Stimulating greenhouse gas emissions reductions in Central and Eastern economies, through EcoLinks program

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Keywords

public/private partnerships, energy efficiency, implementation, case studies, greenhouse gases

Abstract

A unique cross border partnership including public and private businesses and utilities, as well as local authorities in CEE and NIS countries and addressing the closely linked issues of economic development and environmental management is supporting a range of projects aimed at reducing greenhouse gas emissions in Central and Eastern Europe and some Newly Independent States. Since 1998, the EcoLinks program has initiated a number of projects in the energy efficiency/global climate change field, including a range of types of industrial and municipal energy users. This paper will report on the development, evolution and implementation of the EcoLinks program, show the range of savings that could be achieved at the studied facilities and present some case studies of the projects that have found significant energy efficiency potential.

Introduction

Under the United Nations Framework convention on Climate Change and the Kyoto Protocol, parties have common but differentiated responsibilities in mitigating global climate change. The countries with economies in transitions included in Annex I have made a significant contribution to the generation and accumulation of greenhouse gases (GHGs) in the past and therefore have special responsibilities to limit or reduce their emissions. Unfortunately, these also lack the financial resources and face many barriers in implementing a coherent environmental policy to address efficiently global climate change issues.

Central and Eastern European economies in transition have committed themselves to CO_2 equivalent reduction targets of between 6 and 8% of the base line emissions levels. This may not seem to be a problem at present, since many of these economies have witnessed much greater reductions from their base line year to present, due to important changes (contractions) in their industrial output and the structure of their gross domestic products. It is also expected that these countries will be the main sellers in the emissions trading process, in the coming years. The expected industrial growth of the transition economies together with emission sales should raise the awareness of policy makers with respect of meeting the targets to which they committed by the year 2012.

This paper will report on some of the gas emissions reductions projects identified through the EcoLinks Program in Bulgaria, Macedonia, Poland and Romania.

EcoLinks program and some of its successes in the region

Air quality, water quality/wastewater and solid waste management are the most pressing environmental problems facing municipalities and industry in Central and Eastern Europe (CEE) and the New Independent States. These problems entail environmental health risks as economic costs. However, the environmental management capacity and financial resources to address these problems are severely limited. In response to this situation, EcoLinks Partnership Grants Program helped build the capacity of

businesses and municipalities in the region to develop market – based solutions to urban, and industrial environmental problems.

EcoLinks Grants Program was funded by the US Agency for International Development and managed by the Institute of International Education and the Regional Environmental Center for Central and Eastern Europe, between 1998 and 2003.

EcoLinks is based on cross-border partnerships, between US or regional businesses or municipalities and the local project initiator. Working together with one or more partners, from the earliest application stage, the project initiator was able to strengthen its capacity to develop and manage environmental projects that respond to market incentives. The intra-regional linkages are also important mechanisms for promoting regional stability. In addition, EcoLinks mainstreamed the private sector into the assistance process. The need for environmental investments in the region is enormous. However, the central governments have constrained budgets, and the system for collecting fees for environmental penalties is ineffective in many countries. Private sector participation ensures that solutions to environmental problems are market based.

In EcoLinks, working as partners, organizations identify and remedy environmental problems, adopt best practices and finally increase trade and development in the region. The largest of the three components, the Challenge Grants provided funding (up to $ 50 000) for cooperative environmental projects under three grants topics: Global Climate Change, Cleaner Production and Water Quality Management.

From the start of the program, a total of 187 projects, amounting to approximately 8.5 million Euro, have been funded in both Central and Eastern Europe and Eurasia, covering all grants topics. Of these, 56 projects, in the amount of 2.75 million Euro were awarded in Bulgaria, Croatia, Bosnia and Herzegovina, Estonia, Hungary, Macedonia, Poland, Romania and Slovakia, under the Global Climate Change topic, which is the most relevant for this panel. The majority of these projects were undertaken in industry and prepared energy audit reports and pre-feasibility studies for energy saving investments that contributed not only to economic savings for the project initiator, but also to environment improvements for the country and the region.

Several other projects prepared pre-feasibility studies for the introduction of renewable energy sources, including wind, hydropower and wood waste, use of local small cogeneration units, to produce energy and replace classic fuels.
The present paper introduces some positive examples of enhancing energy efficiency and the use of renewable energy sources and thus reducing GHG emissions while gaining substantial economic benefits from these, in Bulgaria, Macedonia, Poland and Romania.

