an energy efficient building with latest eco-friendly techniques/equipment. The project incorporates efficient use of water by incorporating state-of-art waste water treatment cum recycling plant to achieve Zero discharge except for landscaping water requirements. Integrated Building Management System offers effective control over the operating parameters of the building. The building is provided with rain water harvesting facility and also inter-locking pavers for rain water percolation on the walkways.

Other features of the project

- Energy efficient HVAC system with air +water cooled chillers +Thermal Energy Storage combined with AHU, HRU & TFA units. All units are VFD controlled.
- Integrated Building Management System to control and optimize the operation of all the systems and monitor the energy consumption data.
- Non reflective transparent eco-friendly glass façade with ceramic fritting to minimize the glass solar factor and U-Value to reduce air-conditioning load while maintaining the aesthetics of the building.
- Renewable energy based lighting and heating systems.
- Power factor & maximum demand monitoring, total integrated fire alarm system, real time detection of faults in electrical and mechanical systems to reduce downtime.

A.4.3 Estimated amount of emission reductions over the chosen crediting period:

For fixed crediting period of 10 years, the project activity would lead to an estimated emission reduction of 94,110 CERs, as given below:

Years	Estimation of annual emission reductions in tonnes of CO_2e
2009	9,411
2010	9,411
2011	9,411

2012	9,411
2013	9,411
2014	9,411
2015	9,411
2016	9,411
2017	9,411
2018	9,411
Total estimated reductions (tonnes of CO_2e)	94,110
Total number of crediting years	10
Annual average of the estimated reductions over the crediting period	9,411

A.4.4. Public funding of the small-scale project activity:

No public funding is involved in any way for the project activity.

A.4.5. Confirmation that the small-scale project activity is not a debundled component of a large-scale project activity:

A proposed small-scale project activity shall deemed to be a debundled component of a large project activity if there is a registered small-scale CDM project activity or an application to register another small-scale CDM project activity:

(1) With the same project participants;
(2) In the same project category and technology/measure;
(3) Registered within the previous 2 years; and
(4) Whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point.

None of the above applies to the proposed building project implemented by M/s India Land and Properties Ltd. Hence, the proposed project is not a debundled component of a larger CDM 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 small-scale project activity:

Title: Energy efficiency and fuel switching measures for buildings (version 10).

Reference: Appendix B of the simplified modalities and procedures for small-scale CDM project activities – Indicative Simplified Baseline and Monitoring Methodologies for selected small-scale CDM project activity categories (Version 10, EB 35).

http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html.

B.2 Justification of the choice of the project category:

Justification of how the proposed project activity conforms to the project type and category selected is as follows:

Applicability Criteria	Project eligibility
"any energy efficiency and fuel switching measure implemented at a single building, such as a commercial, institutional or residential building, or group of similar buildings, such as a school, district or university".	The project activity is a commercial building in which various energy efficiency measures are implemented.
"The technologies may replace existing equipment or to be installed in new facilities"	The project activity involves installation of energy efficient technologies in a new facility.
The aggregate energy savings of a single project may not exceed the equivalent of 60 GWh per year."	The aggregate projected energy savings of the project activity is 9.114 GWh per year which is less than 60 GWh/year.

B.3. Description of the project boundary:

According to Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories under methodology AMS II.E./Version 10, Sectoral Scope 3, EB 35, the project boundary is the physical, geographical site of the building(s).

Hence, for the project activity under consideration, the project boundary will include "India Tech Park" building where the Energy Efficiency measures are implemented.

B.4. Description of baseline and its development:

The methodology AMS IIE states, "energy baseline consists of the energy use of the existing equipment that is replaced in the case of retrofit measures and of the facility that would otherwise be built in the case of a new facility"

The baseline for the proposed project activity according to the applicable methodology is the facility that would otherwise be built in case of a new facility. This building project with various energy efficiency measures implemented in the same premises has no previous power consumption data as it is a new facility; the base year energy use is determined by simulation of post commissioning period using utility design data provided by the technology suppliers. This is in accordance with the specifications framed by International Performance Measurement & Verification Protocol (IPMVP). This Protocol serves as a framework to determine energy and water savings resulting from the implementation of an energy efficiency program in the buildings. The IPMVP provides a framework for calculating energy reductions before (i.e. baseline) and after the implementation of projects. The IPMVP can help to achieve and document emissions reductions from projects that reduce energy consumption and help energy efficiency investments be recognized.

