



PROJECT IDENTIFICATION FORM (PIF)

PROJECT TYPE: Full-sized Project
THE GEF TRUST FUND

Submission Date: September 12, 2008

Re-submission Date: 23 February 2009

PART I: PROJECT IDENTIFICATION

GEFSEC PROJECT ID: 3800 PROJECT DURATION: 46 months

GEF AGENCY PROJECT ID: PIMS 4018

COUNTRY(IES): Islamic Republic of Iran

PROJECT TITLE: Policy Reforms and Market Transformation of the Energy Efficient Buildings Sector in the I.R. Iran

GEF AGENCY(IES): UNDP

OTHER EXECUTING PARTNERS: Iran Fuel Conservation Organization of the Ministry of Petroleum (Lead Implementing Partner)

Ministry of Housing and Urban Development, Ministry of Energy, Tehran Municipality, Private Sector (Cooperating Ministries and Agencies), Ministry of Industry

GEF FOCAL AREA (S): Climate Change

GEF-4 STRATEGIC PROGRAM(S): CC-SP1: Promoting Energy Efficiency in Residential and Commercial Buildings

NAME OF PARENT PROGRAM/UMBRELLA PROJECT: Global Framework for Promoting Low GHG Emission Buildings

| INDICATIVE CALENDAR | |
|------------------------------|------------------------------|
| Milestones | Expected Dates mm/dd/yyyy |
| Work Program (for FSP) | June 26, 2009 |
| CEO Endorsement/Approval | Dec 1, 2010 |
| GEF Agency Approval | Feb 1, 2011 |
| Implementation Start | Feb 1, 2011 |
| Mid-term Review (if planned) | Dec 1, 2012 |
| Implementation Completion | Dec 1, 2014 |

A. PROJECT FRAMEWORK

Project Objective: GHG mitigation from the buildings sector in Iran through legislative, policy and regulatory reforms and implementation of cost-effective mitigation measures as well as increasing the share of distributed renewable energies (specifically solar water heaters) to meet the energy requirements of new buildings and existing stock.

| Project Components | Indicate whether Investment, TA, or STA ^b | Expected Outcomes | Expected Outputs | Indicative GEF Financing ^a | | Indicative Co-financing ^a | | Total (\$) c = a + b |
|---|--|---|--|---------------------------------------|----|--|----|----------------------|
| | | | | (\$ a) | % | (\$ b) | % | |
| Legislative, policy and regulatory frameworks | TA and STA | The draft of key policy, strategy, regulatory documents, frameworks and studies to provide overall national direction for the cost-effective CO ₂ mitigation/building EE measures and facilitation of cross-sectoral coordination and coherence for improved enforcement | A review of baseline policy, legislative and regulatory frameworks that impact building energy efficiency in Iran and gap analysis; A supportive cross-sectoral strategy (CSSAP) and action plan and follow-up action to streamline provisions of the CSSAP in the fifth five year development plan complete with clear institutional roles and coordination mechanisms; Revisited | 700,000 | 15 | 4,000,000 (government) 250,000 (UNDP) | 85 | 4,700,000 |

| | | | | | | | | |
|---|-------------------|---|---|-----------|----|-------------------------|----|------------|
| | | | regulatory frameworks, in particular a thermal building code that addresses all prevalent climates in Iran and all energy carriers including electricity; | | | | | |
| Implementation of the Pilot for the existing building stock | TA and Investment | <p>Improving the heating system of 424 government buildings</p> <p>1,599,785 tons of carbon dioxide avoided;</p> <p>Integration of solar water heater systems into water heating for buildings</p> <p>Private sector capacity development</p> <p>Evaluation of the pilot and dissemination of lessons learned for replication</p> | <p>Implementation of cost-effective energy saving options in 424 government buildings to retrofit the heating system and close select thermal bridges;</p> <p>Installation of 424 solar water heaters and their integration with the revamped heating system</p> <p>Training of a cadre of accredited boiler room engineers, equipped with necessary monitoring equipment to implement the pilot;</p> <p>A blueprint for the revamping of the heating system complete with drawings of the new designs and boiler room specifications</p> | 2,300,000 | 10 | 22,000,000 (government) | 90 | 24,300,000 |
| Implementation of market transformation strategies | TA | <p>Nation-wide transformation of construction techniques for a thermally isolated building shell and reduced heating, cooling and lighting loads</p> <p>Adoption of a systems and integrated design process approach to building design</p> | <p>Capacity development for manufacturers of heating system including specifications for improved boilers, burners, heat distribution systems and pumps;</p> <p>Capacity development of building professional in implementation of the revised thermal building code,</p> | 700,000 | 7 | 9,000,000 (government) | 93 | 9,700,000 |

| | | | | | | | | |
|----------------------------|--|--|---|------------------|-----------|----------------------|-----------|-------------------|
| | | Proactive utilization of cost-effective renewable sources (e.g. solar energy and other environmental heat sources and sinks) for heating, cooling and lighting Changed behavior and awareness of building occupants | including 1,000 developers, heating system engineers, architects, builders, window fitters etc.; A stakeholder awareness-raising campaign including a public awareness campaign based on a segmentation of the building industry and identification of key stakeholders; Mandatory (e-learning) courses for different stakeholders in the building value chain on the revised thermal code and the setting-up of an examination and an accreditation body Proposals for sustainable financing mechanisms based on the findings of the output above* and capacity development for select banks and financial institutions | | | | | |
| Project Management | | | | 300,000 | 50 | 300,000 (government) | 50 | 600,000 |
| Total project costs | | | | 4,000,000 | 10 | 35,550,000 | 90 | 39,550,000 |

a List the \$ by project components. The percentage is the share of GEF and Co-financing respectively to the total amount for the component.

