INTERNATIONAL INSTITUTE FOR ENERGY CONSERVATION (IIEC)

Promoting Sustainable Energy and Environmental Solutions

Development of Energy Efficiency Buildings Program in Quezon City, Philippines

Task 8 – Final Report

Prepared for

WORLD BANK GROUP

AND

QUEZON CITY, PHILIPPINES

by

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Abbreviations

ABCB – Australian Building Codes Board (Australia)

ASHRAE – American Society of Heating, Refrigerating and Air-Conditioning Engineers (USA)

AS/NZS – Australian-New Zealand Standards (Australia)

BCA – Building Codes of Australia (Australia)

BERDE – Building for Ecologically Responsive Design Excellence (Philippines)

COP – Coefficient of Performance

DOE – Department of Energy (USA)

DSM – Demand Side Management

EE – Energy Efficiency

EE&C – Energy Efficiency & Conservation

EECI – Energy Efficient Cities Initiative

ESCO – Energy Service Company

EPI – Energy Performance Index

ESMAP – Energy Sector Assistance Management Program (World Bank)

GDA – Global Development Alliance

GFA – Gross Floor Area

GRIHA – Green Rating for Integrated Habitat Assessment (India)

HVAC – Heating, Ventilating and Air-conditioning

ICC – International Code Council (USA)

IECC – International Energy Conservation Code (USA)

IESNA – Illuminating Engineering Society of North America (USA)

IGBC – Indian Green Building Council (India)

IIEC – International Institute for Energy Conservation

LEED – Leadership in Energy and Environmental Design (USA, India)

MEPS – Minimum Energy Performance Standards

M&V – Measurement & Verification plan

NABERS – National Australian Built Environment Rating System (Australia)

NEA – National Environment Agency (Singapore)

O&M – Operations and Maintenance

PhilGBC –Philippines Green Building Council (Philippines)

PHP – Philippines Peso

SD – Sustainable Development Blueprint (Singapore)

USGBC – U.S. Green Building Council

1 INTRODUCTION

To promote energy efficiency in the delivery of city services – water/wastewater, district heating/cooling, public buildings, public transport, solid waste management - , the World Bank's Energy Sector Management Assistance Program (ESMAP) launched the Energy Efficient Cities Initiative (EECI) last year following a Practitioner's Roundtable discussions where client cities and potential partners shared what they are doing and what work was still needed. Based on the feedback from the Roundtable, along with discussions with World Bank urban staff and several potential global partners, a 5-year EECI program was developed and presented in December 2008 at the *ICLEI Local Government Climate Session* side event at COP-14 in Poznan, Poland, which outlined the five main components – analytical work, small city technical assistance grants, EECI award and project database, World Bank project development support and outreach and partnerships.

Under the second component, small grants to cities, EECI has partnered with the Cities Alliance to make available small technical assistance grants to cities in developing countries to support efforts in key areas, including green buildings, sustainable transport, water efficiency and public procurement. Quezon City (QC), which participated in EECI roundtable discussions last year, has manifested interest in getting ESMAP technical assistance grant to develop an energy efficient building program.

The World Bank has contracted the services of the International Institute for Energy Conservation (IIEC) to provide assistance in the development of an Energy Efficient Buildings Program for Quezon City and guidance in institutionalizing the program in QC's Green Building Ordinance.

This Final Report provides details of all activities undertaken in this assignment

2 SUMMARY OF ACTIVITIES

Task 1: Review International Experiences on EE/Green Building Codes and Program

The main objective of this task is to examine programs implemented in other countries, draw implications and derive lessons for the design of an EE/ Green Buildings Program in Quezon City. The focus of this task will primarily will be in Asia where several EE related programs and policies have been developed for the Commercial sector. The major focus will be on Thailand, Vietnam, India, Singapore, Malaysia, China and Sri Lanka where EE buildings codes have been developed and building rating schemes are being implemented or considered.

Task 2: Review Current Practices and Market

The objective of this task is to review current construction practices and market in Quezon City to determine potential areas for energy efficiency improvements. The information required for this task will be sought from consultations with different working groups (networks) of the Philippines Green Building Council. These networks include Architects, Financiers, Engineers, Developers, Equipment Suppliers, Building Administrators and Public Sector Administrators.

Task 3: Conduct Briefing Meeting with Stakeholders

The objective of this task is to help the officials of Quezon City understand the various options for energy efficient/ green building programs and to present the findings of Tasks 1 and 2 . The meeting participants will include QC officials, World Bank and private-sector organizations including developers and the Philippines Green Building Council (PhilGBC).

Task 4: Action Plan for EE / Green Buildings Program

The principal objective of this task is to present a draft energy efficiency/ green buildings program that the local government of Quezon City can implement in the short to medium term. This Action Plan will be consistent with the outcomes of the meetings with city officials and features of global programs that could be customized to the Philippines environment and accordance with energy policies and regulations of the National Government. The Action Plan would also consider enhancement of the benefits through designing relevant programs under the Clean Development Mechanism (CDM) program of activities.

Task 5: Develop Detailed EE Building Program Plan

The main objective of this task is to develop a detailed program plan focusing on how to implement large scale retrofits in existing buildings. The TOR indicated that current information suggests that a modest retrofitting of public buildings and voluntary measures for commercial buildings with appropriate incentives could be a starting point. Based on the feed back from Quezon City officials, ESMAP and the World Bank in Manila office on the mid term report of this assignment, a detailed program plan on how to implement large scale retrofits will be developed.

Task 6: Implement Pilot Activities

The main objective of this task is to implement pilot activities to build momentum of the program. In collaboration with city officials, IIEC Team will carry out pilot activities. It could include:

1 A detailed study of the QC government Center or other appropriate sites and development of a specific action plan that the city can implement with the short term to improve the

building efficiency level, allow for the documentation of the benefits and performance and provide a showcase for the rest of the city

2 Organizing all the information and data collected under Task 1 into a simple database and provide guidance on how the database can be expanded as the program matures.

Under this task it is proposed to conduct walk-through energy audits in selected QC sites to identify common measures that could be implemented with limited capital and benefits clearly demonstrated in a short time frame. This could be in the major end-uses including air conditioning and lighting. The potential for replication would be considered when selecting the EE measures.

Task 7: Organize a Final Workshop to Present the Program Plan

The main objective of this task is to present the Program Plan to the city officials and stakeholders. Strategic marketing and awareness of the program at all levels of society is necessary for the success of the initiative. The planners, engineers and architects who design the building to the accounts and finance professionals involved in the EE/green building program need to understand the technical, environmental, financial and strategic impact of the project.

Task 8: Prepare Final Report

The Final Report shall include a summary of all activities (Tasks 1 to 7) and recommendations for further work. The Final Report, along with the final Program Plan, will be uploaded on ESMAP's website and shared with other cities.

3 PRELIMINARY RESULTS

3.1 Relevant International EE Building Programs

The following is a summary of International programs that is relevant to Quezon City

3.1.1 City-Led Programs for Existing Buildings

3.1.1.1 Ekurhuleni Metropolitan Municipality, South Africa

Ekurhuleni is one of the 6 districts of Gauteng province of South Africa and one of the 6 metropolitan municipalities of South Africa. The city of Ekurhuleni adopted the Policy on Energy Efficiency in Council buildings and on Council premises of Ekurhuleni in 2002.

Project Background

The Policy on Energy Efficiency was written and developed by the Directorate of Electricity of the Ekurhuleni Metropolitan Municipality (EMM) and it aimed to optimize the use of resources in municipal buildings and reduce the amount of waste produced. It wanted to set an example for the rest of the community by demonstrating success in their Municipality buildings. EMM has implemented the energy retrofit project in 3 of its municipal headquarter buildings.

In 2005 the Department of Environment and Tourism developed and finalized the State of Energy Report and developed its first draft of an Energy Efficient Strategy. This complemented the Policy and gave guidelines for new projects. One of the suggestions of the report was to target the 'low hanging fruit'; even though the energy consumption by the council was not so significant there was an opportunity to start saving energy.

The project shows the impact of simple and small measures leading to the reduction of energy use. The city has been successful in implementing different cost saving and energy saving measures. One of the highlights of the project was the success of the inter-departmental task force within the city government to implement the project.

Project Description

The leading department overseeing the project was Environment and Tourism but other departments were involved, including the Municipal Infrastructure department (Electricity directorate) and Roads and the Transport and Civil works department (Building Maintenance section).

One of the proposals that were determined to be cost-effective and possible to implement within the required time frame was to reduce energy consumption in lighting and boiling water. The proposal included replacement of conventional incandescent light bulbs with compact fluorescent light bulbs (CFLs), the replacement of cool-beam downlighters with light-emitting diodes (LED) lights, the replacement of urns and kettles with hydroboils (hot water for tea and coffee) and the installation of geysers and lighting timers. Quotations were requested from qualified entities for the proposed work. Some of the other proposals that were considered included solar water heaters, compressors and solar photovoltaic panels, but these were found to be more complex for the time available to complete the work.

SUMMARY OF EQUIPMENT:

- Twenty-three (23) zip hydroboils,
- Two-thousand-and-three (2,003) CFLs,
- Ninety (90) LED lights,

- Two (2) lighting timers,
- Fifteen (15) Geyser timers, and
- Replacement of ninety-six (96), 8-foot double fluorescent light fittings with open channel-5 foot double fluorescent lights with electronic ballasts.

Cost and Implementation

The total cost of the project, including labor and equipment, was R249,120 (USD 41,063). ICLEI secured a grant totalling R242,761 (USD 40,000) from the United States Agency for International Development (USAID) to fund this project. Two local Ekurhuleni companies- El Shaddai Electrical and Ganibo Trading were awarded the contract for the project.

Results

The energy savings from the retrofitting project in the EMM buildings are:

Equipment	Pre retrofit Energy use kWh/year	Post retrofit Energy use kWh/year	Energy Savings kWh/year	Percentage of savings %
Lighting (CFLs and LEDs)	366,694	91,673	275,020	**75**
Lighting (5 foot double fluorescent lights with electronic ballasts)	21,024	18,221	2,803	**13**
Water Heating (Urns replaced with Zip Hydroboil)	214,072	171,258	42,814	**20**
Geyser timers	20,878	12,527	8,351	**40**
TOTAL	**622,668**	**293,679**	**328,988**	**53**

Note: Energy consumption values reported by EMM

As seen by the results in the energy savings, the small-scale retrofit project for EMM's building project was successful in achieving its goals. This translates into cost savings of USD $ 50,664 per year (0.157 USD/kWh as given by EMM, 2006, 1 USD = 6.06 ZAR South African Rand). A simple payback period will be 1.2 years. Besides the monetary benefits, the project is also responsible for green house gas emissions reductions - 308 metric tons of CO_2, 3 metric tons of SO_x and 1 metric ton of NO_x reduced.

Lessons Learned

- A retrofitting project involving replacement of old equipment with new, more efficient technology is a quick way to start saving energy and money.
- The project can be completed in a relatively short time frame.
- There are challenges to getting the different departments within the government to work together.
- In municipally owned building and operations, procedures and policies need to be followed and could add time to the process.
- In a relatively new market like South Africa, energy efficient technology and equipment is relatively new. So it is important to select the right people and companies to do the work. This will improve once the awareness and demand for energy efficient equipment increases.

- This project and the policies are part of an easily replicable strategy that can be used in other South African cities.

3.1.1.2 Ann Arbor, USA

The city of Ann Arbor, Michigan has had an interesting way of funding the cities energy efficiency projects. They started an energy efficiency fund costing $500,000 over five years that is reducing CO_2 emissions by 980+ metric tons annually and which pays itself and future projects in the long term. The city has been able to implement energy efficiency projects in its buildings and throughout the city that pay back their investments in 3-5 years.

In 1981 the city of Ann Arbor's Energy Plan called for energy conservation for city buildings. To fund the efficiency measures, by 1988 the municipal bonding authority provided a $1.4 million energy bond for 30 city facilities. The payment for this ten-year bond has been generated through energy cost savings. By 1998, the final payment on the energy bond was made. Energy bond payments of over $200,000/year had been included in the annual city budget for each of the previous ten years. Instead of discontinuing the budget item, it was reduced by 50% to $100,000 for the next five years and used to start a Municipal Energy Fund.

Established in 1998, the Municipal Energy Fund is a self-sustaining source of funds to be used to upgrade and retrofit city buildings and facilities. The $100,000/year initial funding proved to be adequate both for energy saving opportunities and for the fund management.

Fund Description

The energy fund finances itself by re-investing funds saved through energy efficiency measures into new energy saving projects. A three-person board administers the fund from the city's energy office. They approve the funding, implement the projects and often are the project managers. The energy office provides the board with information from energy audits and applications from facility managers for projects requesting energy funds. The board reviews the application and makes final decisions on which projects to fund every year.

Over the nine-year period, the fund has invested in:

- LED traffic and pedestrian signals
- Street light improvements
- Parking garage lighting
- A boiler
- Two electric vehicles
- Solar energy demonstration projects

Any facility that utilizes the fund for energy improvements pay back 80% of the projected energy savings for five years starting the first year after the energy saving measures were installed. This allows projects with a shorter payback (three years or less) to help support projects with a longer payback (over five years). The reasoning for this is that the shorter payback project will still continue to have a lower operating cost for the fourth and fifth year and will continue to save money and can help the projects with a longer payback.

Financing Mechanism

The city operates 60 facilities and spends $4.5 million per year on energy (out of an annual budget of $288 million in 2005). Most of the measures financed by the fund have a payback period of three to six years.

- In the year 1998-99, city council approved the first $100,000, of which $87,000 was spent in the first year to update energy audits for 21 facilities and to implement lighting improvements at 14 facilities.
- During the year 1999-00 these improvements generated $19,850 in energy savings of which $15,880 was re-invested in the Municipal Energy Fund. This money was available to finance further energy improvements in the year 2000-01.
- The payments from these first year projects continued into the Energy Fund for 5 years, contributing $15,880/year or a total of $79,400 back to the fund.
- The second $100,000 was approved for the year 1999-00 and was used to implement additional energy saving projects at city facilities generating another $15,000 in annual reimbursements.
- The energy savings from this second year of improvements were available to finance further energy saving projects in the year 2001-02.
- For the year 2001-02, $30,000 was available from reimbursements from the first two years of the program.
- The $100,000 budgeted annual contribution to the fund was discontinued after the fiscal year 2003-04.
- From that point forward, the fund has relied on payment of past projects to finance new projects.
- The facilities budgets are not impacted because the up-front costs are covered by the energy fund. In addition the facility can also apply the remaining 20% savings to further improve the facility or services.

Results

The fund has resulted in annual financial savings of $142,000 throughout the 60 facilities with an annual energy efficiency savings of over 1,000 MWh of electricity and 270 MCF of natural gas. This has resulted in annual CO_2 reductions of over 980 metric tons CO_2 equivalent. At present the project is ongoing and self-funding.

Lessons Learned

- The two critical components required to make the energy fund work are:
    - An initial funding source available for 3-5 years, depending on the funds available and the number and condition of municipal facilities.
    - A manager assigned to support and coordinate the fund and its projects.
- Ann Arbor has maintained an active energy office for over ten years. This means that many of the best energy saving opportunities were already implemented before creation of the Municipal energy fund. Most measures financed by the energy fund have a payback period of three to six years. For cities that have not been actively installing energy saving measures, there will be many opportunities available with payback periods of less than three years (low hanging fruit). This will contribute to a much quicker regeneration of an energy fund.
- The Energy Fund is used strictly for municipal programs aimed at improving energy efficiency at municipal facilities. However, the energy plan calls for the city to lead by example, and this type of fund should be feasible for many local businesses that own and operate a large number of facilities.

3.1.1.3 Melbourne, Australia

Melbourne had constituted a greenhouse program for businesses, which requires large greenhouse gas emitters to complete audits and implement sustainable actions that can be paid back in three years or less. By making energy audits mandatory, the greenhouse program has been able to reduce CO_2 emissions by 1.1 million metric tons and save companies $34 million annually. The focus on economic return delivered immediate and sustained reductions in consumption and CO_2 emissions. With its success, it was expanded beyond energy to also address water and waste and applied to other companies too.