Accordingly, the base-case/budget building of ILPL is being developed based on the Energy Cost Budget requirement of ASHRAE/IESNA standard 90.1999. The standard was chosen based on the common practices followed in the region. In addition, it was the stringent standard available at the inception of the project. Building performance is evaluated using Visual DOE 4.1 software program. This program uses the DOE-2.1E simulation engine for evaluating energy-use and peak demand. A budget case model minimally complying with ASHRAE/IESNA 90.1-1999 was developed and simulated in Visual DOE 4.1. DOE-2.1 E is a widely used freeware building energy analysis program that can predict the energy use and cost for all types of buildings. DOE-2.1 E uses a description of the building layout, constructions, operating schedules, conditioning systems (lighting, HVAC, etc.) and utility rates provided by the user, along with weather data, to perform an hourly simulation of the building and thereby helps to estimate the reduction in energy consumption.

Each energy form in the emission baseline is multiplied by an emission coefficient. For the electricity saved, the emission coefficient is calculated in accordance with provisions under category I.D. The Project is implemented in Tamil Nadu and which lies within the southern regional electricity grid of India and hence baseline emissions calculations are based on this grid. As prescribed in the small scale baseline methodology type I D, the baseline emissions are calculated as the product of total kWh of electricity saved by the project and the emission coefficient (measured in kg CO2eq/kWh) calculated in a transparent and conservative manner. In this project, grid emission coefficient is 0.86 kg CO2 per kWh as per the latest CO_2 Baseline Database Version 2.0 for the Indian Power Sector by Central Electricity Authority of Ministry of Power, which was calculated as "weighted average emissions (in kg CO2eq/kWh) of the current generation mix"[1].

Parameters/ variables used in the baseline emission calculations according to the requirements of ASHRAE/IESNA standard 90.1.99 using the simulation software DOE 4.1 are as follows:

Features		**Measure of performance**	**Baseline building**
Building Envelope	Exterior Wall construction	U- factor (Btu/hr.ft^2. deg F)	0.58. Common brick 4 in with outside plaster
	Roof construction	Roof reflectivity, U-factor (Btu/hr.ft^2. deg F.)	Roof reflectivity = 0.30 U-factor = 0.063
	Window-gross Wall ratio	Percentage	40.0 %.uniformly distributed on all sides
	Shading device		None
	Fenestration type: North	U-Value (Btu/hr.ft^2. deg F.)	1.22
		SHGC	0.51
		VLT (%)	70
	Fenestration type: Non-North	U-Value (Btu/hr.ft^2. deg F.)	1.22
		SHGC	0.29
		VLT (%)	70
Lighting	Office area	Lighting Power Density (W/Sq.m)	1.3
	Parking area	Lighting Power Density (W/Sq.m)	0.3
	Service area (stairs & toilets)	Lighting Power Density (W/Sq.m)	0.8

Air-cooled chillers		kW/ton	1.256 (a COP of 2.8 at ARI conditions)
Heat Recovery Ventilator			Not present

Summary

The Business As-Usual Scenario (BAUS) would be the implementation of project activity with the features of the reference baseline building as described in the paragraph B.4. In addition, the projected energy consumption for the project activity is higher by 10942.870 MWh than the simulated energy consumption for the base project activity which otherwise should have been imported from the southern regional grid.

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 small-scale CDM project activity:

In accordance with paragraph 28 of the simplified modalities and procedures for small-scale CDM project activities, a simplified baseline and monitoring methodology listed in Appendix B may be used if project participants can demonstrate that the project activity would not otherwise be implemented due to the existence of one or more barrier(s) listed in attachment A of Appendix B. Accordingly, for the identified CDM project the following barriers have been identified:

In the absence of the project activity, the most likely scenario would be the installation of less efficient systems compared to the systems in the baseline that may lead to higher electricity consumption resulting in the additional import of electricity from the grid resulting in higher emission of green house gas.