b TA = Technical Assistance; STA = Scientific & Technical analysis.

B. INDICATIVE CO-FINANCING FOR THE PROJECT BY SOURCE and BY NAME (in parenthesis) if available, (\$)

| Sources of Co-financing | Type of Co-financing | Amount |
|---------------------------------|----------------------|-------------------|
| Project Government Contribution | Grant | 35,300,000 |
| UNDP | Grant | 250,000 |
| Total co-financing | | 35,550,000 |

C. INDICATIVE FINANCING PLAN SUMMARY FOR THE PROJECT (\$)

| | Previous Project Preparation Amount (a) ³ | Project (b) | Total c = a + b | Agency Fee |
|---------------|--|-------------|--------------------|------------|
| GEF financing | 0 | 4,000,000 | 4,000,000 | 400,000 |
| Co-financing | 0 | 35,550,000 | 35,550,000 | |
| Total | 0 | 39,550,000 | 39,550,000 | 400,000 |

³ Include project preparation funds that were previously approved but exclude PPGs that are awaiting approval.

D. GEF RESOURCES REQUESTED BY AGENCY (IES), FOCAL AREA(S) AND COUNTRY(IES)

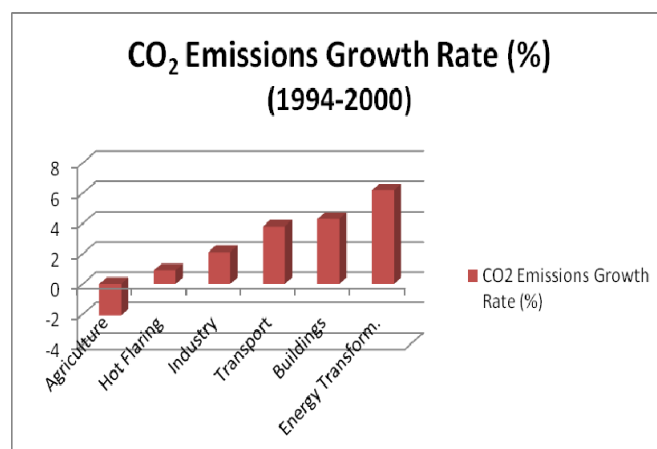
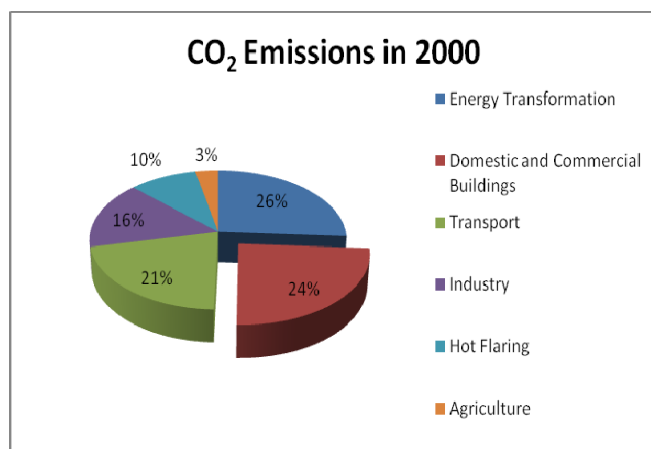
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PART II: PROJECT JUSTIFICATION

A. STATE THE ISSUE, HOW THE PROJECT SEEKS TO ADDRESS IT, AND THE EXPECTED GLOBAL ENVIRONMENTAL BENEFITS TO BE DELIVERED:

With a population of 71 million, the Islamic Republic of Iran is one of the most populous countries in the Middle East and North Africa Region. Over the past few decades, Iran has experienced rapid urbanization, with around 70% of the population now living in urban areas. Although Iran has the second highest GDP in the region, in per capita terms it ranks close to the middle. Clearly though, a middle class has emerged. The demographic trends outlined above, combined with strong economic performance and the relative youth of the population, mean that the demand for energy is expected to grow substantially in the coming years. This pattern will lead to even higher greenhouse gas emissions if the status quo remains the same. Among countries eligible for GEF support, Iran ranks fifth in CO₂ emissions. The residential and commercial buildings sector is one of the largest contributors to CO₂ emissions in the country.