The program is administered by the state EPA and requires over 300 sites with EPA licenses that emit large amounts of CO_2, to undertake audits, develop action plans, implement their actions and report on progress. This program was to be expanded to another 250-500 companies and become the Environment and Resource Efficiency Plan (EREP) program.

EREP is a new regulatory scheme that will apply to the large industrial and commercial users of energy and water, not just licensed sites. Participants will register with the EPA, assess their environmental resources use and waste generation, develop an action plan and report on implementation of the plan over a period of 8-10 years.

Program Description

Under the industry greenhouse program, sites were required to undertake levels of assessment and implementation depending on the level of their emissions. The program started in 2004 and has seen $49 million invested by businesses in internal projects that reduce energy and have been implemented and paid back in an average of less than two years.

Under the program, medium and large consumers of energy were required to:

- Review their energy bills (electricity, gas, LPG, diesel);
- Calculate their energy use and associated greenhouse gas emissions - greenhouse gases produced by an industrial process (such as chemical manufacture or water treatment) should also be calculated;
- Conduct an energy audit to Australian standards;
- Identify best practice options and determine payback periods;
- Prepare an implementation plan for items with a payback of 3 years or less;
- Report on implementation and annual emissions as part of annual reporting to EPA.

The program provided an energy greenhouse management toolkit that provided information on compliance with requirements, conversion factors and best practice information. Businesses applying for an EPA license have also been required to incorporate energy efficiency best practices improvements, using the three-year payback approach.

A three-year or less payback is proving to be a good incentive for the business owners as well. For some projects, the payback is working out to be much shorter – some even just months, which makes very good business sense as well.

Results

The industry greenhouse program has achieved annual greenhouse gas emissions reduction of 1.1 million metric tons (3.5% reduction) and a reduction of annual energy bills by a collective $34 million, as a result of 300 companies undertaking audits and implementing actions.

Lessons Learned

- A short to medium payback period has worked very well in favor of the program since it makes good business sense as a return on investment for the businesses.
- Making energy audits mandatory for large energy consumers is a good step to regulate and standardizing minimum standards for energy efficiency within the industry. Energy audit records can in the future help to set benchmarks of energy use for different building types.
- By keeping the payback period less than three years, one can target the low hanging fruit first, which can be comparatively less expensive and time consuming to achieve. Once the awareness and efficiency standard improves, more complex opportunities can be targeted.

OTHER PROGRAMS: CITY OF MELBOURNE, GREENHOUSE ACTION PLAN 2006-2010:

The city of Melbourne has set the following goals for reducing greenhouse gas emissions for their own facilities and buildings:

- To reduce Council's own emissions by 30 percent below 1996 levels by 2010, and to achieve zero net emissions for the organization by 2020; and
- To reduce the municipality's emissions by 20 percent below 1996 levels by 2010, and to reach zero net emissions for the municipality by 2020.

The greenhouse action plan 2006-2010 is a strategy for the organization to plan to reduce its own greenhouse gas emissions. The plan is to be reviewed on a two-yearly basis.

Key Priorities for Existing Buildings in the plan include:

- Energy efficiency improvements are the most financially attractive way to achieving greenhouse gas reductions. Undertake energy efficiency assessments and implement recommendations for council's building portfolio. Explore the potential role of a revolving energy fund or energy performance contracting to deliver the reductions.
- Develop an energy performance benchmarking process to establish critical performance requirements across the portfolio. This will allow projects to be prioritized effectively and performance can be benchmarked against local and global best practices. This could be expressed as a star rating or as energy use per square meter and be integrated into new building/ major works design brief also.

Key Achievements to Date:

Since the program began in 1998, the council has achieved significant greenhouse savings. All projects outlined in the 2001-2003 greenhouse action plan were delivered over this period with the following results:

Project	Planned reduction 1999-2003 (tons CO_2)	Total reduction achieved in 2003/04 (tons CO_2)
Building retrofit (all)	460	**640**
20% green power for buildings	924	**2,143**
Solar hot water installations	9	**12**
IT improvements (inc Xerox photocopiers and turning off monitors at night)	196	**231**
Public lighting upgrades	44	**79**
30% green power: public lighting	895	**5,148**
Greenfleet emissions offset	670	**476**
Alternative fuel vehicles	12	**15**
Fleet composition changes	54	**17**
Transporting staff	15	**1**
Waste wise	12	**222**
Total ton reduction	**3,801**	**8,984**

3.1.1.4 Berlin, Germany

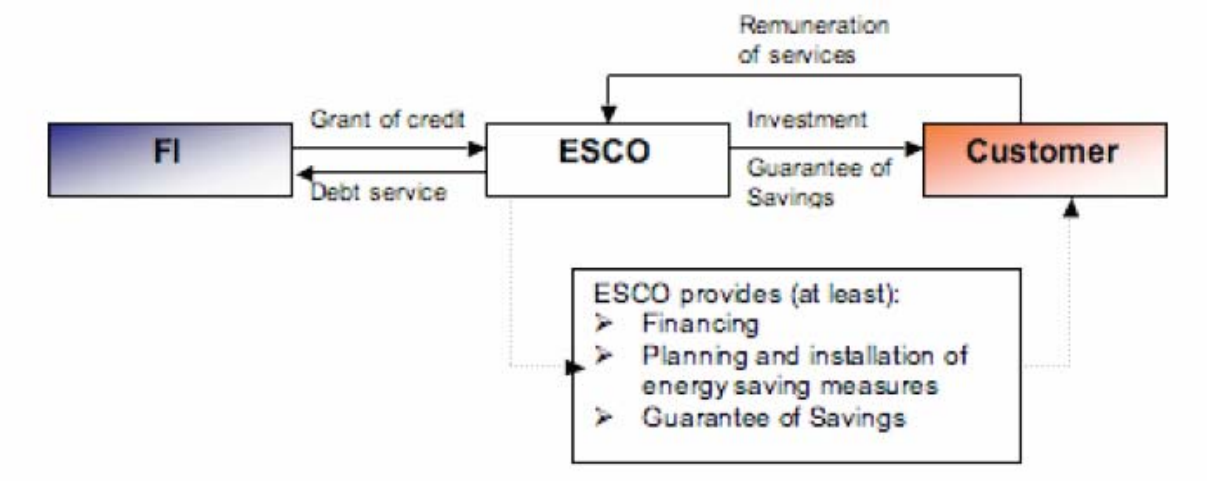
Berlin is following a model for retrofitting their existing public and private buildings called the 'Berlin Energy Saving Partnership' (ESP). This model to improve energy efficiency in buildings is being supported by the city of Berlin and the Berlin Energy Agency (BEA). The building owner does not bear any of the initial expenses but still can get some of the benefits of cost savings immediately. An accredited Energy Service Company (ESCO) finances and implements appropriate energy saving investments to achieve pre-determined energy and cost reductions. The ESCO is determined through a tendering process.

Project Description

The BEA is partly owned by the government of Berlin and organizes retrofits for large public and commercial buildings in Berlin. It is a leading energy consultancy responsible for setting up special contracts between the building owners and ESCOs. The ESCOs pay the upfront costs of the building retrofit. The building owners then repay the ESCOs over time from the energy savings the building achieves, which has been guaranteed by the ESCO. Once the contract is complete, the building owner realizes the full energy saving. BEA helps building owners and ESCOs set up the Energy Performance Contract (EPC). It also helps in deciding the terms of repayment by the building owners to the ESCOs. Average payback periods are 8 to 12 years. BEA is the project manager, managing the process from baseline to contract negotiations. BEA is able to offer its services for free as a result of joint 50/50 funding from the sate and district municipal governments.

Building owners combine several buildings to form a building pool, which are appropriate for tendering. As a requirement to participate, pools must have a minimum energy bill of around €

250,000 (USD 308,788) annually. To reduce energy consumption in buildings, ESCOs offer sustainable technologies and systems like automatic control engineering systems, heating control systems, lighting systems, ventilation and air conditioning system, etc. It has been seen from experience, that due to expanding payback periods, measures for EPC usually do not include window replacement or wall insulation.



Case Studies

Case Study 1: Pool 17 of Germany's largest prisons, JVA Tegel and Siemens

The ESP was the first between Siemens Building Technologies and one of Berlin's prisons (1,700 prisoners). The contract came into effect in April 2004 and has a term of 12 years. Main investments in that Pool were the installation of CHP, the hydraulic adjustment of heating components to achieve adapted supply, the substitution of thermostatic valves and modernization of lighting.

Annual CO_2 reduction: 4,680 metric tons per year

Annual financial savings: € 600,000 (USD 741,090), a 33% cost reduction for an investment of € 2.7 million (USD 3.3 million).

Case Study 2: Pool 19 'Steglitz-Zehlendorf II'

The ESP was contracted in June 2005 between the Council of the Berlin Borough 'Steglitz-Zehlendorf' and a joint venture of ESCOs. The contract has a term of 14 years. It is one of the largest ESP till date- with regards to the number of buildings and related area. The buildings of 69 schools, kindergartens, libraries, sport and other social facilities are participating in that ESP. The focus is on the modernization of components for electricity and heat supply (e.g. hydraulic adjustment of heating components to achieve adapted supply, substitution of thermostatic valves and condensing boilers). The measures included a substitution from oil to gas and the use of solar thermal systems.

Annual CO_2 reduction: 3,973 metric tons per year.

Annual financial savings: € 540,000 (USD 666,981), a 29% cost reduction for an investment of € 2.9 million (USD 3.5 million).

Results

The ESP program started in Berlin in 1997. Till date about 1,400 buildings have been upgraded resulting in annual CO_2 reduction of 60,484 metric tons and an annual financial savings of €

10,164,848 (USD 12,555,100). This has worked out to an average reduction of CO_2 emissions of 27% in relation to the baseline scenario. So far ESCOs have invested about € 44.4 million (USD 54.8 million) in the approximate 1,400 buildings. These buildings have made total guaranteed savings of € 10.2 million (USD 12.5 million) or 26% of their energy bills.

The project has also been expanding nationally and internationally. To date, BEA's division 'International Know-How Transfer' initiated more than 20 projects in Europe and worldwide (Bulgaria, Chile, Romania and Slovenia)

Lessons Learned

- ESPs are effective because savings are guaranteed by contract, building owners have to bear no upfront costs and investment is refinanced through energy savings.

- Even for large public buildings, governments do not need to have large budgets to achieve energy efficiency. And they can benefit with energy savings and reduction of carbon emissions immediately.

- To carry this out successfully there should be a strong legal framework for tenders and contracts.

3.1.2 Incentive Programs to Drive EE/Green Building Adoption

Across the world, there are hundreds of local government-led incentive programs for green buildings and building energy efficiency. Often, these take the shape of incentive payments for EE improvements, either from the local government or utility. Other local government incentives include income tax credits or rebates / abatements for sales or property taxes. Some other incentives include access to specially designated loans or funds (at low interest rates in many cases), as well as full or partial refunds of development, permitting or review fees.

In most cases, these incentives are financed from funds designated by the local governments for these purposes. In some cases, there may be regional / provincial / national government programs or even donor-funded programs that establish sources of financing, so as to help bridge a critical financing gap up front – this may take the shape of a revolving fund, as in Ann Arbor (Michigan), USA, discussed earlier in this report. In other cases, funding comes from private sources, as has also been discussed earlier in this report, such as:

- ESCO-arranged funding for paid-from-savings programs like the one implemented successfully in Berlin, Germany;

- Business/owner-funded EE improvements carried out in Melbourne, Australia after mandatory energy audits were carried out.

However, many of these incentive program options available to local governments include revenue- or cost-neutral programs (for local governments), which may very well be valued as much as, if not more than the financial incentives; by the developer / builder community. In fact, the 2007 National Association of Industrial and Office Properties (NAIOP) survey of 112 developers, architects and local government officials in the US, corroborates this finding – that "money is important, but equally or more important are faster time to market, more certainty in the development approval process and additional flexibility to add more space if market conditions warrant". These revenue- or cost-neutral incentive programs assume even more importance in the context of cities in developing countries, which are, more often than not, limited in their abilities to make financial resources available for green building/EE incentives.

Some common categories of revenue- or cost-neutral incentives include:

1. Priority in the plan review and building permitting process, with a requirement for posting a bond to guarantee the result, if needed.
    a. This is typically offered for achieving a certain minimum rating under a green building rating system or a certain threshold of energy performance (often set at a level better than a code-compliant building).
    b. For example, the City of Chicago, USA, offers a "Green Permit Program" that offers a permitting timeframe of as less as 15 and no more than 30 business days to developers that commit to building green (where typical permitting timeframes in Chicago can take as much as 100 days). The Green Permit Program offers a number of green menu items for developers to choose from, including LEED certification levels, green roofs, outperforming the energy code, etc. In addition, some fees can be waived for green buildings.
        i. The 2007 National Association of Industrial and Office Properties (NAIOP) survey of 112 developers, architects and local government officials in the US found that 36% of local governments were offering this incentive. Other cities offering similar priority permitting programs include Seattle (Washington), USA and San Francisco (California), USA.

2. Increases in development density (or floor area ratio (FAR) or floor space index (FSI) as the case might be), or concessions in height/size restrictions; as compared to other buildings that might be built in the same zone.
    a. The local government typically allows the project to build at a higher density (or relaxes certain height/size restrictions) if certain green criteria are met.
    b. In Seattle (Washington), USA, for example, a project must achieve LEED Silver to qualify for a "Downtown Density Bonus" – an increment of additional floor area above the base FAR. Similarly, Portsmouth (New Hampshire), USA provides a density bonus of 0.5 FAR for projects that earn LEED certification and meet appropriate open space requirements (USGBC, Sierra Club, 2009).
        i. The 2007 NAIOP survey of 112 developers, architects and local government officials in the US found that 21% of local governments were offering this incentive. Other local governments that offer this type of development incentive include Singapore (see section 2.1.2.3 of this report) and Arlington County (Virginia), USA (NAIOP, 2007).

3. Recognition and / or awards for consistent and distinguished performers in terms of green buildings and building energy efficiency, in the jurisdiction of the local government.
    a. In a rapidly growing and competitive marketplace, this kind of (local) government recognition and awareness can be of high marketing value for developers looking to distinguish themselves from the rest of the competition.
    b. In Chicago (Illinois), USA, for example, there is a comprehensive "Green Building Education and Awareness Program" in place that highlights the work of green builders and seeks to drive demand for their product.
        i. The 2007 NAIOP survey of 112 developers, architects and local government officials in the US found that 35% of local governments were offering this incentive. Other local governments that offer this type of marketing incentive include Seattle (Washington), USA and Arlington County (Virginia), USA (NAIOP, 2007).

However, even for revenue- or cost-neutral programs, it can be challenging to implement and enforce effectively and efficiently, if the local government capacities and regulatory regimes are weak in this regard. To this end, it is imperative that local governments go about implementation and enforcement efforts in a deliberate and methodical manner. Some discussion on this is covered in the Best Practices section ahead.

3.1.3 Summary of EE/Green Building Schemes

The following three tables (3.1 to 3.3) summarize green building/EE schemes and instruments (most of which have been covered in Task 1) and categorize them into three categories:

- Performance based schemes/instruments – based on the actual or verified energy (or environmental) performance of buildings
- Design based schemes/instruments – based on the designed or projected energy (or environmental) performance of buildings
- Design and performance based schemes/instruments – based on the designed or projected energy (or environmental) performance of buildings, but including a component of verification or validation of the actual or verified energy (or environmental) performance of buildings

The last category represents the synthesis of the much-needed value of design based schemes/instruments, which play an important role in guiding the design and construction of new buildings, with the tangible benefits of performance based schemes/instruments that seek to ensure that recognition (or compliance) is based on actual, verified performance.

