Cost Effective Climate Change: Opportunities for Sustainable Energy

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Introduction

Global sea level trends, over the past century, based on tidal gauges, have shown an increase of about 1.8 mm per year. In the Caribbean it has been estimated that sea level rose an average of 2.4 mm per year between 1940 and 1970. Regional estimates from tidal gauges indicate that the relative sea level for parts of the Caribbean will be 15-20 cm greater than the worldwide average because of natural subsidence, groundwater pumping, and sediment compaction. A regional value for sea level rise in the Caribbean can only be stated with caution, but 30-45 cm over the next fifty years is reasonable. Such a sea level rise would pose serious problems, for tourism in particular.

A national inventory of greenhouse gases in Jamaica shows that energy use caused more than 75% of emissions. This is in keeping with a global average of 70%. The strategy, therefore, is to reduce the adverse environmental impact of energy use by using cleaner technologies and improving energy efficiency.

Sustainable energy can best be achieved by effecting five major approaches:

1. Encourage energy efficiency;
2. Stimulate renewable energy growth;
3. Promote advanced fossil fuel technologies;
4. Foster fuel cell technology;
5. Give special attention to the development of advanced technologies in nuclear energy that address concerns of safety and waste disposal.

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ENERGY EFFICIENCY

1. Energy efficiency seeks to use less energy for the same service, at both supply stage and end-use. At the global level approximately 37% of primary energy consumption is converted to useful energy. Hence, there is great potential for improvements in energy efficiency.

2. Analyses have shown that the primary energy required for a given level of energy services could be effectively reduced by 25-35% in industrialized countries. For economies in transition, reductions of about 40% can be achieved. In most developing countries, 45% or more may improve efficiency. In North America, which has the highest per capita use of energy, efficiencies can be improved by 0.75% per year. In Europe 1% can be achieved, in economies in transition 1.5%, and in developing countries efficiency improvements of up to 2% per year can be made. Realization of this potential depends directly on the effectiveness of policy frameworks and measures, changes in social attitudes and behaviour, and the level of economic activity.

3. New technologies and new investments alone, could lead to increasing energy efficiency of 0.50% per year. Thus governments and stakeholders should create an enabling environment for efficiency.

4. In industrialized countries, less energy-and material-intensive production and consumption can cause near zero growth of energy use. However, in developing countries higher economic growth rates will dictate increases in energy use. For this reason energy consumption worldwide will continue to increase, even with high levels of efficiency.

5. A number of barriers will have to be hurdled in the thrust towards more efficient use of energy and materials. Among these barriers are:

- Lack of awareness on the part of governments, industry and the consuming public of the potential of efficiency in lowering energy costs and reducing environmental emissions;
- Lack of capability to acquire and assess energy end use data, set efficiency targets, and prepare and enforce efficiency policies;
- Lack of financing for efficiency improvement projects;
- Uncertainties about the performance of investments in new, efficient technologies;
- Lack of incentives for energy companies and utilities to develop and maintain DSM programmes that could delay future expansion plans;
- Lack of R & D to develop new options.

6. Energy efficiency can be stimulated by achieving certain goals:

- Effecting competition in energy supply;
- Maintaining consistent energy policies, through institutional and regulatory arrangements;
- Issuing tighter efficiency and emission standards;
- Providing fiscal incentives to accelerate energy efficiency.

7. Among the measures that have been successfully applied are

codes and standards for buildings; efficiency labels for appliances and lighting; improved efficiency of boilers and furnaces, as well as heating, cooling, ventilation and air conditioning.

8. In the transport sector consumers seem willing to trade fuel

economy for power, comfort, convenience, and safety. Higher taxation on larger engined vehicles that are less fuel-efficient is to be encouraged, as is the improvement of public transport systems and new traffic management schemes.

9. At the international level we need to develop appropriate data for the establishment of energy efficient benchmarks and at the same time develop networked programmes of information exchange.

RENEWABLE ENERGY

1. The global primary energy mix has about 14% renewables at present. Approximately 10% is traditional biomass, the balance of 4% is shared between hydropower and new renewables such as wind, solar, and modern biomass. The traditional use of biomass is primarily firewood for cooking and heating in developing countries. Traditional biomass can cause nutrient deficiency in soils, indoor and outdoor air pollution as well as contribute to greenhouse gas emissions.

2. Different scenarios of the potential contribution of renewables to global energy range from 20% to as much as 50% by 2050. The actual percentage will depend on the production costs of renewables versus fossil fuels during this time, and, importantly, the regulatory environment for greenhouse gases.

3. Many renewable energy technologies are still at an early stage of development, particularly solar. However, wind can now compete with fossil fuel technologies in areas where the wind speeds are consistent and higher than 8 metres/sec.

4. With sustained wind speeds, wind energy can be generated at the best sites at just over 3 US cents kWh. There is a trend towards larger wind turbines, and in 1999 some 480 units of 1 MW or more were installed worldwide.