Iran's share of primary energy consumption in the buildings sector (i.e. combined residential and commercial sub-sectors) amounts to 40% of total primary energy supply. Carbon dioxide emissions from this sector grew by an average of 4.3% between 1994-2000. This figure can be compared with the global growth rate for CO₂ emissions from energy use in buildings of 2.7%. Iran's CO₂ emissions in 2000 from the latter sector stood at 85,423 Gg and can be put into context by considering the CO₂ emissions from the transport, industry and agriculture sectors. These stand at 73,456, 54,693 and 11,165 Gg of CO₂ respectively.



Source: Iran's Second National Communication, 2007

The following table provides a succinct picture of the final energy end use in Iran's residential sector for different prevailing climatic conditions (all figures are in percentages). Tehran, Sanandaj and Rasht are highlighted to demonstrate the high share of space heating and hot water in the residential energy end use. Iran's energy consumption for space heating and home appliances are 2.5 and 1.8 times the global average respectively. While electricity consumption per square meter as a whole is lower than European consumption levels, the total energy use in the building sector is much higher than the corresponding European use. In 2006, the total energy consumed in the residential and commercial sectors amounted to 490.63 mboe. This figure is about 2.5 times the global average for energy consumed in these sectors.

| Climate | Air Conditioning | Space Heating | Lighting | Audio-visual | Hot Water | Cooking | Cooling and Refrigerants | Other |
|------------------------------|------------------|---------------|----------|--------------|-----------|---------|--------------------------|-------|
| Sanandaj (Cold) | 2 | 33.7 | 13.7 | 8.6 | 14 | 5 | 19 | 4 |
| Ahvaz (Hot) | 57.5 | 6.7 | 13 | 3.6 | 2.2 | 2.5 | 9.5 | 5 |
| Rasht (Temperate and humid) | 3 | 33 | 16.5 | 7 | 12.5 | 5.1 | 19.4 | 3.5 |
| Yazd (Hot and dry) | 20 | 23.5 | 13 | 8.8 | 9.7 | 4.8 | 17.5 | 2.7 |
| Bandar Abbas (Hot and humid) | 61.4 | 6.8 | 10.2 | 2.6 | 2 | 2 | 10 | 5 |
| Tehran (cold) | 8.5 | 32.8 | 11.4 | 8.6 | 15.7 | 5.4 | 15.6 | 2.3 |
| Average Country-wide | 25.4 | 22.6 | 13 | 6.5 | 9.4 | 4.1 | 15.1 | 3.7 |

Major contributing factors to the building sector's high share of energy intensity relate to:

- hefty subsidies and artificially low prices of energy carriers, particularly for households;
- poor insulation of the building envelope (e.g., large thermal bridges);
- energy inefficient home appliances and low share of renewable energies in meeting the building energy demand;
- an energy system that is poorly maintained and not amenable to control;
- patchy enforcement of Iran's energy efficient building codes;
- serious awareness gaps among architects, engineers, builders and contractors on the economics of energy efficiency, incentives to implement EE measures and the adverse impact of the buildings sector on global climate change in general; and
- dysfunctional and poorly maintained boiler rooms and heat distribution systems.

Energy systems (i.e. boiler rooms) in Iran's buildings are based on manually-controlled, individual solutions for each house. There are currently an estimated 1 million boiler rooms nationwide, 30-40% of which have been installed in Tehran. The technical standards of these oil or gas-fired systems are the same independent of the size of the system (it is estimated that the "burner efficiency" for fuel oil boilers and gas fired boilers are 75% and 80% respectively). The boiler rooms are used for the dual purpose of domestic hot water (dhw) and space heating and are normally maintained in a very poor state. In fact, the concept of maintenance for enhanced performance has not been widely embraced in Iran and there is an acute shortage of skilled human resources with necessary expertise and monitoring equipment to carry out the work. There are myriad valves, pumps and thermostat set points to change/adjust. This type of complex system is more amenable to automatic intelligent control as against the scarce manual attention they currently receive.

A major difficulty with the existing energy systems is that the heating system and the dhw system are connected in such a way that when there is only need for dhw, heat will also be supplied throughout the building. This would be the case even if the heat circulation pumps are shut off. In order to reduce unnecessary heating, a separate load pump for circulating heated water could be installed. A temperature sensor could then be installed using a protective tube in the outgoing domestic hot water pipe, which would better regulate the running time for boiler and load pump. Radiators are the most common heating source in apartment buildings in Tehran and installing radiator thermostats will create great energy savings and diminished CO₂ emissions. It is estimated that a reduction of the ambient room temperature by 1 degree centigrade will result in a 7-8% reduction of energy use.

THE PROPOSED GEF PROJECT

The objective of this GEF project is to reduce GHG emissions from Iran's buildings sector through barrier removal and implementation of practical measures in the *existing building stock* as well as mitigating future emissions in the context of *new buildings*. The GEF project will also identify and implement cost-effective market transformation measures in an effort to achieve long-term sustainability and GHG mitigation within the sector. The project will focus on the heating components of government and residential buildings in Tehran. As chillers are an important component of building energy efficiency and since the Parties to the Montreal Protocol have agreed to phase out HCFCs, there would be strong rationale for a follow on project targeting the cooling systems of buildings in Iran, particularly replacing HCFC chillers with energy efficient chillers.