TABLE 3.1: PERFORMANCE BASED SCHEMES / INSTRUMENTS

Country / Jurisdiction	Scheme / Instrument Name	Scheme / Instrument Type	Implementing Authority	Building Types	Key Features
Singapore	Energy Smart Building Label	Building Energy Labeling (Benchmarking) Scheme	Energy Sustainability Unit (ESU) of the National University of Singapore and the National Environment Agency (NEA) of Singapore	Existing offices, hotels and retail malls	• Energy Performance is evaluated against an online performance based building benchmarking tool. • Buildings that are in the top quartile- (top 25 percentile) in terms of Energy Efficiency are awarded the Energy Star Label.
Malaysia	Building Energy Benchmarking Program	Building Energy Benchmarking Scheme	Information not available.	Information not available.	• The program encourages tenants to report their energy use. • Tenants who participate are given a report on their energy use and GHG emissions and provided with recommended strategies for reducing energy use.
Australia	National Australian Built Environment Rating System (NABERS)	Building Energy Labeling (Benchmarking) Scheme	Department of Environment, Climate Change and Water, New South Wales (DECCW)	Existing commercial offices, hotels and residential buildings	• NABERS measures overall environmental performance of an existing building during operation and enables comparisons. • Since it is based on actual measured performance, it is complementary to expert design tools and design based rating systems.

TABLE 3.1: PERFORMANCE BASED SCHEMES / INSTRUMENTS					
Country / Jurisdiction	**Scheme / Instrument Name**	**Scheme / Instrument Type**	**Implementing Authority**	**Building Types**	**Key Features**
Europe	The Energy Performance of Buildings Directive (EPBD)	Building Energy Labeling (Benchmarking) Scheme	Each member state to Implement the directive locally or regionally as preferred	New residential and non-residential buildings and major renovations	• Each member country defines a methodology for energy assessment of buildings. • Minimum requirements for energy performance of all new buildings have been set. • Energy performance certification of all buildings is required and Energy Performance Certificates must be provided when making real estate transactions (buy, sell, lease).
USA	ENERGY STAR for Commercial Buildings	Building Energy Labeling (Benchmarking) Scheme	U.S. Environmental Protection Agency (EPA)	New commercial and industrial facilities and major renovations	• To qualify for the ENERGY STAR label, a building must rank in the top 25 percentile. • To determine the performance, EPA compares energy use amongst other, similar types of facilities on a scale of 1-100. • Buildings that achieve a score of 75 or higher may be eligible for the ENERGY STAR.
Melbourne, Australia	Environment and Resource Efficiency Plan (EREP)	Energy Audit and Retrofit Program	Victorian Environment Protection Agency (EPA)	Existing large industrial and commercial facilities	• The program requires large green house gas emitters to complete audits and implement sustainable actions that can be paid back in three years or less.
Berlin, Germany	Berlin Energy Saving Partnership (ESP)	Energy Audit and Retrofit Program	Berlin Energy Agency (BEA)	Existing large government and commercial buildings	• Retrofits of buildings are organized by setting up special contracts between the building owners and ESCO's. • ESCO's guarantee energy efficiencies of about 26% and pay the cost for the retrofit. The building owner pays the ESCO back from the savings due to the energy efficiency retrofit.

TABLE 3.2: DESIGN BASED SCHEMES / INSTRUMENTS					
Country / Jurisdiction	**Scheme / Instrument Name**	**Scheme / Instrument Type**	**Implementing Authority**	**Building Type**	**Key Features**
Singapore	Green Mark Certification	Green Building Rating System	Building and Construction Authority of Singapore (BCA)	New and existing commercial buildings, New residential buildings, office Interiors, landed houses, infrastructure and district projects	• Basic certification is now a mandatory requirement in the Building Code. • The assessment includes design and documentary review as well as site verification.
India	Energy Conservation Building Code (ECBC)	Building Energy Code	Bureau of Energy Efficiency (BEE) under the Ministry of Power	New commercial buildings and major renovations	• First stand alone national building energy code in India • The code has very strong building envelope requirements.
India	Leadership in Energy and Environmental Design (LEED) India	Green Building Rating System	Indian Green Building Council (IGBC)	New commercial buildings and major renovations, core and shell, homes and factory buildings	• LEED India is the indigenized version of the LEED rating system of the USGBC (United States Green Building Council).
Sri Lanka	Code of Practice for Energy Efficient Buildings	Building Energy Code	Sri Lanka Sustainable Energy Authority (SLSEA)	New and retrofit commercial buildings, Industrial facilities and large scale housing schemes	• The code had pre-considerations that suggest load reduction measures before other recommendations. • Requirements for Testing, Adjusting, Balancing and Commissioning best practice, rarely seen in building energy codes. Requirement for Operations and Maintenance Manual as well.
China	Design Standard for Energy Efficiency in Public Buildings (2005)	Building Energy Code	The Ministry of Housing and Urban-Rural Development (MOHURD)	New non-residential buildings (commercial, educational and government buildings) and additions and retrofits of existing buildings	• The standard addresses building envelope characteristics and HVAC system efficiency with both mandatory and voluntary provisions.
Malaysia	Green Building Index (GBI)	Green Building Rating System	GBI Accreditation Panel (GBIAP)	New commercial and residential buildings	• The rating system is very similar to the USGBC's LEED rating system. • To maintain the certification, the building is reassessed every three years.

TABLE 3.2: DESIGN BASED SCHEMES / INSTRUMENTS					
Country / Jurisdiction	**Scheme / Instrument Name**	**Scheme / Instrument Type**	**Implementing Authority**	**Building Type**	**Key Features**
Japan	Energy Conservation Law	Building Energy Code	Ministry of Land, Infrastructure and Transport (MLIT) and the Ministry of Economy, Trade and Industry (METI)	All new construction in Japan comes under the code	• Under the Energy Conservation Law, Japan has issued a set of building energy standards for commercial and residential buildings. There are three building energy codes. One covers commercial buildings and the other two residential. • The Criteria for Clients on the Rationalization of Energy Use for Buildings (CCREUB) is the code for commercial buildings.
Japan	Comprehensive Assessment System for Building Environmental Efficiency (CASBEE)	Green Building Rating System	Japan Sustainability Building Consortium (JSBC) which is set within the Institute for Building Environment and Energy Conservation (IBEC)	New construction, existing buildings, renovations, heat island, urban development, and urban area + buildings	• CASBEE was developed to reflect a building's life cycle. • Under CASBEE there are two spaces, internal and external, divided by a hypothetical boundary. • It evaluates the positive performance of the building for the building users compared to the negative impact of the construction of the building on its surroundings.
Australia	Building Code of Australia (BCA)	Building Energy Code	Australian Building Codes Board (ABCB)	New commercial, public and residential buildings	• The Code gives the mandatory minimum energy performance requirements. • It allows for either a performance based approach to compliance or a prescriptive approach based on requirements for specific building components.
Australia	Green Star	Green Building Rating System	Green Building Council of Australia (GBCA)	New commercial, residential, office interiors, industrial and major renovations	• In design the tool is originally based on BREEAM and also draws upon LEED rating systems. • The rating system is intended to distinguish buildings in the top 25% of the market.
USA	ASHRAE 90.1	Building Energy Code	Each state or local authority can choose to adopt and enforce the code	All commercial and multifamily residential buildings.	• All buildings falling under this code have to comply with the mandatory provisions of the code and either the prescriptive method or the energy budget method.
USA	Leadership in Energy and Environmental Design (LEED)	Green Building Rating System	United States Green Building Council (USGBC)	New commercial buildings, existing buildings, commercial	• This rating system has become quite popular and has captured the imagination of markets in USA and many other countries. Other countries around the world have formed their own Green Building

TABLE 3.2: DESIGN BASED SCHEMES / INSTRUMENTS					
Country / Jurisdiction	**Scheme / Instrument Name**	**Scheme / Instrument Type**	**Implementing Authority**	**Building Type**	**Key Features**
				interiors, core and shell, homes and neighborhood development.	Councils similar to the USGBC, with the help of the World Green Building Council and adopted/adapted the US LEED rating system in their countries.
USA	Green Globes	Green Building Rating System	Green Building Initiative (GBI)	New and Existing Commercial Buildings	• Adapted from Green Globes Canada in 2004 • It is an online assessment protocol, rating system, guidance for green building design, operation and management.

TABLE 3.3: DESIGN AND PERFORMANCE BASED SCHEMES / INSTRUMENTS					
Country / Jurisdiction	**Scheme / Instrument Name**	**Scheme / Instrument Type**	**Implementing Authority**	**Building Type**	**Key Features**
India	Green Rating for Integrated Habitat Assessment (GRIHA)	Green Building Rating System	GRIHA Secretariat backed by The Energy and Resources Institute (TERI) and Ministry of New and Renewable Energy (MNRE)	New commercial, institutional and residential buildings	• GRIHA evaluates the environmental performance of a building holistically over its entire life cycle – from inception to operation. • Validation of the predicted energy consumption, thermal comfort and visual comfort criteria after occupying the building is mandatory in order to get certified.
Thailand	Energy Conservation Promotion Act of 1992	Building Energy Code	Department of Alternative Energy Development and Efficiency (DEDE) under the Ministry of Energy	New and existing commercial buildings with a total installed capacity of 1 MW or more	• The Act covers prescriptive minimum requirements for OTTV (Overall thermal transfer value) and RTTV (Roof thermal transfer value) for the building envelope, lighting load and chiller efficiencies. • Also, to monitor progress and impact of measures the owners are required to submit records on energy consumption of their building twice a year.
China	Green Building Evaluation Standard, (The Three Star System)	Green Building Rating System	The Ministry of Housing and Urban-Rural Development (MOHURD)	New commercial and residential buildings and major renovations	• The rating system is similar to the USGBC's LEED rating system except for the performance criteria. • The Three Star System can only be awarded after one year of property operation.

3.1.4 Advantages and Disadvantages of Green Building / EE Instruments

Table 3.4: Advantages and Disadvantages of Green Building/EE Instruments

Green Building/EE Instrument	Brief Description, Examples	Voluntary / Mandatory	Target Audience[a]	Advantages	Disadvantages
Building Energy Labeling (Benchmarking) Schemes	Typically voluntary, performance based schemes that rate or recognize buildings based on their performance relative to a peer group; e.g., Energy Smart Building Label (Singapore), BEE Star Label (India), NABERS (Australia), Display Energy Certificates (EU), ENERGY STAR (USA)	Voluntary, may be mandatory for basic attainment levels	Early adopters (market leaders who seek and respond well to recognition)	o Help bring about actual performance improvements, o Help make often overlooked attributes of building performance more visible, o Can be relatively easy to get a rating (as compared to green building rating systems).	o Generally not as popular as green building rating systems, o Need robust verification mechanism in place, since rating/label is based on actual performance, o Usually requires operational data for a year.
Green Building Rating Systems	Typically voluntary, design-based assessment systems covering a range of criteria, both mandatory and elective, to establish the overall environmental performance of buildings, including considerations of energy, water, land conservation, access to transit, indoor environmental quality, sustainable materials and resources; e.g., BERDE (Philippines), Green Mark (Singapore), LEED (USA, India), GRIHA (India), Eco-Housing Criteria (India), LOTUS (Vietnam), Green Building Evaluation Standard (China), Green Building Index (Malaysia), CASBEE (Japan), Green Star (Australia), BREEAM (UK)	Voluntary, may be mandatory for basic attainment levels	Early adopters (market leaders who seek and respond well to recognition)	o Holistic instruments that go beyond just energy performance, o Set quantifiable, broadly acceptable yardsticks for environmental performance of buildings, o Popular with markets, investors, developers, o When done right, can result in a far superior building on multiple counts, in a cost-effective manner.	o Ratings are design-based, so there is usually little assurance of actual performance, o Can result in significantly higher costs when adopted late during the design process, o Certification costs and documentation requirements can get burdensome, o Project teams can get distracted about pursuing points instead of actually enhancing the building performance.

[a] As categorized in: Vaidya, Prasad, Ranjit Bharvirkar, Alecia Ward, Reshmi Vasudevan, and Koshy Cherail. "Transforming the Building Energy Efficiency Market in India: Lessons from the USA." In *ACEEE Summer Study 2010 - Energy Efficiency in Buildings*. CD-ROM.

Green Building/EE Instrument	Brief Description, Examples	Voluntary / Mandatory	Target Audience[a]	Advantages	Disadvantages
EE/Green Building Incentive Programs	Programs that offer some sort of incentives (monetary or otherwise) aimed at encouraging stakeholders to adopt desired practices that may include meeting, achieving or exceeding levels of performance or attainment for instruments described above; e.g., considerations for additional floor area or relaxation of height/size restrictions for developers, cost offsets to defray additional investments needed for EE/green buildings, tax benefits, priority plan review and permitting processes, etc.	Voluntary, may be offered for doing considerably better than attaining mandatory levels	Middle of the market (risk averse, fiscally conservative segment that responds well to incentives)	o Can help move the "middle of the market" players by enticing them to participate in EE/green building schemes, o Can set high bars for performance as there is something valuable being offered in return, o May be viewed as preferable by stakeholders, and thereby may be more effective, as rewards are associated directly with specific investments.	o Generally, there are costs associated (monetary, administrative or otherwise) for the entity offering incentives (typically utilities or government), o Difficult to say what portion of the market would have anyway incorporated EE measures in the absence of incentives, o May encourage attempts to "game the system" since there are real and tangible benefits on offer.
Building Energy Codes and Standards	Regulatory standards typically laying out minimum criteria for specification or performance of building systems affecting energy use; e.g., ECBC (India), EEBC (Sri Lanka), EECBC (Vietnam), DSEEPB (China), CCREUB (Japan), ASHRAE 90.1 (USA)	Mandatory, may be rolled out as voluntary to begin with, to gain market acceptance and to build market capability	Laggards (bottom of the market, who do not respond to recognition or incentives, but will do what's needed to stay within legal bounds)	o Set minimum requirements for compliance that are compulsory for everyone o Can be relatively easy to adopt and enforce (especially for prescriptive compliance paths) o Can be a cost-effective means to standardize enhanced EE practices	o Need to balance stringency and ease of use in order to drive high adoption rates and successful implementation o Connection to energy with prescriptive compliance paths is often tenuous, o Performance-based compliance paths (albeit more flexible) can be extremely complicated to enforce

3.1.5 Barriers and Solutions Matrix for EE in Buildings

Table 3.5: Barriers and Solutions Matrix for EE in Buildings[a]

Barriers	Program Areas				
	1	2	3	4	5
High initial cost for EE / insufficient capital (or debt capacity) for EE investments (competition for capital), or lender aversion to EE loans	✓	✓	✓	✓	
Non-implementation of government incentives	✓		✓		
Poor protection of consumers	✓	✓			✓
Poor understanding of use and benefits of EE equipment, or risk / change aversion of facility staff and/or building users		✓	✓		✓
Lack of knowledge on how to incorporate EE and lack of simplified tools to calculate value / benefits of EE investments (or of enhanced EE in buildings)	✓	✓	✓		
Inadequate promotion and advocacy programs on EE opportunities	✓	✓	✓	✓	✓

[a] Adapted from *Barriers and Component Matrix* discussed in:

- Verdote, Noel N. "Efficient Lighting Market Transformation in the Making—The Philippine Experience." In Energy Efficient Cities: Assessment Tools and Benchmarking Practices, edited by Ranjan K. Bose, 131-146. Washington, DC: The World Bank, 2009. http://www.esmap.org/esmap/sites/esmap.org/files/P115793_Energy%20Efficient%20Cities-Assessment%20Tools%20and%20Benchmarking%20Practices_Bose.pdf (accessed September 4, 2010).; citing:
  - Philippines Department of Energy (DOE) and United Nations Development Program (UNDP). "Project Brief—Philippine Efficient Lighting Market Transformation Project." Geosphere Technologies, Inc., consultant report, DOE, Manila, 2002.
- Other discussions on barriers referred to in creating this table include:
  - CoreNet Global, and Rocky Mountain Institute. *The Energy Challenge: A New Agenda for Corporate Real Estate*. 2007. http://bet.rmi.org/files/clients/corenet.pdf (accessed September 11, 2010).
  - Kinsley, Michael, and Sally DeLeon. *Accelerating Campus Climate Initiatives*. Compiled by Association for the Advancement of Sustainability in Higher Education and Rocky Mountain Institute. 2009. http://www.rmi.org/rmi/Library/2009-17_AcceleratingCampusClimateInitiatives (accessed September 11, 2010).
  - Lawrence, Thomas M., Jeffrey D. Mullen, Douglas S. Noonan, and Jay Enck. "Overcoming Barriers to Efficiency." *ASHRAE Journal*, September 2005, S40-S46.
  - Lovins, Amory B. *Energy Efficient Buildings: Institutional Barriers and Opportunities*. Strategic Issues Papers. Boulder, CO, USA: E Source, Inc., 1992.
  - The National Association of Industrial and Office Properties Research Foundation, and Yudelson Associates. *Green Building Incentives That Work: A Look at How Local Governments Are Incentivizing Green Development*. www.naiop.org/foundation/greenincentives.pdf (accessed September 11, 2010).
  - United Nations Environment Program; Division of Technology, Industry, Economics. *Improving Energy Efficiency in Industry in Asia: A Review of Financial Mechanisms (Draft)*. http://www.energyefficiencyasia.org/docs/Review%20of%20Financial%20Mechanisms%20for%20EE.pdf (accessed September 11, 2010).