Barrier analysis

Decisions regarding investments for installation of new equipment in commercial buildings are often taken on the basis of cost savings achieved. Investments in energy efficiency are more difficult to finance as the cost savings achieved due to energy efficient measures are very much less when compared with the investments made on it. The investor of energy efficient technologies in IT Parks are promoters of the building whereas the beneficiary out of its implementation are the individual occupants the promoters always show less interest in such investments as the occupants do not share the benefit out of energy efficient measures with the investors. In addition, the investments in energy efficiency programs are related to fluctuations in energy prices. Monitoring of information on the performance of energy efficiency measures in IT parks and analysis of the same is a tedious process that requires substantial knowledge on the working of installed equipment. There are numerous market failures and barriers but most attention is directed towards the end users. Among the most important barriers are as following:

a) Technological barrier

HVAC system

1) Chillers

The Euro Vent certified hybrid TRANE chillers are imported from France and hence the capital cost has increased by 10% for the same capacity compared with the Indian made chillers as per the techno-commercial study conducted by the project promoter. Euro vent certified products are designed for stringent compliance with Euro vent design specifications' during the entire production process as well as

during installation. As Operation & Maintenance (O&M) of imported chillers requires special skills & training for achieving the guaranteed performance, the project proponent had entered into a 10-year O&M contract with TRANE that includes imparting training to operators. Also the spare parts of the chillers have to be procured from France for any replacement. The project promoter has to face difficulties in transportation and handling at the site, as the chillers are longer than the conventional chillers and the chillers are transported from the manufacturing hub as an assembled unit. Whereas, the conventional chillers of Indian make are easier for transportation as well as for maintenance.
The IT Park will be constructed in such a way that about 50% of the building's AC load will be met by the water-cooled chillers. The water-cooled chillers require water of highest quality for its operation. The project location, Chennai is known for its water scarcity. Chennai lies on the thermal equator and is also coastal, which prevents extreme variation in seasonal temperature. For most of the year, the weather is hot and humid. Historically, Chennai has relied on annual monsoon rains to replenish water reservoirs, partly because of absence of any major rivers flowing through the area. Due to the steady growth of the city population, the city has faced severe water supply shortages and the city's ground water levels have been depleted to very low levels in many areas. The city gets most of its seasonal rainfall from the north-east monsoon winds, from mid-September to mid-December.

Hence, to cater to the water requirements of the water cooled chiller without affecting the green building requirements, additional softener plant has been designed to process the recycled water from waste water treatment to the required purity levels. Whereas there will be no requirement of such softener plant for conventional air-cooled chillers.
In spite of the difficulties in water availability, the project proponent has installed water cooled chillers as they are energy efficient hence would consume less emission intensive gird power.

The water cooled chillers coupled with Thermal Energy Storage (TES) for the project activity will occupy more space than the air cooled chillers. Hence, the air cooled chillers will be installed in the terrace of the building whereas water-cooled chillers with thermal energy storage will be installed in the basement that requires additional work. Thermal energy storage system will minimize the energy consumption by shutting off the chillers partially /entirely during peak load hours and will generate ice/chilled water during off-peak load hours to be used during the peak load hours.

The conventional air cooled chillers without thermal energy storage systems represents a less technologically advanced alternative with lower risks and higher energy consumption pattern. This would have led to higher emissions as the HVAC systems accounts for more than 60% of the total electricity consumed by the entire project activity. The risks involved in the implementation of the project activity with chillers imported from France are that it is not a proven technology as it is imported and the project proponent does not have any knowledge about the costs and benefits of using it. The project proponent may face break downs and increased operation & maintenance costs due to its new technology.

The project developer has to take serious efforts to adhere to those stringent norms in spite of above listed difficulties. Also to ensure the risks related to performance, operations and maintenance are negated, the developer has entered into O&M contract with the HVAC vendors at an additional cost.
2) Air Handling Units (AHU)
Eurovent certified AHUs have to be transported to the project site from France without dismantling them. Upon dismantling the leakage factors cannot be maintained and this may lead to leakage of conditioned air through the ducts. Such problems in transportation would not occur for indigenously manufactured chillers.

The motors that are used in the AHUs & Treat Fresh Air (TFA) systems are of high efficient EFF 1 standard as prescribed by Indian Electrical & Electronics Manufacturers Association (IEEMA) as against the cost effective less efficient EFF 2 motors generally used by IT parks of similar nature.

3) Façade design

The unique feature of the project is that the façade of the building is designed with 100% glass envelope and ~40% (average) of the glass is covered with ceramic frit to reduce the solar gain without affecting the visibility. This façade design feature of 100% glass envelope covered with about 40% ceramic frit is the first of its kind for an IT Park for this size. This design is highly complicated and the project promoter had to hire the services of specialized consultants from Singapore (M/s Arup Façade) to design the structural glazing system along with the principal architect from the UK. LEED accredited professional and leading energy consultants have been appointed additionally to advice on the façade design and simulate the effect of façade on the overall building energy consumption. Fabrication and installation agency based in Singapore have been appointed to carry out the detailed design, testing and safe installation of the glass panels. The project promoter will incur additional expenditure to utilize the best knowledge in the industry to negate the mentioned risks in designing the envelope. The project promoter has taken a very high risk of exclusive design of façade envelope covered with 40% ceramic frit to minimize the solar heat gain factor that will reduce the load on the HVAC with the sole intention of reducing the consumption of emission intensive gird power.