CASE 1. BULGARIA: ENERGY EFFICIENCY ACTION PLAN FOR SOFIA BUILDING STOCK

Because the 1.2 million inhabitants of Bulgaria's capital city, Sofia consume 240 kWh/sqm^2 energy for heating at almost twice the European average of 140 kWh/sqm^2, they suffer the dual impacts of excessive energy costs and high air pollution. The CO_2 emissions only from the heating systems are estimated at some 800 000 tons per year. An earlier study had already identified the main reasons for Sofia's excessive energy consumption and poor air quality: massive use of coal and diesel fuel in both the district heating as well as individual heating systems; an inefficient and unregulated heat distribution system; inadequate insulation and substandard construction of residential and public buildings; and absence of heat meters and control devices in apartments. What the municipality needed was a plan to finance and attack these problems. The EcoLinks Challenge Grant enabled Sofia to assemble an international team to develop the plan. The team included a U.S. company, Good Consulting, a Bulgarian NGO, Energy Efficiency Foundation and the Municipality of Sofia. The objectives of the Plan were to assess energy consumption in both public and residential buildings; identify appropriate energy conservation measures; and define the necessary financing, possible financial resources, and implementation steps for the selected measures. The project team conducted two kinds of energy audits: a preliminary audit of the approximately 300 buildings owned by the municipality and a detailed audit on two sample buildings. Computer models were used to determine current heat losses and to estimate the potential for energy savings.

Based on their analysis of that information, the team prepared a list of basic energy conservation measures such as installing meters and weatherising doors and windows. The team also determined each measure's investment requirements, simple payback periods and possible administrative and regulatory barriers to implementation.

The Action Plan proposed a three to twelve-year period for implementing public and private energy conservation measures and included a marketing component to obtain much – needed buy – in from the owners of private residential buildings. Perhaps the most noteworthy initiative of the plan is the creation of new institutions: Energy Agents to collect payments from consumers and the Municipal Agency for Energy Management to implement energy conservations measures in public buildings. Conservation measures in public buildings would be financed by an Energy Efficiency Fund that would invest in solutions offering the highest rate of return and shortest payback period, on a revolving basis. The Municipality obtained a $ 3 million (2.76 million Euro[1]) loan from the Black Sea Investment Bank to set up this Fund.

On the residential side, consumers would pay their heating bills to a new Energy Agents organization at pre-conservation rates. Balances left after paying the energy provider would be used to re-pay conservation loans and fund other implementation measures.

The necessary investment outlay to implement the plan's basic energy conservation measures is $ 2.3 million (2.11 million Euro) for public buildings and $ 31.5 million (28.9 million Euro) for residential buildings. The average payback period is 1.2 years for public buildings and 1.6 years

1. Exchange rate; 0.92 Euro for 1 dollar (April 2003).

for residential buildings. The plan is expected to save approximately 1 000 000 MWh/year when is fully implemented and reduce CO_2 equivalent emissions by 240 000 tons per year.

CASE 2. MACEDONIA: REHABILITATION OF SMALL HYDROPOWER PLANTS

Electric Power Company of Macedonia applied for the EcoLinks Challenge Grant to study its rehabilitation options of seven small hydro power plants, because of the plants' poor condition and uncertain futures raised serious environmental concerns. The vast majority of Macedonia's electricity is produced from highly polluting lignite coal and heavy fuel oil. Non-polluting hydropower fills only 20% of the country's total electricity demand – with 18 small hydroelectric power plants producing only 13% of that. Partners Elektoproject consultants of Croatia and the mechanical engineering faculty from the Hydraulic Engineering and Automation Institute in Macedonia assisted in preparing the project study. Through site visits and an extensive review of all existing data and documentation, the project team evaluated the current condition of each plant to determine the need for rehabilitation and the possibilities for increasing the installed generating capacity. Three rehabilitation alternatives were formulated based on a cost –benefit analysis of the scale of required equipment changes relative to each facility. The study showed that the rehabilitation of the seven hydro plants would not only be feasible but also quite profitable. For six of the seven plants, the internal rate of return ranges from 16.9% to 45.8%. The team presented specific recommendations for rebuilding each plant's engineered structures and rehabilitating the hydro-mechanical and electrical equipment.

From two possible funding options, the company chose to Rehabilitate – Operate – Transfer financing model.

Rehabilitating the seven plants will avoid the emission of 136 tons of CO_2 per year, by replacing coal combustion with clean hydropower. In addition, since all seven plants are an integral part of Macedonia's water management system, the rehabilitation and life extension of the hydropower plants will result in sustained water management and reduced soil deterioration. Plant rehabilitation will increase the generation of electric energy by 17% from 86 GWh to 101 GWh annually. With this increase in production, an additional income of $ 320 000 (294 450 Euro) to $ 640 000 (588 500 Euro) per year is expected.

The project led the Power Company sign a $ 19 million (17.5 million Euro) concession contract with Hydropol Management, a consortium of British and Czech investors to establish a joint venture that will modernize all of its seven small hydropower plants over a period of 11 years and extend their useful lives well into the futures.

CASE 3. POLAND: INTRODUCTION OF WIND POWER IN KISIELICE

Burning coal to generate electricity, Poland emits approximately 350 million tons of carbon dioxide (CO_2) a year, contributing to global warming and the degradation of the air quality. Alternative energy sources such as wind and sun are increasing in importance as Poland attempts to reduce emissions from fuel combustion.