Barriers	Program Areas				
	1	2	3	4	5
Lack of locally assembled / manufactured EE products (market for EE products not well developed), import duties add to costs	✓	✓	✓		
Ineffective implementation of DSM framework		✓	✓	✓	
Non-implementation of building energy use guidelines	✓		✓		
Inadequate EE equipment / product testing facilities	✓	✓	✓		
Insufficient monitoring and verification to ascertain actual impact	✓	✓	✓		
Poorly developed ESCO transactions, lack of legal and financial infrastructure to support performance contracts		✓	✓	✓	
Split incentives between owner and tenant (“principal-agent problem”)	✓		✓	✓	✓
Fee structures for design professionals are not set up to encourage EE and load reduction (right-sizing of equipment)	✓	✓	✓		✓
Public contracting requirements are a barrier in government green building projects	✓	✓	✓		✓

Program Areas:

1. Create and/or update policies, standards and guidelines
2. Build institutional and technical capabilities
3. Educate stakeholders and disseminate information
4. Develop and implement appropriate financing mechanisms
5. Highlight the positive (climate mitigation, societal) impact of widespread adoption of EE practices

3.2 Current Practices and Market in the Philippines

3.2.1 Quezon City's Building Trend and Energy Consumption

3.2.1.1 Public Sector

From 2001 to June 2009, 25% of Quezon City's public infrastructure projects were devoted to public schools. This is an investment of 4.2 Billion Pesos and is the 2nd largest investment, next only to public roads. This school investment trend will most likely continue as Comparative Enrolment Statistics show that there is an overall increase of 15.96% from SY2001-2002 to SY2008-2009. Infrastructure investment in other sectors during this period included 5.16% (870 Million Pesos) for Offices at 870 Million Pesos and 4.78% (806 Million Pesos) for Health Centers. As shown in Figure 4.1 below.

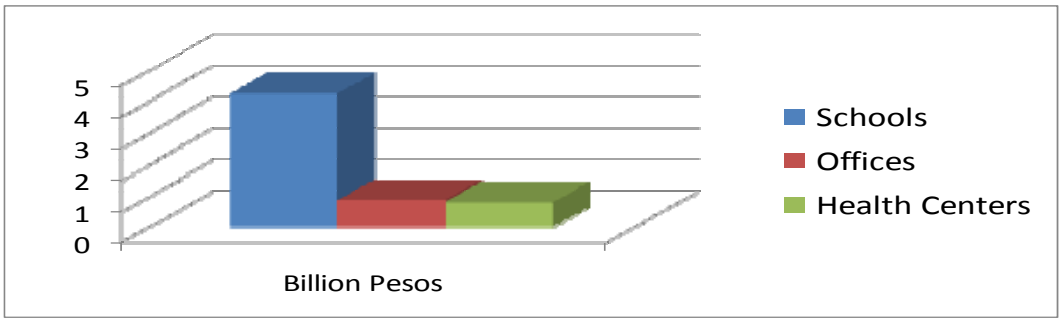


Figure 4.1: Public Sector Investment (2001 – 2009)

In 2007, Quezon City's annual energy consumption on its public buildings (excluding street lights) was 142,237,134 kWh. Around 42% of the consumption comes from public Schools (Elementary & High School) from around 169 campuses all over Quezon City. The public offices accounted for 37% and Hospitals and Health Centers accounted for 11% of the total consumption during this period as shown in Figure 4.2.

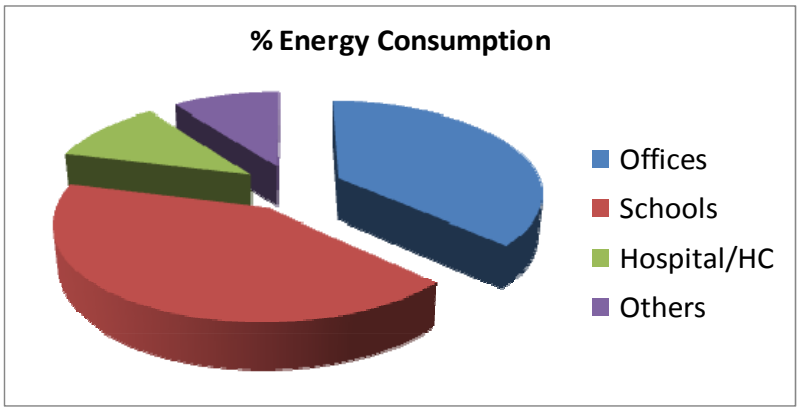


Figure 4.2: Public Sector Energy Consumption (2007)

3.2.2 Private Sector

The city's total power consumption in 2007 was 3,511 GWh. The contribution of the commercial sector was the largest at 45.8%, while the residential sector accounted for 37.3% and 16.1% from the industrial sector. This energy distribution will probably continue in the foreseeable future. Based on the 3,909 Building Permits Approved from January 2008 to February 2010, 52% were Residential

and 43% were Commercial. But the gross floor area of these commercial buildings is far greater than residential buildings and hence, the energy demand will be higher. The sector wise energy consumption in QC in 2007 is shown in Figure 4.3.

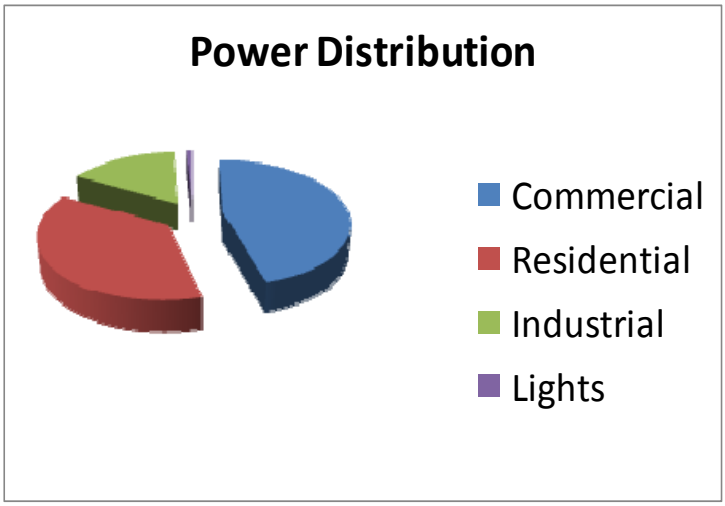
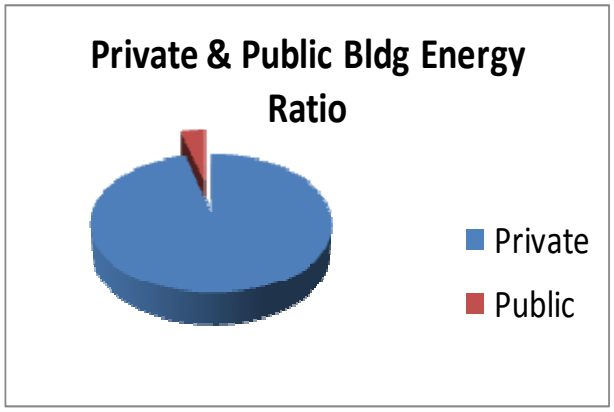


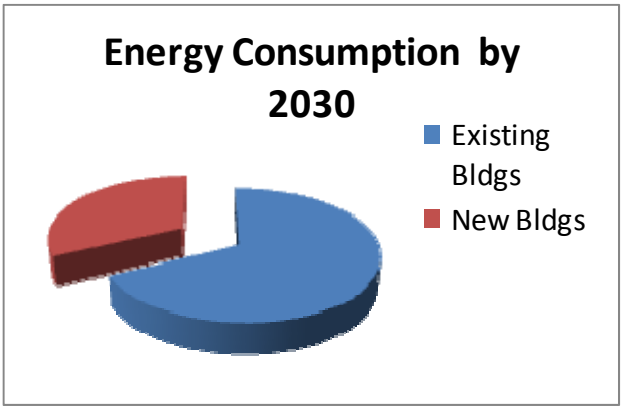
Figure 4.3: Overall Sector Wise Energy Consumption (2007)

It is noteworthy to add that the Quezon City's Real Estate Tax Income has almost doubled from Php758, 000,000 in 2001 to a projected 1.3 Billion Pesos for 2009. Its Business Tax income has more than doubled from 1.1 Billion Pesos in 2001 to a projected 2.8 Billion Pesos for 2009. The commercial building sector indeed is growing exponentially.

Public-owned and Private-owned Building Energy Consumption

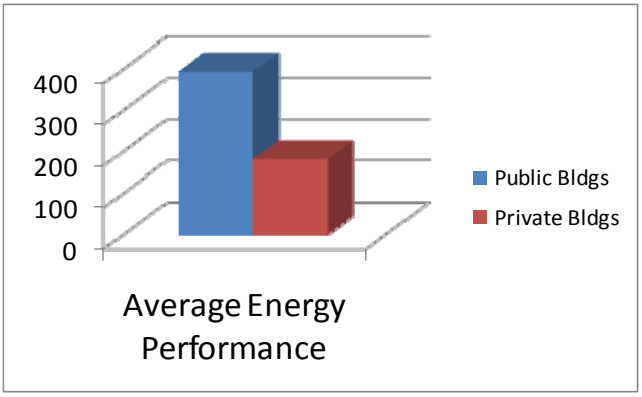
Based on the data gathered, the city's annual power consumption for private and public buildings combined is estimated at 3,642 Gwh. Power consumption comes mostly from private buildings amounting to 96.1% of the total while the remaining 3.9% comes from public buildings. Assuming that the building construction trend will continue based on the approved building permits data for the past 2 years, the city's projected total annual power consumption by 2030 will be around 5,382 Gwh , 32.3% of this will be coming from buildings yet to be built.

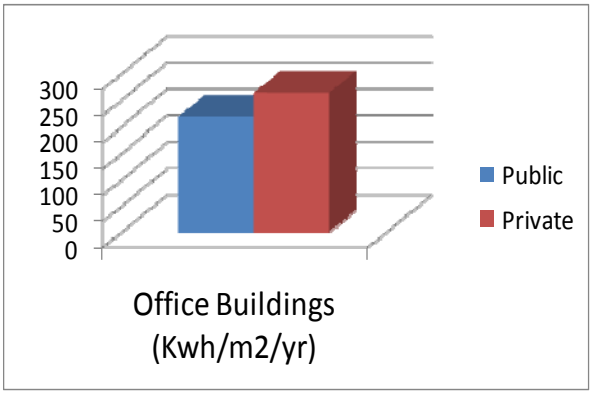




Based on the building walkthroughs and data gathered, the average energy performance' site energy use intensity for public buildings is estimated at 394 Kwh / sq.m. / year while the average energy performance' site energy use intensity for private-owned buildings is estimated at 181 Kwh / sq.m. / year. This puts private-owned commercial buildings 54% more energy efficient than public buildings. This is quite surprising because most of the public buildings audited do not have centralized air-conditioning while the commercial buildings audited all have centralized air-conditioning. It is important to note however that the energy performance of the public office building audited is 217

Kwh / sq.m. / year while the average energy performance of the private-owned office buildings is 263 Kwh / sq.m. / year. Please see the building walkthrough audit reports for more details.





3.2.3 Overview of National Codes, Laws, Ordinances and Policies

National Building Code

The current Philippine National Building Code was designed mainly for the building occupants' public health and safety. Although mandatory, it contained only voluntary standards on energy efficiency concerning building shells, lighting, HVAC and water heating. In the past 15 years, the Philippine government has taken substantial action to establish a mandatory building energy code, but there is a lack of significant implementation or enforcement of the code. In 2004, it was concluded that the energy code was obsolete and there was a need to revamp and revise it. Up to this writing, that revised Energy Code has not been published, even key people in the Department of Energy are not aware of this Energy Code.

Existing Environmental Laws and Policies

There are currently many national codes and laws that relates to green building and energy. These include:

1. Clean Air Act
2. Solid Waste Management Law
3. Philippine Environmental Policy
4. Philippine Environment Code
5. Pollution Control Law
6. Toxic Waste and Hazardous Substance Act
7. Anti-Smoking Law
8. Renewable Energy Act of 2008
9. Environmentally Critical Areas
10. Water Code

However, implementation and enforcement is lacking. It is notable to mention however that Quezon City has taken great strides on its Solid Waste Management.

Current Bills in Congress and Senate

To add to the existing laws and policies, there are currently numerous Legislations on the table at the Senate and the Congress. These include:

1. Green Building Act of 2009
2. Greening Act of 2007
3. Green Energy Education Act of 2009
4. Promoting Green Collar Jobs in the Philippines Act of 2009

Makati City

The City of Makati, is currently crafting a resolution encouraging the design, construction, restoration, operation and maintenance of building and other structure to meet minimum standards of green building.

3.2.4 Review of Quezon City Green Building Ordinance of 2009

The Ordinance mandates green buildings for new construction and existing building retrofits/renovation for both government-owned and private-owned buildings. It is effective February 2, 2009, which is its enactment date.

3.2.5 Incentives

Green Building Tax Credit (Art IV, Sec 17)

Compliance with this ordinance and its Green Building Rating System, a tax credit will be awarded which will be as follows:

1. Whole building credit = not more than 25% of Real Property Tax due for the same taxable year
2. Base Building credit = not more than 20% of Real Property Tax due for the same taxable year
3. Tenant Space credit = not more than 15% of Real Property Tax due for the same taxable year

Tax Discount (Sec 20)

This incentive still needs to be devised and evaluated. This covers tax discounts for the following:

1. Use of Renewable energy
2. Use of energy efficient technology
3. Provision of open spaces
4. Use of environment-friendly materials

3.2.6 Green Building Rating System (Sec 9)

This is mandatory and a major part of the ordinance. This part is still to be devised and will be implemented by:

1. Building Official
2. City Planning and Development Office
3. Environmental Protection and Waste Management Department
4. Engineering

The Green Building Criteria for evaluation shall cover:

1. Renewable building materials
2. Insulation and energy reduction/efficiency mechanism
3. Solid waste and waste water treatment
4. Green architecture
5. Reduction of GHG & VOC emissions

3.2.7 Initial Public Comments

IIEC conducted an initial survey from the private sector about this ordinance and here are some of their comments:

1. They have no knowledge it exists. They further suggested that the Quezon City Government should have more public information drives.
2. In addition to the tax incentives, entities that show effort in energy efficiency and sustainability should be given recognition.
3. The ordinance is vague on parameters to be implemented. Some examples are:
   3.1 Please clarify further and define parameters of *"all major structures or facilities"* in Section 9. Maybe a minimum total gross floor area requirement?
   3.2 Please clarify further the last phrase in Section 9 which states *"The process of certification shall begin from the initial preparation and planning phase and throughout the lifespan of the facility or structure."* How will the final credit certification be given then?