b) Barrier due to prevailing practice

The prevailing practice for IT Parks is buildings with non-green building features and no compliance to any international standards such as ASHRAE/IESNA 90.1-1999 or to any national standards. As per the IT Parks association data, no other IT Parks of similar size in area was available with green building features at the time of inception of this project activity. IT Parks built were with non-green building features and without energy efficient measures to be implemented in the project activity and this will be the first of its kind in the region.

c) Other barriers

One of the important barriers to energy efficient programs and that too for buildings is the difficulty to obtain funding for the projects. Due to lack of understanding, the financial institutions consider it a risky business. The risk perception involved in the development of the energy efficiency program and installation of expensive equipment are high. Energy efficiency measures are considered as risky as the potential benefits are perceived to be unsure and not guaranteed. In this activity the promoter is implementing the energy efficiency measures only with intention of contributing to the mitigation of global warming as the promoter organization itself is not a direct beneficiary since the reduction in energy consumption is to be passed on to the occupants. This building project cost is high as compared to that of a conventional building and project promoter has to bear the additional costs with no guaranteed incentives besides involving long payback periods as well.

India Tech Park is designed as a green building as per the international IT/ITES requirements and there is no commissioned/operational “IT park” of comparable scale in Chennai. It has been certified as a green building prior to the designing of the project. Hence the project developer has considered ASHRAE 90.1 1999 standard as the baseline which is the most stringent international standard.

Thus, the project activity faces several barriers for implementation, while they did not prevent the implementation of the alternative to the project activity. Therefore, the project activity is additional to the baseline scenario.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

Project Emissions

Emissions due to the project activity are the GHG emissions resulting from the energy use of the various energy consumption systems incorporated in the project activity. The Tamil Nadu Electricity Board that constitutes the Southern regional grid of India supplies the electricity for the project activity. Each energy form in the project is multiplied by an emission coefficient of the Southern regional grid.

$PE_y = EF * EC_{project}$

Where PE_y = Project emissions in year y in tCO_2/year
EF = Emission factor of the southern regional grid in tCO_2/ MWh
$EC_{project}$ = Energy consumed by the project activity in year in MWh

Baseline Emissions

According to the baseline methodology AMS II E, "the energy baseline consists of the energy use of the existing equipment that is replaced in the case of retrofit measures and of the facility that would otherwise be built in the case of a new facility". Each energy form in the emission baseline is multiplied by an emission coefficient. For the electricity displaced, the emission coefficient is calculated in accordance with provisions under category I.D.

Accordingly, the energy baseline for various parameters in the project activity is calculated using the simulation of the baseline building using assumptions based on ASHRAE/IESNA Standard 90.1999. The baseline emissions are calculated as the product of energy baseline and the baseline emission factor.
$BE_y = BEF * EC_{baseline}$
Where,
BE_y – baseline emissions in tCO_2/year
BEF – baseline emissions factor (southern regional gird emission factor, tCO_2/MWh)
$EC_{baseline}$ – energy consumption in the baseline building, MWh/year

Estimation of energy baseline ($EC_{baseline}$)
Building performance for all measures was evaluated using Visual DOE 4.1 software program. This program uses the DOE-2.1E simulation engine for evaluating energy-use and peak demand on an hourly basis. A budget case model minimally complying with ASHRAE/IESNA 90.1-1999 was developed and simulated in Visual DOE 4.1.

Leakage Emissions

As per the methodology the energy efficiency technology is neither not due to equipment transferred from another activity nor the existing equipment is transferred to another activity, leakage is not to be considered.

Calculation of Baseline Emissions Factor (BEF)

The applicable methodology AMS II E prescribes the calculation of baseline emissions factor as mentioned in the methodology AMS I D. The baseline is the kWh produced by the generating units multiplied by an emission coefficient (measured in kg CO_2e/kWh) calculated in a transparent and conservative manner as:

(a) A combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the approved methodology ACM0002. Any of the four procedures mentioned in the methodology can be chosen to calculate the operating margin, but the restrictions to use the Simple OM and the Average OM calculations must be considered:

OR

(b) The weighted average emissions (in kg CO_2e/MWh) of the current generation mix. The data of the year in which project generation occurs must be used.