With the support of EcoLinks Challenge Grant, the municipality of Kisielice and the American consulting firm AWS Scientific, Inc. explored the technical and financial steps required to develop the first modern wind power station in northern Poland. The successful implementation of a project in a small town (pop. 6 500) will serve as a model for other cities in Poland. After collecting meteorological and terrain data and analysing these using computer-based models, the project team decided to install a single 1 500 kW windmill, 85 meters high, with a blade 77 meters in diameter, capable of producing 3 600 megawatt hours per year of electricity. A funding mechanism was one of the project's primary goals and as a result, the Polish EcoFund awarded Kisielice a $ 600 000 (651 700 Euro) grant to cover 30% of the investment outlays for installing the wind turbine. The difference will be covered from a preferential 8.6% eight-year loan and municipal funds. According to the project's Environmental Impact Assessment, operation of just the one proposed windmill can reduce annual emissions from coal combustion by 1 213 tons of CO_2. The project's primary economic benefit is the annual 17 187 500 (202 400 Euro) from electricity sales.

CASE 4. ROMANIA: ENERGY SAVING PROGRAM AT A SODA ASH MANUFACTURER

UPSOM, a leading soda ash manufacturer in Romania, was established in 1894. Soda ash is used to manufacture multiple products including chemicals, pharmaceuticals, metals, glass, pulp and paper, cosmetics, and textiles.

Soda ash production is energy intensive and the company consumes 47 000 MWh of electricity, and 82 million m^3 of gas per year. UPSOM's energy costs in 2001 were approximately $ 8.2 million (7.53 million Euro), representing 60% of the total production costs. UPSOM gets its power from its own combined heat and power station and from the power grid. The combined heat and power station includes: three steam boilers, a feed water treatment station, two pressure reduction stations and pumps. Two German steam boilers (36 bar, 425 ^{0}C, 31 t/h) were commissioned in 1957 and the third, a Romanian steam boiler (36 bar, 425 ^{0}C, 28 t/h) in 1970. Electricity is produced by steam in an 8.2 MW German turbine that was commissioned in 1957. In order to completely cover its electricity demand, the company also buys approximately 18% of it from the power grid.

The company emits approximately 7.2 tons of CO, 720 tons of NO_x, and 548 tons of CO_2 per year.

With the support of an EcoLinks Challenge Grant, UPSOM collaborated with Sustainable Energy Partnerships, a US firm, and Energobit, a local Romanian partner, to develop an energy savings program. The program included the introduction of a modern power monitoring system and a financial analysis detailing low, medium, and high cost energy saving opportunities. The financial analysis also included an estimate of the company's financial capacity for making investments in energy efficiency measures.

The project team investigated in detail the heat and electricity generation and consumption at UPSOM. They recommended several low and medium cost measures requiring a total investment outlay of $ 872 000 (801 800 Euro) with an annual cost savings of $ 906 000 (833 000 Euro), representing a very good rate of return be-

tween 30 and 70%. These included measures like: installation of gas, water and steam meters, installation of an energy management system, installation of inverted bucket steam traps, use of plate heat exchangers for space heating; installation of condensers to compensate for reactive energy, modernization of CO_2 compressors, etc. The simple payback period varied between 0.3 and 1.2 years. Two very attractive high cost investment strategies, replacing two 50-years old steam boilers and a steam turbine with modern technology, totalling 3.63 million (3.34 million Euro) with an IRR of 15% that would ultimately produce a savings of $ 671 700 (617 580 Euro) per year were developed and recommended.

In addition to these cost savings, environmental benefits were also generated. Implementation of the recommended energy saving measures can reduce the total emissions by 28%.

Lessons Learned

Some useful lessons were learned from both the national and the regional initiatives to enhance energy efficiency and reduce green house gas emissions. As a general observation, all programs identified substantial energy saving potential in both the commercial/industrial sector, as well as the in the public sector. Most of the projects yielded a very good economic return and the cost of CO_2 equivalent reduction was quite attractive. At the national level, there was a tendency to soften the projects costs by grants or subsidized loans (see Poland and Hungary).

It also seems that since countries became parties of the UNFCCC and Kyoto Protocol, more attention is being given to emission reduction through energy efficiency improvement and use of renewable energy sources and that we would see more environmental activities implemented in the region. The region recognizes the potential for implementation of very cost effective energy efficiency projects, and the foreign investment opportunities that this will bring with expanded emission trading.

EcoLinks as a five-year regional program, managed not only to highlight the benefits of saving energy and increasing the use of renewable energy forms, but also contributed to leverage important financial resources to implement the recommendations. Much of its efforts to build capacity in the region to address and find solutions to environmental problems were re-paid by the post grant implementation activities. In addition to the local capacity building that took place through the individual projects, important and valuable business partnerships were seeded that will continue to bear fruit in both economic and environmental value well into the future.

References

EcoLinks – Annual Reports 1999, 2000 and 2001, Institute of International Education and The Regional Environmental Center for Central and Eastern Europe.

Good Practices in Measures for Climate Change Mitigation, *The Regional Environmental Center for Central and Eastern Europe*, World Resources Institute, Hungary, 2002.

Efficient Solutions to Environmental Problems: Best Practices, Institute for International Education, The Regional Environmental Center, USA, September 2002.

International Emission Trading, International Energy Agency, France 2001.