3.2.8 National Green Building Rating System

Currently, the Philippine Green Building Council (PhilGBC) is developing a national green building rating system called "BERDE". BERDE stands for Building for Ecologically Responsive Design Excellence. PhilGBC is the only organization in the Philippines that is recognized and a member of the World Green Building Council (WorldGBC), which is an umbrella organization of all the Green Building Councils in the world, which includes U.S.A (USGBC), Canada, UK, Australia, Singapore, Japan and many more.

BERDE is voluntary and uses existing Philippine environmental laws, policies and codes as pre-requisites. BERDE will officially launch its pilot project in June 2010. The Net Group and Ayalaland have announced their commitment to pilot BERDE for their new and existing buildings. Megaworld, a major developer in Quezon City also expressed their interest in piloting BERDE.

To fast track the implementation of this ordinance, Quezon City might want to incorporate BERDE and pilot new and existing government-owned buildings to showcase and set an example to the private sector.

3.2.9 Key Value Drivers

To implement and programs for energy efficiency and green buildings in Quezon City, it is important to identify key value drivers to move various programs forward. Drivers for the public and the private sectors vary and some of the key drivers are listed below.

Key value drivers for the Government are:
- Environmental Stewardship
- Operating Cost
- Employee Satisfaction and Retention
- School Student Performance
- Stakeholder Relations

Key value drivers for the Commercial Real Estate are:
- Occupancy Rate
- Operating Cost
- Tenant Satisfaction and Retention
- Asset Value
- Shareholder Value

3.2.10 Potential Barriers

Energy Efficiency Programs specially Green Building Programs are very new to Quezon City. There will be numerous barriers in implementing these programs. Some of these barriers are listed below.

Public Sector:

- **Strong first cost bias.** Generally, operations and maintenance budget for public buildings are very limited. The local government usually looks at the first cost in justifying expenses and very seldom looks at the long term investment value of the first cost. Then, there is the lack of incentive for the building users to implement energy efficiency programs because there is a separate department in the Quezon City government that takes care of procurement and major maintenance services for the buildings they occupy. The Quezon City government needs to create a sustainable Operations and Maintenance plan for their buildings and create an incentive for the building users. This plan needs to be mandated in all their existing and new building facilities. This will only work if there is sufficient and sustainable funding for this program. Currently, Quezon City has a budget surplus, this might be a good opportunity to make use of the surplus. If not, financing thru ESMAP might be another option.
- **Lack of availability of local "green" products.** The local government should encourage and promote local manufacturers and entrepreneurs, thru tax breaks and incentives, to engage in manufacturing of "green" products to support the program. This will not only lower the cost of these products, but also help grow the local economy more sustainably.
- **Lack of equipment testing & certification for building products.** To avoid "green washing" a third party certification is needed for "green" building products. Currently, PhilGBC has partnered with GreenChoice Philippines to do this task for BERDE. To further expedite this process, the local government needs to partner with other governmental or private agencies to do this testing and certification.
- **Lack of green building design, analysis and implementation expertise.** Since green building is fairly new, local government departments that are essential in implementing this program needs to be trained. A new Quezon City Department of Sustainability might be essential to lead this undertaking.
- **Lack of awareness, information and tools.** Funding is needed to properly disseminate this program to all the local government departments and baranggays. A new Quezon City Department of Sustainability might be essential to lead this undertaking.
- **Electricity rate structures and subsidies.** To make this program effective, a good partnership and collaboration between the local government and the utility companies is needed.
- **Territoriality by agencies involved in the traditional building certification system.** The green building ordinance suggests that the green building rating system and the ordinances' implementation will be borne by three to four different departments. An inter-departmental conflict and a lack or unclear responsibility between departments may occur and therefore impeding the program. A new and special department that is directly under the Office of the Mayor should be created to handle this specific program and other sustainable development or other green programs in Quezon City. A new Quezon City Office of Sustainability may be the answer.
- **Potential official abuses.** A lot of the abuses and corruption happens during procurement of products and services. Under specified and over-priced products and services can kill this program over time. A more robust and sustainable policing procedure needs to be in place and implemented.
- **Lack of government & utility "Champions".** Continuity of an energy efficiency program will be dependent on program "champions" from key people in the local government. Programs usually die or get shelved due to election cycles. There needs to be a more robust energy efficiency program structure that will sustain thru different election cycles and thru different local government officials. A good partnership and

collaboration between the local government and the utility companies need to happen to support the program.

Private Sector:

- **Strong first cost bias.** Developers and building owners don't have the incentive to build new "green" buildings if the savings and benefits goes to their tenants. The green building market has not matured in Quezon City to enable the building owners or developer to ask for a premium to lease, rent or buy their properties. Tax incentives and discounts stated in the green building ordinance might be financially viable for the private sector to absorb the first cost. Public recognition is also an added benefit for the private sector. The local government can also partner with other governmental or private (local, national or international) financial organizations to help finance private companies to participate in this program.
- **Lack of availability of local "green" products and materials.** Almost all of the "green" products in the Philippines are imported. Even the locally manufactured PV Panels in Laguna cannot be purchased in the Philippines but have to be imported from China due to international agreements. Imported construction materials and products are usually very expensive and unsustainable.
- **Lack of equipment testing & certification for building products.** To avoid "green washing" a third party certification is needed for "green" building products. Unfortunately, there is still not much demand for this testing & certification. This green building ordinance will definitely help create this demand.
- **Lack of green building design, analysis and implementation expertise.** Green building is still at its infancy in the Philippines. The green building strategies and expertise used in the Philippines are usually technology driven and expensive, hence only large companies can afford it. Although Green Building movement is now happening, the likes of the Philippine Green Building Council, UAP's Green Architecture Movement and Green Advocacy Philippines, proper implementation is still lacking.
- **Lack of awareness, information and tools.** Although green building is now being talked about in the media, the local government needs to make the green building case a local necessity. Most big developers in Quezon City were not even aware of the green building ordinance. The local government needs to do a lot more public consultation to get the "buy-in" from the local market.
- **Electricity rate structures and subsidies.** The IRR of the Philippine Renewable Act of 2008 is currently being developed. One of the items they are developing is the net-metering policy. The local government should not wait for the national government for the implementation, it took around 17 years for this act to be passed. They should start this process independently to benefit the implementation of the green building ordinance.
- **Territoriality by agencies involved in the traditional building certification system.** With how the green building ordinance's implementation is setup, it is bound to confuse the private sector. The current building permit process is already slow, this certification process will definitely further slow down the process and create further confusion. A "one stop shop" department should be created to expedite the process and therefore encourage the uptake of this program. Using BERDE in the mix, will further expedite the process while easing the burden and the work load on the local government.
- **Potential code official abuses.** As stated in the previous item, further confusion in the process will only lead to further delay. The private sector will see this as another opportunity for code official abuses. The program should promise a more expedient process, quicker than the regular building permit process... as an incentive.
- **Lack of government & utility "Champions".** A good partnership and collaboration between the local government and the utility companies need to happen to support the program.

3.2.11 Summary

Energy Efficiency (EE) and Green Building (GB) Programs in Quezon City should cater to everyone. The Quezon City government-owned buildings are consuming around 142,237,134 KWh of energy annually, and this will continue to grow as more infrastructures will be built such as buildings for education, offices, healthcare, recreational facilities. So it is vital that Quezon City spearhead programs for high performance buildings.

In addition, a new Central Business District (CBD) is being developed and this will be interesting if we can make this into a more sustainable development. As it is, the commercial buildings accounts to around 46% of Quezon City's total power consumption. The commercial real estate also needs to look at high performance (HP) buildings as well. EE/GB programs will probably balance out Cost versus Demand scenario for HP buildings.

But it always boils down to the residents of Quezon City, the consumers, whose major building concerns are energy costs, water security and health issues. So it is vital that the Quezon City Government do public consultations and study if there should be a balance of mandatory and voluntary rules in their ordinance. Collaboration is key to the success of any EE/GB program in Quezon City.

3.3 Summary of Stakeholder Consultations

Based on the comments and recommendations gathered during the briefing meeting of stakeholders, the conclusions are as follows:

1. Program options that are applicable to QC can be identified from among those that were presented. These program options that are applicable to QC can be further classified in terms of ease of implementation and absence from controversy from those that will require incentives, passing an ordinance and/or enforcement by local government, and may take years before it can be implemented or delivered.

2. Program options of more than ten will be too overwhelming. Five program options for consideration is more acceptable. Information sharing is one program option that can be easily implemented and different implementation approach on information sharing can be developed.

3. EE Building Program addressed to the residential sector can be considered but should be voluntary. It should not impose additional cost on the residential sector. It could be in the form of information dissemination or provision of incentives in the permitting process.

4. Possible incentives for the private sector to participate in EE Buildings Program are cap on development areas, expediting the permitting process, or recognition and bragging rights on measures undertaken.

5. A road map for the development of the IRR for the Green Building Ordinance will help the QC officials in their objective to implement the said ordinance.

6. Considering that a significant portion of the city's electricity consumption is accounted for by the school building sector in QC, a school to showcase the adoption of EE and other green building measures is a possible pilot activity. The school to be chosen as a showcase should have a typical design to present opportunities for replication. It should also offer opportunities for maximum impact from measures to be identified.

3.4 Options for EE Building Program Plan

The programs proposed in this Section were identified in concurrence with QC officials. Initial estimates of benefits are based on walk-thru audits and similar programs undertaken in the region. Following approval, a detailed Program Plan will be developed which would include targeted buildings, proposed EE measures, cost / benefit analysis, implementation options, capacity building requirements for QC staff, monitoring and verification procedures etc.

3.4.1 Green Schools Retrofit Program

At present there are a total 169 elementary and high schools in QC and the expenditure on new schools is the highest excluding roads. Preliminary energy audits conducted indicated there is potential for significant energy savings through the implementation of simple measures. The construction of schools has been based on a standard design and hence, the potential for replication of EE measures is very high. The key features of the proposed program are given in the Table below.

Program	***Green Schools Retrofit Program***
Program Objectives	*This program is aimed at reducing the energy costs in Public Schools in QC by the implementation of low cost EE measures. These would include retrofitting of efficient lighting systems, air-conditioner controls, reducing heat gain due to orientation.* *In addition, the program will propose revisions to the existing design for new schools to comply with BERDE (Green Building Rating System) in accordance with the requirements of the Green Building Ordinance.*
Target Market Segment	*All public schools (Elementary and High) in Quezon City*
Program Scope	*The program involves the replacement of existing T12 (40W) Fluorescent tubing and standard ballasts with T5 (28W) Fluorescent tubing with electronic ballasts and efficient luminaires; modifications to the classroom switching arrangements and use of light shelves to maximize use of daylighting; air-conditioner timer controls; use of energy efficient appliances and other measures to the building envelope to reduce heat gain.* *Detailed energy audits will be conducted in a series of schools and a standard set of measures will be developed that could be applied to all the schools.* *Compliance with the Green Building Ordinance will be considered for new schools or for schools undergoing extensive renovation. A review of the current schools designs will be undertaken and the costs and benefits of incorporating energy, waste, solid waste management & environmental features (in compliance to BERDE) will be determined. The Department of Education has recently revised (December 2009) the Educational Facilities Handbook to include a section on Green Schools*
Potential Benefits	*It is estimated around 30 % of the current energy consumption could be saved by the implementation of simple EE measures. The benefit to QC will be a reduction in energy consumption in schools by around 18,000,000 kWh (127 Million Pesos) per year.*

3.4.2 Energy Efficiency Program for Offices and Hospitals

At present there are a total of 37 office buildings, 2 Hospitals and 55 Health Centers in QC and accounts for 48% (37% for offices and 11% for hospitals/health centers) of the total electricity consumption. The infrastructure expenditure in these two sectors from 2001 to June 2009 was 870

Million Pesos and 806 Million Pesos respectively. Initial benchmarking of energy use intensity (kWh/sq,m/year) indicate significant potential for EE improvement. The key features of the proposed program are given in the Table below.

Program	***Energy Efficiency Program for Offices and Hospitals***
Program Objectives	*This program is aimed at reducing the energy costs in Public Offices, Hospitals and Health Centers in QC by the implementation of low cost EE measures focussing on lighting, air-conditioning and office equipment.* *In addition, the program will prepare an Energy Efficiency Manual for use by Public Sector Employees. Development of Energy Management Plan for the sites and participation of employees will also be included.*
Target Market Segment	*All public offices, hospitals and Health Centers in Quezon City*
Program Scope	*The program involves the conduct of energy audits in selected office buildings, hospitals (2) and health centers. The audits will determine cost-effective EE measures that could be implemented in the respective sectors. Pilot programs will be undertaken to monitor and verify the energy savings.* *The EE technologies that may be applicable include:* • *Replacement of existing T12 (40W) Fluorescent tubing and standard ballasts with T5 (28W) Fluorescent tubing with electronic ballasts and efficient luminaires;* • *Use of dedicated light switches (pull-cord type) for fluorescent lights to facilitate localized switching off.* • *Use of AC timers to control hours of operation* • *Routine AC maintenance program* • *Regulation of room temperature (~ 25C)* *In addition, the following complimentary activities will be undertaken:* ***Public Sector Energy Awareness Program:*** *To get the maximum benefits from the public sector energy conservation program the awareness and participation of the employees is essential. A focused awareness campaign is proposed It is also recommended that Energy Officers are appointed for each building who will regularly inspect the premises during and after working hours and report any violations or misuse for rectification by the employee or Manager.* ***Revision of Government Procurement Guidelines:*** *It is proposed to revise the existing procurement guidelines to ensure the inclusion of EE equipment (lighting, air conditioning, office equipment).*
Potential Benefits	*It is estimated around 20% of the current energy consumption could be saved by the implementation of simple EE measures. The benefit to QC will be a reduction in energy consumption in Offices, hospitals and Health Centers by around 23,500,000 kWh (95 Million Pesos) per year.*

3.4.3 Benchmarking of Public and Private Sector Buildings

Activities undertaken in Task 2, have highlighted the deficiency of information in relation to specific energy consumption in both public and private sector buildings (offices, schools, malls, hospitals,

hotels etc). Hence, comparison of energy performance has been difficult. Initial comparisons were made with Guam (a country close to the Philippines with similar climatic conditions). However, there is a need for more accurate benchmarking to ensure sustainability of the QC program.

Program	***Benchmarking – Public and Private Sector Buildings***
Program Objectives	*QCs total power consumption (all sectors) in 2007 was 294 GWh per month of which the Commercial sector accounted for 46%. Hence, improved energy performance in this sector is likely to have a big impact on QCs overall EE Program objectives.* *This program is aimed at establishing local benchmarks on building energy performance for all sectors – offices, hospitals, schools, malls, hotels. These benchmarks will be used as a guide to identifying buildings for energy efficiency improvements. The benchmarks established will be compared to international standards in order to establish goals for energy performance in QC.*
Target Market Segment	*Public and Private sector buildings*
Program Scope	*The program involves the conduct of an extensive survey of all commercial establishments in QC to obtain information on energy consumption, floor area and construction type. The information for public buildings will be obtained from the relevant QC officials.* *Information request from the private sector will be on a voluntary basis and incentives could be provided to encourage responses. Confidentiality of information provided by respondents and sharing of results after completion of the study could be offered.* *A comprehensive database will be developed for benchmarking energy performance by building type. The information could be used in the building rating system of the Green Building Ordinance for the provision of incentives for compliance to specific standards. It may be possible to mandate a certain level of performance and provide incentives for higher level of performance.*
Potential Benefits	*This activity will be the basis of EE programs in the Commercial sector and enable to mandate minimum building energy performance requirements in the Green Building Ordinance and provide incentives for establishments with higher performance.*

3.4.4 Enforcement of Green Building Ordinance

The Green Building Ordinance which was enacted in February 2009 has not been enforced to date due to the unavailability of implementation procedures. A Green Building Rating System, stipulated in the Ordinance as mandatory (Section 9) is still to be devised. Hence, in order for the Ordinance to be enacted an accepted Green Building Rating System has to be incorporated and implementing rules and regulations have to be finalized.