The baseline emission factor EFy is the weighted average of the Operating Margin emission factor (EFOM ,y) and the Build Margin emission factor (EFBM ,y):

$$EF\ y = w_{OM} . EF_{OM,\ y} + w_{BM} . EF_{BM,,y}$$

where the weights w_{OM} and w_{BM} by default, are 50% (i.e., wOM = wBM = 0.5), and EFOMy and EFBMy are operating margin and build margin factors expressed in tCO2/MWh are calculated as follows:

Build Margin emission factor (EFBM,y) as the generation-weighted average emission factor (tCO2/MWh) of a sample of power plants m, as follows:

$$EF_{BM,y} = \sum_{i,m} F_{i,m,y} . COEF_{i,m} \ / \ \sum_{m} GEN_{m,\ y}$$

where $F_{i,m,y}$, $COEF_{i,m}$ and $GEN_{m,y}$ are analogous to the variables described for the simple OM method mentioned below for plants *m*.

The Build Margin emission factor $EF_{BM,\ y}$ is based on the most recent information available on plants already built for sample group *m* at the time of PDD submission. The sample group *m* consists of either the five power plants that have been built most recently or the power plant capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently.

Using the above given relation, the calculated Build Margin $EF_{BM,y}$ = 0.71 $kgCO_2$/ MWh

Simple OM emission factor ($EF_{OM,simple,y}$) is calculated as the generation-weighted average emissions per electricity unit (tCO2/MWh) of all generating sources serving the system, not including low-operating cost and must-run power plants:

$$EF_{OM,y} = \sum_{i,\ j} F_{i,j,,y} . COEF_{i,j} \ / \ \sum_{j} GEN_{j,\ y}$$

where $F_{i\ ,j,\ y}$ is the amount of fuel *i* (in a mass or volume unit) consumed by relevant power sources j in year(s) *y*,*j* refers to the power sources delivering electricity to the grid, not including low-operating cost and mustrun power plants, and including imports6 to the grid, $COEF_{i,j\ y}$ is the CO2 emission coefficient of fuel *i* (tCO2 / mass or volume unit of the fuel), taking into account the carbon content of the fuels used by relevant power sources *j* and the percent oxidation of the fuel in year(s) *y*, and $GEN_{j,y}$ is the electricity (MWh) delivered to the grid by source *j*.

The CO_2 emission coefficient COEFi is obtained as

COEFi = NCVi . EFCO2,i . OXIDi
Where,
NCVi is the net calorific value (energy content) per mass or volume unit of a fuel i,
OXIDi is the oxidation factor of the fuel (Revised IPCC Guidelines for default values),
EFCO2,i is the CO_2 emission factor per unit of energy of the fuel i.

The operating margin emission factor calculated from the above relation is $EF_{OM,y}$ = 1.01 $kgCO_2/MWh$

The Combined Margin Baseline Emission Factor is $EF_y = w_{OM} .EF_{OM, y} + w_{BM} . EF_{BM,y}$
= 0.86 $kgCO_2$/ MWh

Emissions Reductions
The emissions reductions for the project activity are calculated as the difference between baseline emissions and the project emissions and are represented as follows:

Emissions reductions = Baseline emissions – Project emissions

$ER_y (tCO_2) = BE_y - PE_y$

Where ER_y - Emissions reductions in tCO_2 in the year y.

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

Data / Parameter:	$BEF_{southern\ grid}$
Data unit:	tCO_2/ MWh
Description:	Baseline Grid Emission Factor for southern regional grid that includes TamilNadu Electricity Board (TNEB) from where the electricity to the project activity is imported.
Source of data used:	CO_2 Baseline data for the Indian Power Sector, User guide Version 2.0
Value applied:	0.86 CO_2/ MWh
Justification of the choice of data or description of measurement methods and procedures actually applied :	Calculated as the weighted average of the operating margin and the build margin emission factor as prescribed in the applicable methodology and would be constant through out the crediting period.
Any comment:	

Data / Parameter:	$EC_{baseline}$
Data unit:	MWh/year
Description:	Energy consumption by the baseline building
Source of data used:	Simulated baseline building energy consumption complying ASHRAE/IESNA 90.1.99 standards
Value applied:	61241.260 MWh/year
Justification of the	Energy simulation of various parameters of the baseline building using Visual

choice of data or description of measurement methods and procedures actually applied :	DOE 4.1 software program minimally complying with ASHRAE/IESNA 90.1.99 standards using DOE-2.1E simulation engine
Any comment:	