The project will apply the approaches identified in UNDP's "Global Framework for Promoting Low Energy Buildings". These include components dealing with the first three "thematic approaches" of the global framework, namely:

- Improving the Knowledge, Understanding and Visibility of the Energy Efficiency Performance of Buildings and their Carbon Emissions
- Promotion and increased uptake of High Quality Energy Building Codes and Voluntary Building Energy Efficiency Standards
- Promoting Energy Efficient Municipal and Other Public Buildings

Legislative, Policy and Regulatory Frameworks

The GEF project will review the baseline policy, legislative and regulatory frameworks that impact building energy efficiency in Iran. It will provide technical assistance to enable Iran to produce a multi-sectoral and integrated national strategy and action plan for mitigation of GHG emissions in Iran's building sector. Assistance will, inter alia, be rendered for the revision of Iran's thermal code and the tightening of its enforcement. The project will raise awareness and knowledge about energy efficiency amongst building professionals and mandatory requirements and punitive measures that non-compliance with the law would entail and will ultimately propose a bill to the Parliament in the interest of tightened enforcement.

One of the main outputs under this component will be a Cross-sectoral Residential EE Strategy and Action Plan (CSSAP), delineating the most cost-effective and relevant policies and means of implementation in the Iranian context. Such policies are broadly categorized as:

- i. Control and regulatory instruments (e.g. building codes, mandatory labeling and certification programmes);
- ii. Economic and market-based instruments (e.g. energy performance contracting, EE certificate schemes);
- iii. Financial and fiscal instruments and incentives (e.g. taxation on CO₂ or household fuels, tax exemptions, capital subsidies, grants, subsidized loans); and
- iv. Support, information and voluntary action (e.g., voluntary certification and labeling, mandatory audit and energy management requirements).

Once the CSSAP is finalized, the project will selectively focus on the implementation of certain important and cost-effective elements of the document. For example, as part of i) above, the current building code would be revisited, assessed and examined. Energy codes are often considered to be an important driver for improved energy efficiency. However, the implementation of these codes in practice needs to be well prepared and to be monitored and verified. The GEF project will also build capacity for such monitoring and verification.

Pilot Demonstration

The pilot component of the GEF project where actual mitigation measures will be introduced will focus on hot water and space heating as two end-uses with high energy demands in the colder climates of Iran. The project will

work with heating system engineers and manufacturers to build capacity and transform energy inefficient practices and equipment. Measures to improve the heating system will be supplemented with the integration of solar water heaters as a cost-effective component of a building's heating system. Cost-effective alterations to the building shell, specifically the elimination of thermal bridges around windows will also feature high on the agenda of this project.

For the existing building stock, the energy savings potential by rebuilding the heating system is huge. The boiler rooms in Tehran are quite similar to each other and the same scheme for rebuilding may be utilized in almost all boiler rooms. This is also true in larger buildings where fan coils are used for the dual purpose of heating and cooling. A cost effective solution for conserving interior energy is the combination of radiator thermostats and the rebuilding of the boiler rooms. By providing the heating system with the supply temperature regulated as a function of the outdoor temperature, the heating energy demand can be reduced by up to 50%. Thus, installing radiator thermostats and re-adjusting the hydraulic balancing of the heating system is one simple but very effective way to reduce heating requirements. In addition, reducing the running time of the boilers when the boiler is not needed for heating purposes could result in very large savings. It is possible to save up to 75% of the energy use for the dhw production during summer time.

The pilot demonstration will be carried out in Tehran as a representative urban center for colder climates. The pilot project will be evaluated so that lessons can be drawn, disseminated and channeled into subsequent replication efforts and into the policy making process. Several other replication sites with similar climates to Tehran will be identified during the PPG phase. This project will only address space heating and hot water as two end uses where cost-effective solutions could be proposed in the context of the existing stock in Tehran. For Tehran and colder climates in general, the latter two areas combined constitute nearly half of all energy consumed in the residential sector. The existing governmental building stock will be the subject of mandatory boiler room and window retrofitting.

Market Transformation Measures

To transform markets, the GEF project will work closely with the private sector on training and accreditation and operation and maintenance. An important contribution of the GEF project would be to train and accredit a cadre of professional boiler mechanics/engineers and retrofitters. System installers will also be targeted for training and accreditation. Lessons learned through this phase of the project can also be utilized to improve Iran's building code vis-à-vis boiler specification and construction. Actual building energy performance also depends critically on how well the building is operated and maintained. Hence, this GEF project will also address the need for continuous performance monitoring and improved operator training.

The proposed market transformation activities are designed to effect sustainable changes and comprise of: i) Capacity development for manufacturers of heating system including specifications for improved boilers, burners, heat distribution systems and pumps; ii) Capacity development of building professionals in implementation of the revised thermal building code, including developers, heating system engineers, architects, builders, window fitters etc.; iii) a stakeholder awareness-raising campaign; and iv) proposals for sustainable financing mechanisms based on the findings of targeted studies such as a fuel subsidy diversion scheme. The precise composition and approach to market transformation measures will be determined based on the findings of the "Targeted Studies" of the first project component (i.e. Legislative, policy and regulatory frameworks).