Program	**Enforcement of Green Building Ordinance**
Program Objectives	*This program is aimed at incorporating a Green Building Rating System in Section 9 of the Green Building Ordinance and finalizing the Implementing Rules and Regulations (IRRs) to facilitate enforcement.* *The approved rating system and implementation procedures will be finalized after extensive stakeholder consultation to ensure commitment from both private and public sectors.*
Target Market Segment	*New construction and existing building retrofits/renovation for both government-owned and private-owned buildings*
Program Scope	*Currently, the Philippine Green Building Council (PhilGBC) is developing a national green building rating system called "BERDE" (Building for Ecologically Responsive Design Excellence). BERDE is voluntary and uses existing Philippine environmental laws, policies and codes as pre-requisites. The Philippine Department of Energy (DOE) is currently supporting the development of BERDE through the Philippine Energy Efficiency Project (PEEP). Hence, BERDE is likely to be the nationally adopted green building rating system for the Philippines.* *The Green Building Ordinance covers the following evaluation criteria – Renewable building materials, insulation, energy efficiency, solid waste and waste water management, green architecture and reduction of GHG and VOC emissions. BERDE is more comprehensive and includes - Land, Water, Energy, Transportation, Indoor Environmental Quality, Materials, Emission, Waste, Cultural Conservation.* *The official launch of the BERDE pilot project is scheduled for June 2010. It is proposed, the BERDE rating system is incorporated in the Green Building Ordinance.* *The implementation of the Ordinance is to be undertaken by the QC City Building Officials, City Planning and Development Office, Environment Protection and Waste Management Department and the Engineering Department of QC. For this purpose Implementing Rules & Regulations (IRRs) will be formulated.*
Potential Benefits	*International green building rating programs indicate an initial cost increase of 2 – 15% with life-cycle energy savings around 20-30%.*

3.5 Design of Energy Efficiency / Green Building Program Plan

A detailed program plan was developed under Task 5. A summary of the program designs are given in this Section.

3.5.1 Green Schools Program

Parameter	Description
Target Buildings	All schools comprising of 117 Elementary and 52 High Schools
Key Measures	EE lighting, lighting controls, daylighting and EE appliances Revision of existing school design to incorporate EE features
Energy Audits	The pilot program comprising of six schools (3 elementary and 3 high schools of different designs) should be undertaken either by QC following specialized training or by certified energy auditors. The threshold for EC measures should be 5 years simple pay-back. Considering the standard designs, the subsequent audits in schools will include an inventory of equipment required (lighting, ballasts etc). This could be undertaken by QC Department of Engineering.
Implementation	Directed by the Special Task Force for Energy Management (TF-EMO) to be established under the direction of the Office of the Mayor. Implemented through the QC Division of Schools and Department of Engineering. The revision of school building designs should be undertaken a qualified Architect have appropriate Green Building Accreditation (e.g. LEED Certification). Assistance should be sought from Phil GBC.
Program Monitoring	The energy audits will establish baselines at each site for performance monitoring. Preparation of a M&E Plan will be incorporated in the scope of the energy audit and associated metering will be included in the scope for implementation. The M&E function is critical in determining the overall program impacts. The responsibility for this should be with QC and the Task Force (TF-EMO) will determine the respective Departments.
Funding	The estimated budget is given in Section 7.2. and should be incorporated in the 5 Year Capital Plan. New schools will be constructed based on the revised designs and is likely to cost slightly higher than the previous standard designs but will have lower life-cycle costs.
Regulatory Requirements	Adoption of revised school building designs for new construction Adoption of BERDE rating system for new and retrofitted schools
Incentive Schemes	Certification as “Green Schools”
Program Benefits	Average 30% reduction of electricity costs in existing schools

Parameter	Description
Data Requirements	The preliminary information requirements include historical energy consumption, gross floor area and inventory of equipment of all schools
Capacity Building Requirements	Overall capacity building program is incorporated in overall EE Buildings Program Plan. The finding for this program is still to be determined. The objective is to train QC staff in the development of policies in energy management; conduct of energy audits; monitoring and evaluation of savings and project management

3.5.2 Energy Efficiency Program for Offices and Hospitals

Parameter	Description
Target Buildings	Hospitals, Health Centers, Office building and Libraries
Key Measures	Hospitals – lighting, HVAC and Cogeneration Health Centers – lighting and air conditioning Office Buildings and Libraries – lighting, air conditioning, EE appliances
Energy Audits	The pilot program at QC Main Hall Building and Super Health Center will identify a set of measures that would applicable for office buildings and Health Centers. Individual audits to be carried out in each building to identify scope of standard measures and any specific EC measures applicable to each site. The threshold for EC measures should be 5 years simple pay-back except for larger investments (Chillers, Cogeneration units) where a pay-back of up to 7 years is applicable.
Implementation	Directed by the Special Task Force for Energy Management (TF-EMO) to be established under the direction of the Office of the Mayor. Implemented through the QC Department of Health, Department of Engineering and Buildings Division. Energy audits could be conducted by QC Engineering Department after training by expert energy auditors. The energy audits in Hospitals should be conducted by certified energy auditors due to complexities associated with electrical and thermal loads at the site.
Program Monitoring	The energy audits will establish baselines at each site for performance monitoring. Preparation of a M&E Plan will be incorporated in the scope of the energy audit and associated metering will be included in the scope for implementation. The M&E function is critical in determining the overall program impacts. The responsibility for this should be with QC and the Task

Parameter	Description
	Force (TF-EMO) will determine the respective Department.
Funding	The estimated budget is given in Section 7.2. and should be incorporated in the 5 Year Capital Plan. The use of internal funds for office buildings, libraries and health Centers should be included in the capital plan Hospital projects may require higher capital and QC may require sourcing external funding. A performance based contract with an ESCO could be considered as an option.
Regulatory Requirements	None
Incentive Schemes	BERDE Certification
Program Benefits	Average 20% reduction of electricity costs in office buildings and hospitals
Data Requirements	The primary requirements for energy audits are historical energy consumption, gross floor area, inventory of equipment.
Capacity Building Requirements	Overall capacity building program is incorporated in overall EE Buildings Program Plan. The finding for this program is still to be determined. The objective is to train QC staff in the conduct of investment grade energy audits; monitoring and evaluation of savings; and project management.

3.5.3 Benchmarking of Public and Private Sector Buildings

Step	Program Component and Brief Description	Institutional Framework, Roles and Responsibilities						Indicators / Success Factors	Estimated Level of Effort	Estimated Time Frame
		Lead Entity	Approving Entity	Contributors	Informed Entities	Funding Source	Monitoring & Verification			
1	Establish (or engage) a Building Benchmarking and Performance Assurance Institute (BPBAI) – an entity tasked with long-term stewardship of the overall initiative.	Quezon City (QC)	QC	WB, DOE, Phil GBC, IIEC, UPCA?, UP BRS?, UPSCRFI (UPSTAT)?	Developers, Real Estate Service Providers, Real Estate Owners, Professional Associations	Internal / Donor Funds	QC	Establishment of entity	20 days	8 weeks
2	Convene a Technical Steering Committee comprising international and local experts.	BPBAI	QC	QC, WB, DOE, Phil GBC, IIEC, Professional Associations, UPCA?, UP BRS?, UPSCRFI (UPSTAT)?	Developers, Real Estate Owners, Real Estate Service Providers	Internal / Donor Funds + Volunteer Efforts	BPBAI	Formation of Steering Committee	15 days	6 weeks
3	Convene Stakeholder Committees by broad sectors or building types (e.g., offices, schools, etc.)	BPBAI	Technical Steering Committee	QC, WB, DOE, Phil GBC, IIEC, Professional Associations, Developers, Real Estate Service Providers, UPCA?, UP BRS?, UPSCRFI (UPSTAT)?	All stakeholders	Internal / Donor Funds + Volunteer Efforts	BPBAI	Formation of Stakeholder Committees	20 days	8 weeks
4	Design standardized format/s for data collection for pilot data	BPBAI	Technical Steering Committee	Stakeholder Committees, QC, WB, DOE, Phil	All stakeholders	Internal / Donor Funds +	BPBAI	Creation of standardized data collection	10 days	4 weeks

Step	Program Component and Brief Description	Institutional Framework, Roles and Responsibilities						Indicators / Success Factors	Estimated Level of Effort	Estimated Time Frame
		Lead Entity	Approving Entity	Contributors	Informed Entities	Funding Source	Monitoring & Verification			
	collection efforts.			GBC, IIEC, Professional Associations, Developers, Real Estate Service Providers, UPCA?, UP BRS?, UPSCRFI (UPSTAT)?		Volunteer Efforts		form/s		
5	Pilot test standardized data collection format/s for 20 buildings each within each broad sector or building type	UPSCRFI (UPSTAT)? + UP BRS? / UPCA?	Technical Steering Committee	Stakeholder Committees, QC, WB, DOE, Phil GBC, IIEC, Professional Associations, Developers, Real Estate Service Providers	All stakeholders	Internal / Donor Funds + Volunteer Efforts	BPBAI	Collection of data for 20 buildings for each sector / building type	40 days	8 weeks
6	Refinement of standardized data collection format/s	UPSCRFI (UPSTAT)? + UP BRS? / UPCA?	Technical Steering Committee	Stakeholder Committees, QC, WB, DOE, Phil GBC, IIEC, Professional Associations, Developers, Real Estate Service Providers	All stakeholders	Internal / Donor Funds + Volunteer Efforts	BPBAI	Revised data collection standardized format/s	10 days	4 weeks
7	Launch data collection efforts across building types / sectors (might consider starting with one building type /	UPSCRFI (UPSTAT)? + UP BRS? / UPCA?	Technical Steering Committee	Stakeholder Committees, Stakeholder Committees, QC, WB, DOE, Phil	All stakeholders	Internal / Donor Funds + Volunteer Efforts	BPBAI	Complete basic data collection for 50% of buildings within sector /	120 days	24 weeks

Step	Program Component and Brief Description	Institutional Framework, Roles and Responsibilities						Indicators / Success Factors	Estimated Level of Effort	Estimated Time Frame
		Lead Entity	Approving Entity	Contributors	Informed Entities	Funding Source	Monitoring & Verification			
	sector)			GBC, IIEC, Professional Associations, Developers, Real Estate Service Providers				building type.		
8	Establish a framework for data segregation and screening – including elimination of outliers, compiling the data in standardized format, cross-checking with participants in case clarifications are required,	UPSCRFI (UPSTAT)?	Technical Steering Committee	Stakeholder Committees, QC, WB, DOE, Phil GBC, IIEC, Professional Associations, Developers, Real Estate Service Providers, UPCA?, UP BRS?	All stakeholders	Internal / Donor Funds + Volunteer Efforts	BPBAI	Completion of preliminary reports on building performance data by sector, building type.	20 days	8 weeks
9	Use elementary statistical methods and simplified analysis of data from pilot data collection efforts to inform rating thresholds for first round of voluntary benchmarking schemes by *broad* categories.	UPSCRFI (UPSTAT)?	Technical Steering Committee	Stakeholder Committees, QC, WB, DOE, Phil GBC, IIEC, Professional Associations, Developers, Real Estate Service Providers, UPCA?, UP BRS?	All stakeholders	Internal / Donor Funds + Volunteer Efforts	BPBAI	Completion of preliminary reports on building performance benchmarking by sector, building type.	20 days	8 weeks
10	Launch first round of voluntary benchmarking schemes by sector.	BPBAI	Technical Steering Committee	Stakeholder Committees, QC, WB, DOE, Phil GBC, IIEC, Professional Associations,	All stakeholders	Internal / Donor Funds + Volunteer Efforts	BPBAI	Preliminary schemes launched by sector / building types	10 days for each sector / building types?	4 weeks

Step	Program Component and Brief Description	Institutional Framework, Roles and Responsibilities						Indicators / Success Factors	Estimated Level of Effort	Estimated Time Frame
		Lead Entity	Approving Entity	Contributors	Informed Entities	Funding Source	Monitoring & Verification			
				Developers, Real Estate Service Providers, UPCA?, UP BRS?, UPSCRFI (UPSTAT)?						
11	Expand data collection initiative on an ongoing basis to build a comprehensive dataset of as many buildings as possible.	UPSCRFI (UPSTAT)? + UP BRS? / UPCA?	Technical Steering Committee	Stakeholder Committees, QC, WB, DOE, Phil GBC, IIEC, Professional Associations, Developers, Real Estate Service Providers.	All stakeholders	Internal / Donor Funds + Volunteer Efforts	BPBAI	Complete basic data collection for 50% of buildings within sector / building type.	120 days	24 weeks
12	Develop detailed data collection format for collecting system level information, also initiate detailed studies of building by sector so as to develop a deeper understanding of issues related to actual building performance.	BPBAI	Technical Steering Committee	Stakeholder Committees, QC, WB, DOE, Phil GBC, IIEC, Professional Associations, Developers, Real Estate Service Providers, UPSCRFI (UPSTAT)?, UP BRS?, UPCA?	All stakeholders	Internal / Donor Funds + Volunteer Efforts	BPBAI	Detailed data collection format/s finalized, 3-5 building performance case studies initiated for each sector / building types	120 days	24 weeks (can be concurrent with previous step)
13	Disseminate findings from bottom-up technical insights and approaches developed above, so as to inform	BPBAI	Technical Steering Committee	Stakeholder Committees, QC, WB, DOE, Phil GBC, IIEC, Professional	All stakeholders	Internal / Donor Funds + Volunteer Efforts	BPBAI	3-5 building performance case studies finalized for each sector /	20 days	8weeks

Step	Program Component and Brief Description	Institutional Framework, Roles and Responsibilities						Indicators / Success Factors	Estimated Level of Effort	Estimated Time Frame
		Lead Entity	Approving Entity	Contributors	Informed Entities	Funding Source	Monitoring & Verification			
	stakeholders on ways to reduce building energy use.			Associations, Developers, Real Estate Service Providers, UPSCRFI (UPSTAT)?, UP BRS?, UPCA?				building types		
14	Develop multivariate regression models to establish significant parameters driving energy use for each building type and help develop recommendations for improving rating schemes based on more rigorous statistical analysis and expanded datasets.	UPSCRFI (UPSTAT)?	Technical Steering Committee	Stakeholder Committees, QC, WB, DOE, Phil GBC, IIEC, Professional Associations, Developers, Real Estate Service Providers, UPCA?, UP BRS?	All stakeholders	Internal / Donor Funds + Volunteer Efforts	BPBAI	Completion of detailed reports on building performance benchmarking by sector, building type.	30 days	12 weeks
15	Develop mandatory requirements based on inputs from stakeholder groups driving voluntary benchmarking schemes, technical steering committee/s and government policy objectives	BPBAI	QC	Stakeholder Committees, QC, WB, DOE, Phil GBC, IIEC, Professional Associations, Developers, Real Estate Service Providers, UPSCRFI (UPSTAT)?, UP BRS?, UPCA?	All stakeholders	Internal / Donor Funds + Volunteer Efforts	BPBAI	Development of mandatory scheme/s by sector, building type.	60 days	24 weeks

Step	Program Component and Brief Description	Institutional Framework, Roles and Responsibilities						Indicators / Success Factors	Estimated Level of Effort	Estimated Time Frame
		Lead Entity	Approving Entity	Contributors	Informed Entities	Funding Source	Monitoring & Verification			
16	Introduce mandatory requirements, consider incentives for going beyond mandatory requirements	BPBAI	QC	Stakeholder Committees, QC, WB, DOE, Phil GBC, IIEC, Professional Associations, Developers, Real Estate Service Providers, UPSCRFI (UPSTAT)?, UP BRS?, UPCA?	All stakeholders	Internal / Donor Funds + Volunteer Efforts	BPBAI	Launch of mandatory scheme/s by sector, building type.	20 days	8 weeks
17	Establish a culture of proof and an ethos of continuous improvement of benchmarking practices for both mandatory and voluntary schemes; including requirements for renewing labels/certificates periodically (at most every year, at least every 3 years), as well as continuously raising the bar for better building energy performance.	BPBAI	Technical Steering Committee	Stakeholder Committees, QC, WB, DOE, Phil GBC, IIEC, Professional Associations, Developers, Real Estate Service Providers, UPCA?, UP BRS?, UPSCRFI (UPSTAT)?	All stakeholders	Internal / Donor Funds + Volunteer Efforts	BPBAI	Continuous improvement and maintenance framework in place and functional	Ongoing	Ongoing

3.5.4 Enforcement of Green Building Ordinance

Parameter	Description
Target Sector	Public & Private (Commercial)
Key Measures	Green Building Rating System (BERDE)
Implementation	Implementing Rules & Regulation for the Green Building Ordinance **Current Status:** Steps 1,2 and 3: Completed Steps 4 and 5: on-going
Funding	Initial funding requirements for start-up costs and first year of program operations are given in Section 7. The funding for this phase could be either sourced from a donor agency od from internal funds. In the following years, the budgetary requirements could come from different departments composing the QC Staff Green Building Task Force, since each department has a vested interest.
Regulatory Requirements	Green Building Ordinance
Incentive Schemes	Property Tax Reductions & Discounts, Expedited Permitting Process, Reduced Permit Fees, Density or Floor Area Ratio (FAR) Bonuses, Required Parking Reductions, Public Recognition
Program Benefits	Energy Efficiency, High Performance and Sustainable Design for Public Buildings and Private Commercial Buildings
Data Requirements	Creating a Green Building Rating System or Adoption of BERDE
Capacity Building Requirements	Staff Training, New Staff, New QC Department

3.6 Summary of Pilot Activities

This section provides details of the pilot programs that was considered to complement the programs proposed for the EE Buildings Program for Quezon City . These activities will be undertaken in parallel with the detailed design of the EE Buildings Program

3.6.1 Pilot Program Options

The following pilot programs were considered:

- Investment Grade Audit of selected building to show case EE measures
- Database of international programs appropriate for QC
- Expansion of QC website to include EE Program

- Preparation of a Roadmap for development of Implementation Rules and Regulations (IRR) for the Green Building Ordinance

The above options were discussed at the stakeholder meeting on 6 April 2010 and the two programs recommended are detailed in Section 3.6.2.