B.6.3 Ex-ante calculation of emission reductions:

Project emissions

The project emissions are calculated using the relation,

$PE_y = EF * EC_{project}$

Where

PE_y = Project emissions in year y in tCO_2/year

EF = Emission factor for the southern regional grid is 0.86 tCO_2/MWh

$EC_{project}$ = Energy consumed by the project activity obtained by energy simulation is 50298.39 MWh/year

$PE_y = 0.86 * 50298.39$

$= 43{,}257\ tCO_2$ / year

Baseline Emissions

$BE_y = BEF * EC_{baseline}$

Where,

BE_y – baseline emissions in tCO_2/year

BEF – baseline emissions factor (southern regional gird emission factor) is 0.86 tCO_2/MWh

$EC_{baseline}$ – energy consumption in the baseline building, 61241.26 MWh/year

$BE_y = 0.86 * 61241.26$

$=52{,}668\ tCO_2$ / year

Emissions Reduction (ER)

$ER = BE_y - PE_y$

$= 52{,}668 – 43, 257$

$= 9{,}411\ tCO_2$ / year

Leakage

Leakage for the project activity is not applicable as per the methodology.

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

Year	Estimation of Project activity emissions (tCO_2 e)	Estimation of baseline emissions (tCO_2 e)	Estimation of leakage (tCO_2 e)	Estimation of overall emission reductions (tCO_2 e)
2009	43,257	52,668	0	9.411

2010	43,257	52,668	0	9.411
2011	43,257	52,668	0	9.411
2012	43,257	52,668	0	9.411
2013	43,257	52,668	0	9.411
2014	43,257	52,668	0	9.411
2015	43,257	52,668	0	9.411
2016	43,257	52,668	0	9.411
2017	43,257	52,668	0	9.411
2018	43,257	52,668	0	9.411
Total (tonnes of CO_2 e)				**94,110**

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

B.7.1 Data and parameters monitored:

Data / Parameter:	**$EC_{project}$**
Data unit:	MWh
Description:	Energy Consumption by the project activity
Source of data to be used:	Building Management System of ILPL
Value of data	MWh
Description of measurement methods and procedures to be applied:	Final energy simulation of the building based on the as built drawings and datasheets for the equipment /systems/materials , calculations as issued by the architects/consultants/vendors. Energy meters installed to monitor the electrical energy consumption by the building and recorded by the Building Management System during operation.
QA/QC procedures to be applied:	Verification of the design vs actual details by the respective consultants and the PMC/commissioning agent.The energy meters are calibrated in regular intervals according to the prescribed manual.
Any comment:	

B.7.2 Description of the monitoring plan:

As per the applied methodology AMS II E, Version 10, the following parameters are required to be monitored during the implementation of project activity and to be reported for the emission reductions calculation:

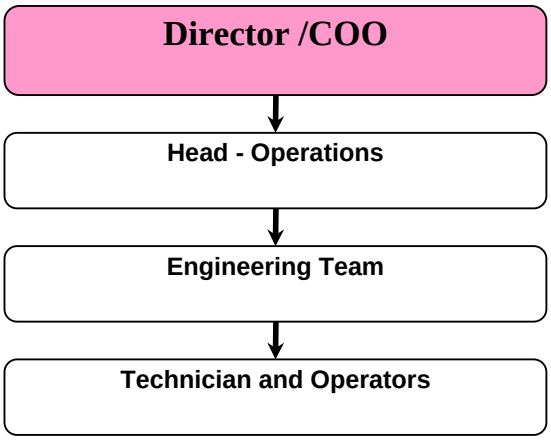
(a) Metering the energy use of the building(s);
(b) Calculating the energy savings of the new building(s).

(a) Metering the energy use of the building(s);
The metering of the energy use of the building is done by the various energy meters installed in the project facility. The meters are connected to all the electrical energy consumption points of the building and the meters in turn are connected to the automated building management system. The Building Management System (BMS) gives the consolidated energy consumed by all the consumption points in the project activity.

(b) Calculating the energy savings of the new building(s).
The energy savings due to the project activity is calculated by the difference between the actual energy consumed & measured by the building monitoring system and the simulated baseline energy consumption for the whole building developed on the basis of the Energy Cost Budget requirement of ASHRAE/IESNA 90.1999. The actual energy consumed by the project activity is measured using the energy meters installed at various consuming points, compiled by the building management system.