With regard to the awareness-raising campaign, the GEF project would build on the efforts of the designated implementing Partner, IFCO of the Ministry of Petroleum, to transform public perceptions and attitudes. A cost-effective awareness campaign will be designed and delivered to increase the potential for carbon emissions savings in the future. The awareness campaign will also address the public's sparse knowledge about climate change in general and solar water heaters in particular. In this regard, best practices in countries where high penetration of solar water heaters has been achieved (e.g. Turkey and Japan) will be examined and adopted should the Iranian context permit.

B. DESCRIBE THE CONSISTENCY OF THE PROJECT WITH NATIONAL PRIORITIES/PLANS:

This project is fully consistent with Iran's national priorities, as outlined in its Constitution, Environmental Protection and Improvement Act, and Common Country Assessment (CCA). One of the goals put forward in the CCA is to increase energy efficiency and reduce air pollution.

Article 50 of Iran's Constitution, adopted in December 1979, calls for the preservation of the environment to ensure that the needs of future generations are met. The Environmental Protection and Improvement Act (1974) calls for both preventive and remedial measures for the protection and rehabilitation of the environment. The act also established the Department of Environment (DOE) as an inter-ministerial authority, which currently presides in the Office of the President. The DOE is thus one of the oldest and strongest environment authorities in the developing world. Iran's National Climate Change Office was established in January 1998 under the auspices of the Department of Environment. Among other responsibilities, the Office has built national capacity to systematically address climate change issues.

The importance of environmental protection is also underscored in Iran's Third and Fourth Five-Year Development Plans (2005-2009) through Item 121 and Item 20 respectively. The Fourth Plan obligates energy audits in governmental buildings and mandates the rationalization of energy consumption through: a) preparation of standards and technical specifications in relation to energy consumption by appliances, processes and energy-consuming systems so that all consumers, producers and importers of such appliances, processes and systems are mandated to comply with such standards; and b) regulations in relation to energy efficiency standards pertaining to the design and construction of new private sector- and government-owned buildings in order to avert energy waste as well as the design and implementation of reward systems in relation to the existing stock in the use of EE standards.

In 1991, the Council of Ministers approved and adopted the first version of Iran's EE code for the buildings sector (the so-called Chapter 19) to regulate all new constructions. The code became compulsory in 2000 for construction of all new buildings. In the same year, the Iranian Fuel Conservation Organization (IFCO), a subsidiary of the Ministry of Petroleum, was established in 2000 with the mission to reduce fuel consumption in different sectors through reviewing and surveying current consumption trends and implementing conservation measures nationwide.

IFCO has helped implement chapter 19 in government buildings, with residential buildings targeted for future activities. As a first step, IFCO has been carrying out energy audits for government buildings in an effort to select the most cost effective measures. IFCO is currently involved with energy audits in 40% of the buildings of the Petroleum Ministry, of which IFCO is a subset. Over the course of 2001-2009, IFCO has been implementing an ambitious programme to install and commission 2,100 baths in remote villages heated by SWHs. The rural installation of SWHs has been complemented with massive assistance to a few domestic manufacturers of SWHs. IFCO has also completed a pilot programme for the retrofitting of 1,000 boiler rooms. IFCO is planning to extend the latter to another 5,000 boiler rooms. However, IFCO's extensive efforts, although admirable, have not resulted in the requisite market transformation to reduce energy intensity in the residential and commercial sectors and therefore a meaningful mitigation of GHGs from the latter sector. This proposed GEF intervention is meant to build on past IFCO activities but more importantly shape IFCO's activities within a structured environment to create synergy and achieve value added. Hence, the project's initial emphasis on appropriate strategy, policy, legal and regulatory frameworks as well as select measures to instigate market transformation and penetration of cost-effective and integrated RE systems to address heating needs in the building sector.

C. DESCRIBE THE CONSISTENCY OF THE PROJECT WITH GEF STRATEGIES AND STRATEGIC PROGRAMS:

The project is consistent with GEF's overarching mission in the area of climate change mitigation, which is to develop and transform markets for energy in developing countries, with a long-term view to slowing the growth rate of GHG concentrations in the atmosphere.

The proposed project seeks to improve the energy efficiency of buildings in Iran through:

- (i) legislative, policy and regulatory reforms;
- (ii) implementation of a pilot where building heating systems will be targeted through cost-effective and state-of-the-art system and technological improvements; and
- (iii) implementation of market transformation strategies.