3.6.2 Proposed Pilot Programs

3.6.2.1 Show Casing of Energy Efficient Building

Based on the recommendations of the QC officials, the QC Hall Main Building was selected as the building for showcasing an energy efficient building. This building is the symbol and focal point of the administration's priorities and efficiency. This building is the largest energy consumer in all local government buildings in QC and is perceived to yield the best benefits and highest impact from showcasing energy efficient building design and retrofit opportunities.

A detailed checklist of information required for the audit will be prepared and preliminary analysis will be undertaken prior to the on-site audit. It is envisaged that monitoring activities will be undertaken to determine baselines. Relevant approvals will be obtained from QC prior to the conduct of the Investment Grade Audit. An investment plan will be submitted to QC for consideration.

3.6.2.2 Roadmap for Implementing Rules and Regulations for Green Building Ordinance

The current Green Building Ordinance, though enacted in February 2009, is not being enforced due to the absence of Implementing Rules and Regulations (IRR). In order to facilitate this process, it was recommended to prepare a Roadmap for the IRR which could be used as a starting point for the subsequent development of the IRR.

During the conducted of the pilot activities, it was found that QC had already developed the draft IRR and hence, the scope of this activity was changed to providing comments on the draft IRR.

3.6.2.3 Optional Task – Case Studies

A series of 13 case studies of EE and GB programs that are relevant to QC was prepared. The program summary is given in the Table below.

Case Study	*Country*	*Program Description*
1	Singapore	Energy Smart Building Label
2	Singapore	Green Mark Certification
3	India	Energy Conservation Building Code
4	India	Green Rating for Integrated Habitat Assessment
5	India	Leadership in Energy and Environmental Design
6	Sri Lanka	Code of Practice for Energy Efficient Buildings
7	Vietnam	Lotus Green Building Rating Tool
8	Thailand	Energy Conservation Promotion Act
9	South Africa	Improving Energy Efficiency in Municipal Buildings
10	USA	Energy Efficiency Fund
11	Australia	Industry Greenhouse Program
12	Germany	Berlin Energy Saving Partnership
13	Austin, USA	Energy Green Building Program

3.7 Summary of Final Workshop

The final workshop was conducted on 23 September 2010 to present the EE Program Plan for QC and the proposed next steps for implementation. There were 55 participants at the workshop including the Mayor of Quezon City who delivered the keynote address. The participants included representatives from various Departments of QC, private sector developers, building contractors, professional associations, NGOs and donor agencies (World Bank and International Finance Corporation).

Based on the comments and recommendations gathered during the briefing meeting of stakeholders, the conclusions were as follows:

1. The local government is set to launch the Implementing Rules and Regulations (IRR) for the Green Building Ordinance. It is important to have a dedicated group to implement not only the IRR but to implement the long term goal of the city to become green. This group will guide, train, implement and develop details of the Quezon City Green Building Program and future sustainable initiatives of the city. The local government staff assigned to implement the IRR will need capacity building. The training can be designed in such a way that compliance evaluation of the local government owned buildings are done in tandem with the training.

2. The local government will need assistance in developing investment grade studies for the government buildings that will have to be retrofitted. The conduct of energy audits in its own offices, schools, health centers and hospitals are a key component of the EE Buildings Plan and hence, having in-house resources for this activity is vital

3. The local government should plan and implement an information, communication and education activities for the program plan and put up measures to address private sector perception of graft and corruption in implementing the program.

4. The need to increase the scope of the investment grade audit in the QC Hall Main Building to cover the whole building was stressed. The chiller plant is now over 30 years old and is reaching the end of its operating life. The importance of the QC Hall Main Building being certified a green building was also considered significant, so that QC is seen as leading the effort.

3.8 Deliverables

The following is a summary of all the project deliverables:

Project Reporting Schedule

Task	*Details*	*Date of Submission*
1	International Review of EE Building Codes/Programs	31 Mar'10
2	Review of Quezon City's Building Construction and Practices	31 Mar'10
3	Stakeholder Consultation Meeting Report	10 Apr'10
4	Mid-Term Report	20 Apr'10
5	Detailed Program Plan for Quezon City	05 Sep'10
6	Report on Pilot Activities	15 Sep'10
7	Final Workshop Report	28 Sep'10
8	Final Report	30 Sep'10

4 RECOMMENDATIONS

The recommendations detailed in this Section is based on stakeholder consultations during the assignment and inputs during the Final Workshop

4.1 Implementation of EE Measures in QC Hall Main Building

As a part of the pilot activities an energy audit was conducted in the QC Main Hall Building focussing on 4 Floors (3, 4, 9 and 10). The preliminary findings of the energy audit are given in a report under Task 6 (Pilot Activities). QC Officials have indicated that their intention is to expand the scope of the energy audit to cover the whole building (also suggested by the World Bank) considering the HVAC system is centralized and services the whole building. In addition, the existing chiller plant is 30 years old and will be due for replacement in the near future. Plans are underway to install sub-meters to gather sufficient information required for a Investment Grade Audit (IGA).

The implementation of the identified EC measures is considered a critical activity in QC's overall Energy Efficiency Buildings Program. This would provide an opportunity to showcase EE measures and lead by example in promoting the EE/GB Program

4.2 Implementation of the Green Schools Program

Based on the strong support from QC officials for the Green Schools Program it is recommended that this program is prioritized in their implementation plan. It is expected that the Implementing Rules and Regulations (IRR) for the Green Building Ordinance (GBO) will be finalized before the end of 2010 and would specify the applicable rating system. For the pilot program, it is proposed that six schools (3 elementary and 3 high schools) selected from the current 3 building designs (QC, DepEd and DPWH) to determine the extent of retrofits and practices for compliance with the rating system. The scope could be determined with extended IGAs in the schools. This would present an opportunity for determining the capital costs and benefits associated with achieving Green certification for existing schools. Based on the outcome, a large scale Green Schools program could be developed incorporating all existing primary and high schools in QC.

The pilot program would also identify EE and environmental features that could be incorporated in the design of new schools which has been proposed as a part of the Green Schools Program in QC's EE Buildings Plan.

4.3 Benchmarking of Public and Private Sector Buildings

It is proposed that a benchmarking study is undertaken as a priority activity since the information would be critical for the implementation of the EE/GB Program Plan. The representatives of private developers who attended the workshop expressed strong support for this activity and requested the scope to be expanded to other utilities (e.g. water consumption) within a building. There is also the provision for expanding the study to cover other regions within the Philippines.

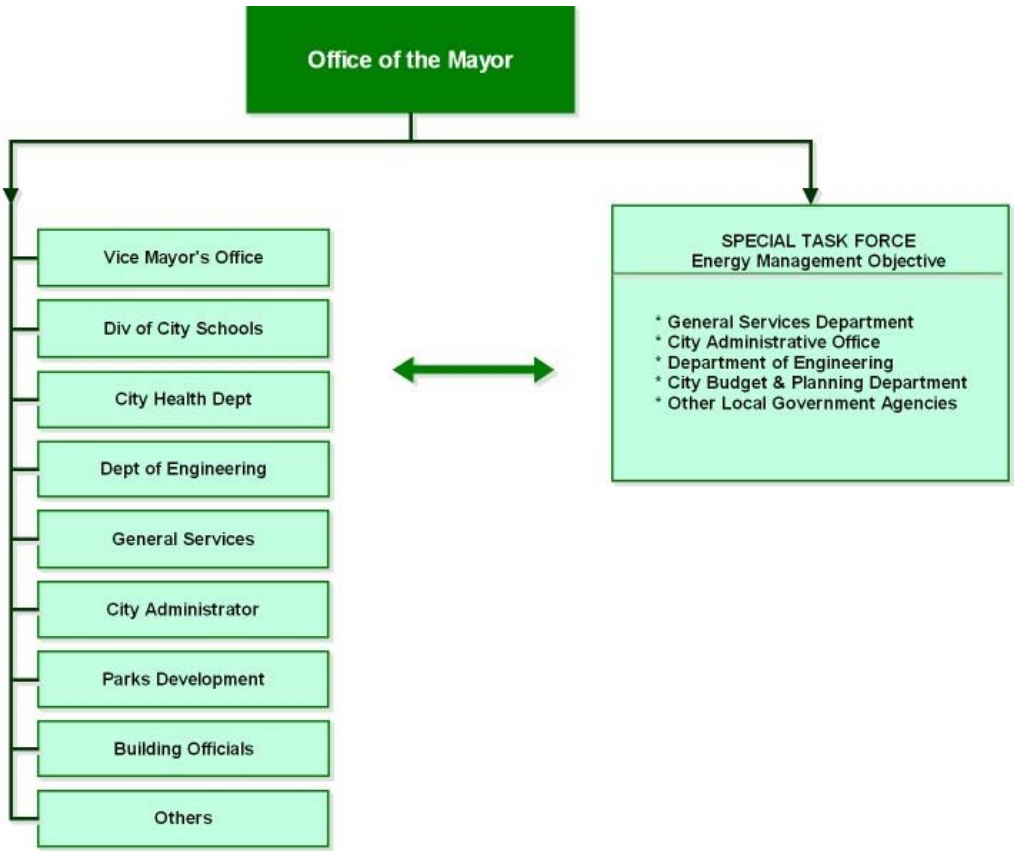
4.4 Program Management

This section outlines the management structure already established by QC and details of the recommended the capacity building requirements for personnel assigned for development and enforcement of the Green Building Ordinance and implementation of EE programs identified in the program design.

4.4.1 Task Force on Energy Management Objective

The Energy Systems Management Agenda developed by QC in July 2010, proposes the establishment Task Force on Energy Management Objective (TF-EMO) to coordinate the implementation of the EE Buildings Plan. The proposed structure is given in Table 4.1

Table 4.1: Task Force on Energy Management Objective



The Task Force will be established after the approval of the QC Energy Systems Management Agenda by the Office of the Mayor. Once approved, the TF-EMO will have the mandate for the enforcement of the Green Building Ordinance in both public and private sectors. The TF will be responsible for the following tasks:

- Propose, administer and complete pilot projects which shall showcase this government's dedication to environment protection through energy efficient buildings.
- Propose a Five-Year Capital Plan for energy efficient retrofits for existing facilities and installations
- Coordinate and institute the Implementing Rules and Regulations for the Quezon City Green Building Ordinance.

- ❖ Initiate and institute city government procurement procedures and guidelines to incorporate life-cycle cost considerations
- ❖ Propose, institute and administer a Municipal Fleet Maintenance Program
- ❖ Propose and initiate training, exhibitions, and other programs and activities pertinent to the EMO.

4.4.2 The Environment Policy Management Council (EMPC)

The Executive Order 19 of 2010 details the creation of the Environment Policy and Management Council (EMPC) effective from 10 August 2010, under the Chairmanship of the Mayor and the Head of the Environment Protection and Waste Management Department as the Vice-chairperson. A copy of the Executive Order is given in **Attachment 5.3.** One of the functions of the EMPC is to supervise and oversee the implementation of the Green Building Ordinance.

4.4.3 Capacity Building

It is recommended that a structured capacity building plan is implemented for the QC officials responsible for the implementation of the EE Buildings Program. As a prerequisite, QC needs to establish a separate Division within one of the existing Departments with responsibility for the implementation of the GB Ordinance and the supporting EE programs in QC.

The capacity building requirements fall into two categories, namely:

- Development and implementation of EE programs
- Enforcement of the Green Building Ordinance

4.4.3.1 Development and Implementation of EE Programs

The proposed programs in schools, office buildings, Health Centers, libraries and hospitals would involve the conduct of energy audits, procurement of equipment, installation and project management. Hence, a formal training program that will provide basic technical, financial, contracting, marketing and project management knowledge to the QC team to facilitate the development and implementation of projects is proposed.

Technical training would include: energy auditing, technical system analyses and recommended efficiency improvements in main end-use systems targeted, financial analyses of EE investments and technology options, various contractual options for EE services, project management, energy savings verification and marketing / communication. The training program should be designed to facilitate transfer of relevant information and methods, drawn from international and regional commercial EE experience, to aid in overcoming the specific market barriers existing in the Philippines.

The training approach, wherever possible, should include hands-on experience using actual potential project sites. The pilot projects proposed in schools and office buildings would be an ideal opportunity to gaining practical experience. Details of the Energy Project Development Cycle are given in Attachment 5.1 and an outline of the proposed training program is given in Attachment 5.2.

4.4.3.2 Enforcement of Green Building Ordinance

QC has developed the draft IRR for the GB Ordinance and plans to have stakeholder consultations during the last quarter of 2010. It is expected that enforcement will begin in 2011 and it is important that QC staff have sufficient skills to review, assess and certify applications. It is proposed that sufficient training is provided in the relevant areas.

Training is proposed in the following areas

- Outreach to Stakeholders
- Implementation:
    - GB 101 Basic Training
    - Permitting and Certification Process
    - Training of Assessors

4.5 Development of Program Implementation Plan

QC has established a management structure for the implementation of the EE/GB Program Plan which is represented by all key Departments. It is recommended that a separate Project Implementation Division is established within one of the existing Departments and dedicated staff assigned on a full-time basis. As the primary activity, it is proposed that an Implementation Plan is developed with clearly defined milestones, activities and budgetary requirements. The Plan could be over 3 to 5 years covering all public buildings and activities that are included in the Design Report.

4.6 Organization of a Green Building Summit

QC officials are currently considering a Green Building Summit in the fourth quarter of 2010. The summit could be used for the launching of QC's EE Building Program and provide information to stakeholders on the Green Building Ordinance.

In addition, the participation could include officials from neighboring cities that could explore opportunities for replication of similar programs in cities. A Green Building Expo could be considered as a part of the summit which would allow EE equipment suppliers and service providers to market their services.

The PhilGBC is organizing a Building Green Expo & Convention on 17-18 November 2010. A joint event between PhilGBC and QC could be considered.