The project activity is operated and managed by the project proponent. The project abides and will abide by all regulatory and statutory requirements as prescribed under the laws and regulations of the region. A project team will be entrusted with the responsibility of retrieving, storing, recording and archiving data related to the project activity. The project team will also be responsible for calculation of actual creditable emission reduction in the most transparent and relevant manner. All the monitoring data will be stored, recorded and kept under safe custody of the Project In-charge at the plant site. Also any change within the project boundary, such as change in spare and or equipments related to the electrical energy consumption will be recorded and any change in the emission reduction due to such alteration will also be studied and recorded.

The project team consists of the members in the following hierarchy:



The project activity is monitored by the team headed by the Director/Chief Operating Officer (COO). The Building Management System (BMS) is operated by the technicians and the parameters required for monitoring are recorded in the log books and the data recorded are verified by the Maintenance engineers daily. The data are scrutinized by the Head-Operations every week. The Director/COO whose is responsible for the overall execution of the project activity verifies and authorizes the recorded data every month.

B.8 Date of completion of the application of the baseline and monitoring methodology and the

name of the responsible person(s)/entity(ies)

Date: 10.10.2007

Organization:	Asia Carbon Emission Management India Pvt. Ltd.
Street/P.O.Box:	#167, Kodambakkam High Road
City:	Chennai
State/Region:	Tamil Nadu
Postfix/ZIP:	600 034
Country:	India
Telephone:	+91 – 44 – 3918 0501
FAX:	+91 - 44 – 3918 0501
E-Mail:	cdmpdd@asiacarbon.com
URL:	www.asiacarbon.com

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:

25/11/2005

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

50 years

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:

NA

C.2.1.2. Length of the first crediting period:

NA

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

The start date of the crediting period is 01/01/2009 or a date not earlier than the date of registration of the small-scale project activity.

C.2.2.2. Length:

10 years

SECTION D. Environmental impacts

D.1. If required by the host Party, documentation on the analysis of the environmental impacts of the project activity:

The Environmental Impact Assessment study for ILPL was conducted by a third party, M/s Ensys India as per the regulations of the region in November 2005. No negative environmental impacts due to installation of technologically upgraded energy efficiency equipment and instrumentation work had been identified as per the assessment report.
This project activity has excellent environment benefits in terms of reduction in carbon emissions. It also imparts a direct positive impact in the improvement of quality of life of local people by providing inflow of funds, additional employment, technological & managerial capacity. The agency has presented a detailed report covering the noise, water, air and biological effects of the project. The project has also obtained the environmental clearances as per the statutory norms from the state as well as the central regulatory bodies of the Government of India.

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:

NA

SECTION E. Stakeholders' comments

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

The project participant hosted a stakeholder consultation meeting at the project location, on 2nd August 2007. The meeting was attended by various sections of people that included:

- Consultants
- People in the local vicinity
- Laborers
- Local body representatives
- Technology/equipment suppliers

Apart from the above, top executives and unskilled employees of ILPL attended the meeting. The environmental and socio-economic benefits accrued due to the project activity implementation were explained to the participants. The Participants were also informed about the new technology and its role in the reduction of the greenhouse gases, a major source of climate change.

A questionnaire was circulated among the participants in order to receive their comments on issues related to the proposed project activity. The opinions received have been summarised in the form of a table and attached as Appendix A.

E.2. Summary of the comments received:

A local stakeholder consultation meeting was conducted in order to invite the opinions from the people who would be directly or indirectly affected due to the project activity. Letters of invitation were

delivered to the local people and other potential participants mentioning the date and venue of the stakeholder consultation meeting.

The meeting was organised on 2nd August 2007 at the conference hall of ILPL at Chennai. Various peoples from different background attended the meeting. Apart from ILPL representatives, contract labourers, employees of other organizations, neighbouring factories and the design consultants for the project were participated in the same.

The participants were given an overview of the project activity and the project promoter's views of the environmental and economic benefits associated with its implementation. Participants were also informed about the new technology and its role in the reduction of the greenhouse gases, a principal cause of climate change.

The participants showed tremendous interest about the concept of CDM and the advantages that the project implementation accrues to the society. They were enthusiastic about the new technology, the cleaner environment and the socio-economic developments due to the project implementation. There were no specific concerns / issues raised by the people regarding the project activity.

A specially designed questionnaire was circulated among the participants in order to receive their comments on issues related to the proposed project activity. The comments received are summarized and attached in Appendix A.