The project's focus is clearly a long-term one and its market transformation aspiration is very much in line with the new GEF strategic objectives and priorities for climate change. The proposed design addresses legislative, policy and regulatory frameworks, but it nevertheless realizes that policy gains are insufficient to lead to full market transformation. The proposed project banks on Iran's strong commitment to energy efficiency but also realizes that private sector engagement is a prerequisite for market transformation. The proposed project also realizes that considerable follow-on investments will be required to complete the process of market transformation that it is hoping to kick-start. It hopes to achieve this by virtue of the development of a Cross-sectoral Strategy and Action Plan for the buildings sector and ensuring that the latter is mainstreamed within impending five year development plans. By and large, the proposed project aspires to a toolkit approach with cost-effectiveness, sustainability and market transformation in mind.

The requirements for a comprehensive capacity building and outreach program, along with strengthening the necessary legal, regulatory and institutional frameworks, are in line with GEF Operational Program 5: Removal of Barriers to Energy Efficiency and Energy Conservation. The project is also consistent with the GEF Strategic Programme 1: (CC-1) Promoting Energy Efficiency in Residential and Commercial Buildings under the climate change focal area.

D. JUSTIFY THE TYPE OF FINANCING SUPPORT PROVIDED WITH THE GEF RESOURCES:

A GEF grant is being sought to support the review of the existing policy framework and craft a cross-sectoral strategy, implement a pilot demonstration of energy efficiency measures in government buildings, and initiate a market transformation initiative. The GEF grant will be catalytic in raising the profile of energy efficiency in the buildings sector, training a cadre of engineers, manufacturers, building professionals and policymakers on building energy efficiency and in stimulating sustained future investments in this sector.

E. OUTLINE THE COORDINATION WITH OTHER RELATED INITIATIVES:

The majority of national projects and programmes on building energy efficiency are currently being implemented by the proposed lead Implementing Partner for the project, the Iran Fuel Conservation Organization (IFCO) of the Ministry of Petroleum. IFCO has been mandated to lead the implementation of Iran's thermal code (dubbed "Chapter 19"). However, in many instances, the scope of IFCO's activities have far exceeded the latter's mandate to encompass the execution of a wide range of EE measures within the building sector.

IFCO's past activities include drafting standards for home appliances (e.g. gas-fired heaters and gas-fired wall mounted water heaters), implementation of energy audits, monitoring and management in select Ministry of Petroleum (MoP) and National Iranian Oil Company building sites, and installation of 10,000 solar water heaters in parts of Iran where the hot climate is conducive and where the gas grid is not available for provision of hot water. Although IFCO was established fairly recently in 2000, the value of IFCO's nationwide projects thus far has exceeded tens of millions of dollars and included the allocation of substantial subsidies to implement piecemeal EE measures. IFCO has plans to install 210,000 small-scale residential solar water heaters in rural villages as well as 1,000 rural solar bath facilities within the next five years. This residential solar initiative will form a part and parcel of the replication strategy of the project. The lessons from the GEF project, and in particular the pilot demonstration, will feed into IFCO's future initiatives and government policy-making more broadly.

The Ministry of Energy has defined standards for electric home appliances. Other key institutions comprise the MoHUD, Municipalities and the private sector. However, in terms of actual de facto work, the major share of activities is being implemented by IFCO. Hence, the degree of fragmentation in building energy efficiency has been relatively low. IFCO's activities have been sporadic in nature and not based on a clearly thought through

strategy and action plan. That said, as a first activity, the project will produce a cross-sectoral Strategy and Action plan for building EE where roles and responsibilities of various stakeholders are clearly delineated and potential synergies realized.

F. DISCUSS THE VALUE-ADDED OF GEF INVOLVEMENT IN THE PROJECT DEMONSTRATED THROUGH INCREMENTAL REASONING :

Without the GEF intervention, only limited progress would be made in introducing energy efficiency measures and practices in the buildings sector in Iran. As they have done in the past, CO₂ emissions from the residential and commercial buildings sector could be expected to increase by more than 4% per year. Enforcement of the energy efficiency building codes has been spotty and will likely continue to be so, in the absence of a targeted intervention. Wasteful energy practices, particularly with regard to hot water and space heating, would continue. Awareness gaps among all the key stakeholders of the buildings sector would remain. IFCO's activities would continue to be piecemeal and ad hoc, and would focus mainly on hotter climates in the rural areas. To date, there has not been any systematic strategy to improve energy efficiency in the buildings sector in Iran.

The GEF project will support the government in developing a Strategy and Action Plan on Building Energy Efficiency. This action plan will underpin IFCO's future work, and indeed the work of all government ministries and private sector counterparts, in this area. The thermal building code will be revised and enforcement of the code will be tightened by introducing penalties for non-compliance. The project will also raise awareness and knowledge about energy efficiency among building professionals. It will train and accredit a cadre of professional boiler mechanics/engineers and retrofitters. The project will work with heating system engineers and manufacturers to build capacity and introduce energy efficient practices and equipment, such as radiator thermostats and improved heating systems. Measures to improve the heating system will be supplemented with the integration of solar water heaters as a cost-effective component of a building's heating system. Finally, cost-effective alterations to the building shell, specifically the elimination of thermal bridges around windows, will also feature among the project's incremental activities.