4.7 Summary of Further Assistance to QC

Based on discussion with QC officials the following is a summary of further assistance requested to support the implementation of the EE/GB Program:

- Investment Grade Audit of QC Hall Main Building
- Investment Grade Audits of 6 schools – 3 Elementary and 3 High Schools for the different building designs
- Investment Grade Audits of the 2 Public hospitals and Super Health Center
- Conduct of benchmarking study
- Capacity building in EE project design and implementation
- Capacity building in the enforcement of GB Ordinance

5 ATTACHMENTS

5.1 Energy Efficiency Project Development Cycle

Development and implementation of Energy Efficiency (EE) projects involve various important steps. Before undertaking any EE project, it is also essential to understand the importance of the project as well as rationale and goals for the project. In general, EE project development steps can be divided into 3 major phases as follows:

1. Phase I: Project Identification
2. Phase II: Project Planning
3. Phase III: Project Implementation

The steps involved in each phase are illustrated in **Figure** below.

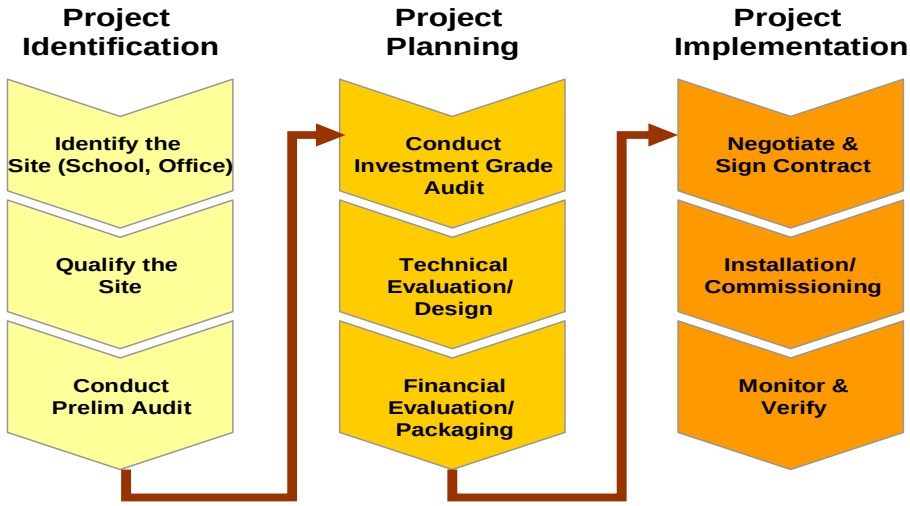
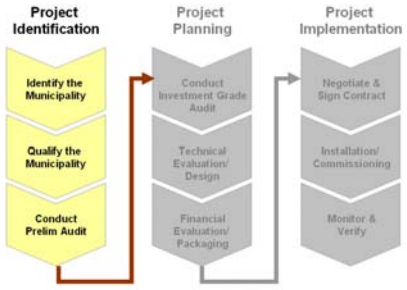


Figure 1: EE Project Development Steps

The Implementation Plan of EE projects should be prepared based upon the above key steps which are described in more details in the following sections.

5.1.1 Project Identification Phase

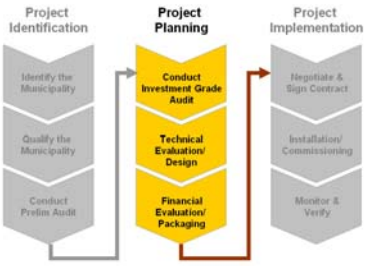


For EE projects, the first two steps, i.e. identify and qualify the sites, in the project identification phase could be undertaken based on the implementation plans developed for the QC buildings (schools, offices, health centers and libraries). The main criteria to qualify municipal EE projects should include the availability of budget for implementation. Brief description of the remaining development steps are as follows.

Conducting Preliminary Energy Audit: Energy audits for EE projects should be conducted in 2 stages. In the first stage, a walk-thru audit is to be conducted to determine key end-use sectors at the site, and also to determine appropriate approach for the detailed audits. Review of historical energy consumption should also be undertaken in this stage.

The preliminary audits in the pilot buildings in QC show that air-conditioning and lighting are the major energy end-use areas in municipalities.

5.1.2 Project Planning Phase



Conduct of Investment Grade Energy Audit: Following the preliminary energy audit, the Investment Grade Audit (IGA) or detailed energy audit will be conducted. IGA process will basically include detailed monitoring of energy consumption and quality of outputs delivered by each key energy systems, being identified during the preliminary audits. For buildings in QC, these may include, for example, quality of illumination, lighting uniformity, thermal comfort. IGA usually involves installation of measuring instruments, such as energy data loggers and run-hour meters, for a specific duration of measurements. Level of measurement details will be dependent upon the protocol chosen to be followed, for instance the International Performance Monitoring and Verification Protocol (IPMVP), CDM methodologies, or a protocol agreed upon by QC under the Green Building Ordinance. The Monitoring and Verification (M&V) plan is to be prepared and defines the measurements and computations to demonstrate compliance with any guaranteed level of performance. The M&V plan may become part of the energy performance contract, if any.

Technical Evaluation and Design: On the basis of the audit results, major energy end-use systems are to be confirmed and various technical indicators and savings potential will be identified. Baseline energy consumptions and specific values (e.g. power demand or power consumption per sq.m.) are calculated and are compared to reference values, if any. For EE projects, general criteria to identify energy saving measures are to focus on major energy consumption areas and application. Designs of energy savings measures may include both standardized measures or complex and specific approaches. Specific factors that need to be considered in designing energy savings measures include energy cost, working hours per year and cost of measures (equipment, technologies and administration). Consideration on no-cost and low-cost measures such as regular maintenance of the energy systems and good EE housekeeping should always be considered first, and then, medium-cost and high-cost measures will be considered based primarily upon technical and economical feasibility results.

Financial Evaluation and Packaging: Financial and other benefits due to the proposed EE measures are to be quantified and compared to their costs. The Return on Investment (ROI) calculation may include life cycle cost, simple payback period, Internal Rate of Return (IRR) or other data specific to the requirements of municipality. The results will help evaluating precise recommendations on what actions should be taken, and this will be used as a basis for planning the Project Implementation Phase.

Following the initial listing of EE measures in Step C, the final listing of EE measures for the site is to be developed using the following steps:

1. Develop screening criteria and weights
2. Score each option against the criteria
3. Use weights to obtain total scores for each option and rank options
4. Identify the highest ranking options.

An example of screening criteria and weights are given below:

Table: Screening Criteria for EE Measures and Weights

Criteria	Scoring Guideline 1 ←----------→ 5		Weight
Standard EE Measures and Replication Potential	Specific/ tailor-made measures	Standard measures with easy replications	10%
Local Availability of Technology	Locally available	Fully import or special order required	20%
Investment Cost	Low	High	10%
Saving Potential	Low	High	10%
Payback Period	Long	Short	10%
Proven Reliability and Warranty	No warranty	Lifetime warranty	20%
Likely Acceptance	QC is not familiar with EE measures at all.	QC is familiar with EE measures.	10%
Comply with rating system	Not comply	Fully comply.	10%
Total			100%

Each EE measure will be scored from 1 to 5 against each criterion as per the guideline given in the above table, and the total score will be calculated using the below equation:

$$\text{Total Score for each EE Measure} = [(CS_1 \times W_1) + (CS_2 \times W_2) + (CS_3 \times W_3) + (CS.. \times W..) + ...]$$

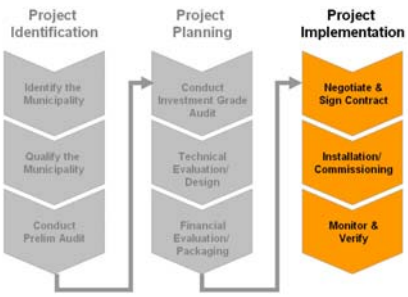
Where:

CS = Score of each criterion (1-5)

W = Weight of each criterion ($W_1 + W_2 + W_3 + W_4 + ... = 100\%$)

The top ranks EE measures are to be included in the implementation plan.

5.1.3 Project Implementation Phase



Negotiating and Signing Implementation Agreement: The Implementation Agreement will be prepared for execution by the City and party involved which may include but not necessarily be limited to project developers, suppliers, Energy Service Company (ESCO), and financial institutes. The agreement will detail the terms and conditions to implement project, the obligations of each party during implementation, project costs, terms and conditions of financing, monitoring and verification methodology and, if applicable, formula for sharing of savings. The agreement should also include risks and risk management issues, for example, construction and installation risk, performance risk for energy saving, and operating risk. Following the conclusion of the implementation agreement, procurement of equipment and services can be executed.

Installation and Commissioning: The installation and commissioning of equipment and/or systems should be undertaken in accordance with suppliers' specifications and the Philippine national electrical codes. All electrical, mechanical and civil works shall be done in accordance with sound engineering practice and based on nationally and internationally accepted standards. This is to ensure the proper operation and full warranty of the equipment and/or the systems. All engineering

computations shall be supported by proper documentations and computer modelling, if any. Following the installation and commissioning, test results signed by licensed technical professionals shall be submitted to the City for final acceptance.

Monitoring and Verification (M&V): The primary purpose of M&V is usually to demonstrate the performance of EE measures in comparison against the baselines. M&V costs could be the major issue of concern of all parties involved in EE project development and implementation, therefore, level of details, boundary of measurement, and duration of measurement are to be agreed upon among by all parties involved. M&V should not only target on the energy use by the energy systems, but should also document necessary independent variables (e.g. ambient temperature) and statistical factors (e.g. building envelope, equipment inventory, operating practices, etc.) that impact energy consumption.

5.2 Scope of Training Program for QC Staff

This section outlines the scope of the proposed training program for the implementation of EE Projects in Buildings in Quezon City.

The objective of the training program is to provide knowledge and skills required to design and undertake the implementation of sustainable EE projects in schools and commercial establishments (offices, libraries, health centers etc). The scope of the training program will be based on the typical project cycle for EE projects. This would include:

Step 1: Site Identification
Step 2: Preliminary walk-thru audit
Step 3: Submit proposal and approval
Step 4: Detailed Energy Audit
Step 5: Preparation of financial package
Step 6: Contract negotiation and finalizing contracts
Step 7: Installation and commissioning of equipment
Step 8: Monitoring and Verification of Savings

The key areas for training are given below.

5.2.1 Area 1: Energy Auditing

This would outline key steps in developing an Energy Management Program:

1) Set energy management policy;
2) Conduct of an energy audit;
3) Formulate the plan of action; and
4) Evaluate and maintain the energy management program.

The most important of above is the conduct of an energy audit. The energy auditing skills are fundamental to a EE program and building the capability to conduct an investment grade audit will be the primary focus. Generally, an energy audit needs to be organized in a structured series of exercises.

This module will include a step-by-step guide to conduct of energy audits – collect and analyze historical data, use of energy consumption monitoring equipment for monitoring of energy use, identification of EE measures, technical and financial analysis of EE measures, establish targets for energy saving, specify saving monitoring and verification procedure and reporting. The reporting format will address the requirements of the potential funder in order to facilitate evaluation for project financing.

The module will include discussion of the latest cost effective and proven energy efficiency technologies applicable to the commercial sectors and specific evaluation methods of various energy efficiency technologies and process technology utilized.

The training needs to be conducted both in the classroom and on-site to have maximum impact. The on-site component will include the conduct of a walk-through audit at a pre-selected site and the demonstration on the use of energy audit equipment. Where appropriate, actual site data will be used in the analysis. It is also proposed to invite participation from EE equipment suppliers to present case studies.

5.2.2 Area 2: Financial Analysis

Lack of understanding of project finance concepts and availability of capital are considered as the key financial barriers and the proposed course structure aim to address these issues.

This would provide the guidelines and the tools to conduct a financial evaluation of EE options, evaluate different financing options for EE projects, develop simplified cash flow statements and conduct sensitivity analysis and package and present bankable EE projects to investors and financial institutions. The module will discuss in detail the traditional and innovative EE project financing concepts - equity financing, trade financing, vendor financing, leasing, ESCO financing and other issues such as guarantees.

It will also specify methodology to conduct cost/benefit analysis of EE measures in evaluating options during feasibility and detailed audit stages, introduce the concept of the time value of money, discuss the methodology of comparing business propositions or choices that involve future cash flows and present the quantitative valuation techniques used in the selection of investment projects and the factors that come into play that will determine the discount rate to be applied for financial analysis. It will also include project structuring, and risk assessment and management. The quantitative approach to determining the project's weighted average cost of capital will also be discussed.

The training will be conducted in the classroom using actual on-site data from a energy audit.

5.2.3 Area 3: Contract Negotiation and Monitoring & Verification

This would introduce the different types of contracts for commercial EE projects and how to select most appropriate contract for a particular project. Existing forms of contract currently being used in the Philippines will be considered in finalizing this training module.

There are two common types of Performance-based Contract structures used by energy services providers, called "**Guaranteed Savings**" and "**Shared Savings**".

The "**Guaranteed Savings"** structure is an arrangement where the customer makes periodic fixed payments to a financial institution, the amount required to repay the cost of EE measures implemented by a service provider. The service provider guarantees the customers that the projects realized savings would equal or more than all project payments, including debt service to the Lender plus any downstream fees such as cost of monitoring and verification of savings, operational and maintenance services.

The "**Shared Savings"** structure refers to an arrangement where the service provider finances a turnkey project and bears the obligation to repay the financial institution. The customer commits to pay a percentage of the project's realized savings to the service providers to cover the debt service payments to the financial institution and other costs including monitoring and verification of savings.

The training will include the basics of the two performance based contracts and relevant variations that may be applicable.

The contracts cover the three phases of commercial EE projects, namely: i) development of projects, which covers technical and project financing, under a Feasibility Agreement, ii) construction of projects under an Energy Service Agreement (ESA) and iii) calculation, measurement and verification of project savings under project-specific exhibits attached to an ESA.

Saving monitoring and verification protocols set out the framework and operational aspects for independently verifying energy savings and benefits from commercial energy-efficiency projects. The aim is to enable service providers, end-users and financial institutions to speak with one voice.

Essentially, for an energy service contract, this training can help how to select the most appropriate saving measurement and verification (M&V) approach, taking into account the project costs, technology-specific requirements, and risk associated with the project.

The training will be conducted in the classroom using actual on-site data from an energy audit.

5.2.4 Area 4: Marketing and Presentation

This would cover all aspects of marketing and presentation of commercial EE projects and service providers. It would include the customer oriented marketing of commercial EE activities to enhance the awareness of customers, strategic marketing to identify needs of customers and how to develop a strategic marketing program for the service provider, mechanisms to evaluate customer behaviour to a particular marketing strategy, sales approaches, methodology to conduct a market research to evaluate the effectiveness of programs and ways to identify the market positioning of the company by conducting an analysis of statistics and customer surveys.

Good communication/presentation skills are essential to market commercial EE projects. The module will present ways to develop communication skills such as organising ideas, designing presentations, visual aids, delivery, etc. The training will be conducted in the classroom using few case studies.

5.2.5 Area 5: Project Management

This would introduce guidelines to define and achieve targets of a project while optimising the use of resources (time, money, people and space, etc). It includes mechanisms to identify and fix the project cycle in order to carefully plan and organize efforts to accomplish a specific one-time effort, ways to define objectives of the project in order to reach the targeted output by conducting activities listed and assess resource to accomplish tasks listed to deliver specified output.

Allocating responsibilities is critical for the successful completion of a project. The module will introduce techniques used to keep control of variables over the project term from the beginning to the conclusion by allocating responsibilities to individuals and teams.

Proper scheduling of activities is important to follow a critical path in order to complete the project in a timely manner and the module will discuss the ways to develop a critical path for a project. It will address issues relating to client relationships, communication and managing client expectations.

During a project implementation, regular communication with project team is important in managing time and funds, vital for successful implementation of the project. The module will discuss ways to improve communication skills and introduce mechanisms to control resource for the successful and timely completion.

The training will be conducted in the classroom.

5.3 Quezon City – Executive Order No: 19 / 2010

(Attached separately)