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

The project activity did not receive any adverse comments from the participants of the stake holders meeting and hence it was concluded that no corrective measures need to be undertaken to address the same.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	India Land and Properties Limited
Street/P.O.Box:	Plot No :14 ,3rd Main road
Building:	Ambattur Industrial Estate
City:	Chennai
State/Region:	Tamil Nadu
Postfix/ZIP:	600 058
Country:	India
Telephone:	*044-26254440*
FAX:	*044-42060070*
E-Mail:	*revathi@indialand.net*
URL:	*www.indialand.net*
Represented by:	Mr.S.Salaikumaran
Title:	Director & Chief Operating Officer
Salutation:	Mr
Last Name:	Sudalaimuthu
Middle Name:	-
First Name:	Salaikumaran
Department:	-
Mobile:	-
Direct FAX:	*044-42060070*
Direct tel:	*044-26254440*
Personal E-Mail:	salai@indialand.net

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding of any form is involved in the context of the project activity

ANNEX 3

BASELINE INFORMATION

Features		**Measure of performance**	**Baseline building**
Building Envelope	Exterior Wall construction	U- factor (Btu/hr.ft^2. deg F)	0.58. Common brick 4 in with outside plaster
	Roof construction	Roof reflectivity, U-factor (Btu/hr.ft^2. deg F.)	Roof reflectivity = 0.30 U-factor = 0.063
	Window-gross Wall ratio	Percentage	40.0 %.uniformly distributed on all sides
	Shading device		None
	Fenestration type: North	U-Value (Btu/hr.ft^2. deg F.)	1.22
		SHGC	0.51
		VLT (%)	70
	Fenestration type: Non-North	U-Value (Btu/hr.ft^2. deg F.)	1.22
		SHGC	0.29
		VLT (%)	70
Lighting	Office area	Lighting Power Density (W/Sq.m)	1.3
	Parking area	Lighting Power Density (W/Sq.m)	0.3
	Service area (stairs & toilets)	Lighting Power Density (W/Sq.m)	0.8
Air-cooled chillers		kW/ton	1.256 (a COP of 2.8 at ARI conditions)
Economizer			Not present
Heat Recovery Ventilator			Not present

Annex 4

MONITORING INFORMATION

Please refer to section B.7

Appendix A

Summary of Stakeholder Consultation Response

S.No.	Participants Name	Category	Employment opportunities increased?	Infrastructure facilities are developed?	Whether you have learnt or exposed to new technology?	Whether you are facing any type of pollution (Air / Water / Sound) problems due to the project?	Whether the electricity facilities are improved?	Whether your local area is improved?
1	**G.Sri Geetha**	**Local Public**	YBVV	YMVM	**Yes**	**No**	**E**	YVVVN
2	**Vinod**	**Local Public**	YBVV	YMVM	**Yes**	**No**	**E**	YVVVN
3	**V.K.Balaji**	**Consultant**	YBVV	YMVM	**Yes**	**No**	**E**	YVVVN
4	**K.Cheralathan**	**Architect**	YBVV	YMVM	**Yes**	**No**	**E**	YVVVN
5	**P.Elangovan**	**Contractor**	YBVV	YMVM	**Yes**	**No**	**E**	YVVVN
6	**K.R.Mohan**	**Contractor**	YBVV	YMVM	**Yes**	**No**	**E**	YVVVN
7	**R.Ramkumar**	**Contractor**	YBVV	YMVM	**Yes**	**No**	**E**	YVVVN
8	**Mukesh**	**Labor**	YBVV	YMVM	**Yes**	**No**	**E**	YVVVN
9	**Umesh**	**Labor**	YBVV	YMVM	**Yes**	**No**	**E**	YVVVN
10	**M.Roopesh**	**Consultant**	YBVV	YMVM	**Yes**	**No**	**E**	YVVVN
11	**Vikram**	**Local Public**	YBVV	YMVM	**Yes**	**No**	**E**	YVVVN
12	**S.SalaiKumaran**	**ILPL**	YBVV	YMVM	**Yes**	**No**	**E**	YVVVN
13	**B.Ravi**	**ILPL**	YBVV	YMVM	**Yes**	**No**	**E**	YVVVN
14	**Revathi Devanand**	**ILPL**	YBVV	YMVM	**Yes**	**No**	**E**	YVVVN
15	**G.Balaji**	**ILPL**	YBVV	YMVM	**Yes**	**No**	**E**	YVVVN