By removing the main barriers in this sector, the GEF project will aim to create a favorable enabling environment that will create the conditions necessary for self-sustained replication of building energy efficiency measures and practices in Iran. The Cross-sectoral Strategy and Action Plan, along with the revised policies and regulations, will serve as the foundation upon which all future EEB initiatives will take place. They will provide direction and coherence to climate mitigation efforts in the buildings sector, which up until now have been absent. Furthermore, the pilot investments will demonstrate the energy savings and economic benefits of energy efficiency improvements, and strengthening the capacity of building industry stakeholders will foster a sustainable market for building energy efficiency in Iran.

G. INDICATE RISKS, INCLUDING CLIMATE CHANGE RISKS, THAT MIGHT PREVENT THE PROJECT OBJECTIVE(S) FROM BEING ACHIEVED, AND IF POSSIBLE INCLUDING RISK MITIGATION MEASURES THAT WILL BE TAKEN:

| Risk | Risk Level | Mitigation Measure |
|--|------------|---|
| Lack of coordination between the Ministry of Housing and Urban Development, the Tehran Municipality, and private sector developers | Modest | To mitigate this risk, UNDP will ensure the presence of a strong project steering committee mechanism, which will include all relevant stakeholders. The PSC will facilitate cross-sectoral involvement and coordination from the ministerial to the private sector and community levels, review outputs, and ensure that the project strategies meet national goals and objectives. The Cross-sectoral Strategy and Action Plan that will be developed under the project will include clear institutional roles and coordination mechanisms. |
| Weak or delayed policy implementation, most notably lack of enforcement of the more stringent energy efficient building codes | Modest | The project will introduce punitive measures and penalties for non-compliance with the thermal building code. Training courses will be provided for different stakeholders in the building value chain on the revised thermal code. These courses are intended to build capacity for monitoring and verification of |

| | | |
|--|--------|---|
| Low level of knowledge and skills among local professionals to integrate energy efficiency in building design and operations | Modest | the code. The project will provide technical assistance to build capacities of various local stakeholders involved in building design, construction and operation. |
|--|--------|---|

H. DESCRIBE, IF POSSIBLE, THE EXPECTED COST-EFFECTIVENESS OF THE PROJECT:

Based on IFCO's experience and its analysis of energy consumption trends in Iran, heating system improvements and solar water heating are deemed to be two of the most cost-effective options available. It is estimated that for every 1% improvement in boiler efficiency, there is a 1.5% reduction in natural gas use. Consequently, a difference of just a few percentage points in boiler efficiency can translate into substantial savings. Fuel costs and maintenance costs represent the largest portion of boiler equipment investment. A boiler installation costing \$75,000 can easily consume over \$400,000 in fuel every year it operates. Improving the efficiency of boilers can provide significant savings and maximize boiler investment. Solar water heaters are also highly cost-effective given Iran's extensive solar resources and have considerable comparative cost advantages over PV technology. Furthermore, the project will focus on both the supply and demand sides and there will not be any rebates or subsidies handed out under the project.

The project is expected to reduce nearly 800,000 tons of CO₂ emissions over the next 15 years (see assumptions in Annex 2). This initial estimate will be verified during the preparatory stage. In addition, given the project's market transformation focus, a significant amount of indirect CO₂ emissions are expected to be avoided beyond the implementation of the pilot and within the residential sector in Tehran and other urban centers where energy systems are based on boiler rooms. With a proposed GEF grant of \$4.9 million, the unit abatement cost would be just over \$6 per ton, which is lower than the current EUA market price of about 10 Euros per ton. Furthermore, co-benefits associated with the project are considerable and can be attributed to improved local and regional air quality as a result of reduced air pollution in one of the most polluted cities in the world. Replication to other major urban centers in Iran will substantially increase project co-benefits.

I. JUSTIFY THE COMPARATIVE ADVANTAGE OF GEF AGENCY:

According to the paper on Comparative Advantages of the GEF Agencies, and specifically the matrix that is annexed to the document, it is acknowledged that UNDP has a comparative advantage in implementing energy efficient buildings projects.

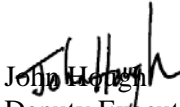
PART III: APPROVAL/ENDORSEMENT BY GEF OPERATIONAL FOCAL POINT(S) AND GEF AGENCY(IES)

A. RECORD OF ENDORSEMENT OF GEF OPERATIONAL FOCAL POINT (S) ON BEHALF OF THE GOVERNMENT(S):

(Please attach the [country endorsement letter\(s\)](#) or [regional endorsement letter\(s\)](#) with this template).

| | |
|---|--------------------------|
| Mr. Eshagh Alhabib Director General for International Economic Affairs and Specialized Agencies Ministry of Foreign Affairs | Date: September 10, 2008 |
|---|--------------------------|

B. GEF AGENCY(IES) CERTIFICATION

| | |
|--|--|
| This request has been prepared in accordance with GEF policies and procedures and meets the GEF criteria for project identification and preparation. | |
|  John Houghton Deputy Executive Coordinator UNDP-GEF | Faris Khader Regional Technical Specialist for Climate Change Tel. +66 2288 2756 |
| Date: 23 February 2009 | E-mail: faris.khader@undp.org |

Annex 1: Potential Energy Savings from Heating System Improvements

The following table summarizes energy saving potentials corresponding to a menu of energy saving options as these relate to the heating system for an average building with an assumed heating energy consumption of 275 kwh/m² per year:

| Component | Description | Energy Savings/ year |
|---------------------------------|---|---|
| Boilers | a) Boiler Capacity: Optimize boiler combustion efficiency by choosing the correct capacity and combination of boiler and burner. The overcapacity of the boiler can decrease the efficiency by about 5-10%; | 15 kwh/m2 |
| | b) Insulation: The heat loss from an insulated boiler is 2-3% of the mark plate boiler effect. This results in an energy loss to the boiler room of 8-10 % of the heating energy demand (oil or gas); | 20 kwh/m2 |
| | c) Closure of boilers not in use: There is no need to simultaneously run two boilers in the summer time. By shutting off water and air flow to closed boilers, an undesired heat loss of 0.5-1% of the mark plate boiler effect will be avoided. This results in an energy loss to the boiler room environment of 2 % of the heating energy demand. | 5 kwh/m2 |
| Burners | Installing a burner that matches the boiler and effective demand: the burner can be changed to a two step burner or for big boilers to a modulating burner. A suitable burner and boiler matching decreases demand by 5-10 % of the heating energy demand. | 15 kwh/m2 |
| Heat Distribution System | <p>a) Control system and radiator thermostat valves (RTV): Installation of control equipment that regulates the supply temperature to the radiators commensurate with the outdoor temperature (i.e. real demand), thus reducing the high prevalent winter time indoor room temperature of about 27 degrees C in Tehran residences to 22 degrees C. This is accomplished by installing a way valve and an actuator that mixes return water from the heating system with hot water from the boilers to the desired temperature. Installation of RTVs and flow adjustment of the heat distribution system also creates energy savings. To be properly working, this demands a changing of the circulating pump and a higher temperature difference between the supply and return temperature in the distribution system. The existing pumps employed in the boiler rooms have a characteristic of high pressure and high flow, which is not necessary for the flow distribution in the existing heating systems and not at all suitable for systems with RTVs. Hence, to implement this measure a change of pump is also required. The pump is turned off when the outdoor temperature is above a temperature set point. This measure should only be performed in combination with installing control equipment for the supply temperature. The combined measure will save 30% of the heating energy demand. The change to smaller pumps will also result in decreased electrical energy demand of 2 kwh/m2/year;</p> <p>b) Separate the dhw from the radiator system: The hot water is usually stored in a hot water double shell accumulator tank. This tank can be operated by a separate pump and good sensors that regulates the running of the pump and the boiler. In buildings where the dhw tank and the radiator system uses the same circulating pumps or the radiator system is not closed to the boiler in the summer time, the heat losses to the radiator system can be 10% of the energy demand for heating;</p> | <p>75+2 kwh/m2</p> <p>25 kwh/m2</p> |
| Total | 50-60% | 157 kwh/m2 |

Annex 2: Calculation of CO₂ Emissions Reductions

Pilot: CO₂ Avoided - Assumptions and Energy Saved:

Number of government buildings: 424 units with an average area of 3000 m²

Energy saving for 424 units of government buildings and based on extrapolations of Annex 1 where savings could reach an approximate level of 157 kwh / m² after the implementation of the indicated EE measures:

$$424 * 157 * 3000 = 199.48 \text{ million kwh}$$

Given that the heating value of each cubic meter of Natural gas is equal to 10.46 kwh, the natural gas saving comes up to:

$$199.48 / 10.46 = 19.06 \text{ million m}^3 \text{ per year}$$

Over the 15 year lifetime of the project EE investments, the natural gas saving will be:

$$15 * 19.06 = 285.97 \text{ m}^3 \text{ Natural gas}$$

CO₂ emissions for each million m³ natural gas equates to 2133 tons. Therefore the amount of CO₂ avoided is:

$$285.97 * 2133 = 609,974 \text{ tons}$$

Solar Water Heaters for Pre-heating - Assumptions and Energy Saved:

Number of solar systems : 424

Each system contains 20 collectors

Each collector saves 700 m³ natural gas

Energy saving:

$$424 * 20 * 700 = 5.936 \text{ million m}^3 \text{ natural gas annually}$$

For systems with an average life of 15 years, the natural gas saving will be equal to:

$$15 * 5.936 = 89.04 \text{ million m}^3 \text{ natural gas}$$

Therefore the amount of CO₂ avoided for a period of fifteen years is:

$$89.04 * 2133 = 189,922 \text{ tons}$$

Total Natural gas saving: 285.97 + 89.04 = 375.01 m³ during project life

Total CO₂ emissions avoided: 609,974 + 189,922 = **799,896 tons of CO₂ over the next 15 years**

Based on the current natural gas price in the international market (about 30 cents per m³), the total cost saving is:

$$375.01 * 0.3 = \$112.5 \text{ million}$$