The turbines also have fewer components and are more reliable. At the same time output has become more controllable and grid compatible. Variable speed systems with synchronous generators now integrate better in existing grids, leading to potentially higher penetration (of 10% or more) even in weak grids. Negative environmental impacts are limited to visual aesthetics, noise and some interference with electromagnetic signals.

5. Jamaica has a 20 MW windfarm project slated for completion in early 2002, which I will use as an example of wind energy and climate change. Sited at Wigton on a plateau in central Jamaica, the project will use 23 - 900 kW wind turbines from NEG-Micon. The Clean Development Mechanism (CDM) involves climate change mitigation projects undertaken between Annex 1 and non-Annex 1 countries. Jamaica, as a non-Annex 1 country, has no specific legally binding reduction targets for greenhouse gases. Jamaica ratified the Kyoto Protocol on June 28, 1999.

Under the proposed international CDM regime, the wind project is likely to meet the sustainable development, internality and externality requirements, gain host country acceptance, and be able to demonstrate that the emissions reductions are real, long term, and measurable. Approximately 50,000 tons of CO_2 will be saved per year, and traded at a price to be negotiated. The plan is to seek, in 2001, third party purchasers known to be voluntarily active in this market.

The Wigton 20 MW windfarm project could be an example of an energy emission reduction activity that can generate Certified Emission Reductions (CERs) under the Clean Development Mechanism. We urge other Caribbean countries to support similar projects in renewable energy, in such areas as wind, solar, hydropower and energy forests.

6. The barriers to renewables are:

- Lack of enabling national policies;
- High initial cost of investment, and often long lead times for development;
- Cumbersome processes for financing;
- Lack of local skills in R & D, manufacturing and system maintenance.

7. What is needed is the development and implementation of national and regional programmes to stimulate the use of renewables with assessment of resources being cardinally important.

Targets should be set, obligatory or non-obligatory, for the introduction of renewables into an energy system. Emphasis should be placed on obligations-to-buy and obligations-to-supply regulations. For example, in Jamaica 4% of electricity now comes from renewables (hydropower and bagasse). The target is to raise this to 12% by the year 2020.

ADVANCED FOSSIL FUEL TECHNOLOGIES

1. Atmospheric pollution at the local, regional and global levels,

associated with fossil fuel use, and the impact on health, environment and ecosystem are primary concerns. Public policy should guide a more rapid rate of innovation in fossil fuel technology.

2. Natural gas, with its environmental and economic advantages, will have a growing role in the global energy mix. The present move to natural gas will see an increase in its share of global energy from 22% today to about 33% by 2030. Effective in combined cycle and cogeneration technologies, natural gas may also become a favourable fuel for the transport sector.

3. Oil products will see cleaner production, transportation, conversion and end use processes. Further development of advanced fuels and engines for transportation is required to improve fuel economy and lower emissions.

4. Coal is the dirtiest of the fossil fuels. Improved technologies for cleaner production, conversion and use of coal could drive a return of interest in this fuel, considering its low cost and abundance in many parts of the world. Coal gasification by partial oxidation with oxygen to make syngas (carbon monoxide and hydrogen) will make it possible to produce really clean synthetic fuels, including hydrogen for fuel cells.

FUEL CELLS

1. A future energy solution for homes, vehicles and electric utility systems, fuel cells are a highly efficient power source that emits only water and heat. Using hydrogen as a fuel they are virtually pollution-free. However, the hydrogen must come from the conversion of hydrocarbon fuel such as natural gas or methanol, and that process creates some emissions.

2. At present hydrogen is not available as a commodity fuel, and even if it were, there is no infrastructure to deliver it.

3. In principle a fuel cell works much like a battery – only it does not run down. It creates electricity as long as it receives hydrocarbon fuel.

4. Niche opportunities will develop in the next five years, in transport and distributed electricity, giving this technology a base for launching into mass transport and the power industry by 2015.

NUCLEAR POWER

1. Nuclear power accounts for 16.5% of total world electricity generation and about 5% of total world energy consumption. In some countries (Belgium, France, Lithuania) it dominates electricity production. However, the minimum economic size of a nuclear power plant is about 500 MW; too large for many island states in the Caribbean.

2. The use of nuclear power avoids significant amounts of global emissions of carbon dioxide, sulphur dioxide, nitrous oxide and particulate matter. It has also helped to meet security of supply concerns and has held back the potential escalation of fossil fuel prices. Furthermore, there are large reserves of nuclear fuel in uranium and thorium.
3. The role of nuclear power in slowing climate change depends on social acceptability, safety of new nuclear technologies, economic viability, the management of spent fuel and nuclear waste; as well as the impact on the peaceful use of nuclear power on the proliferation of nuclear weapons.

4. If nuclear power is to become an option to positively lessen climate change, concerns regarding safety, waste disposal and proliferation must be addressed before there is any expansion of nuclear power.

Conclusion

What is driving today's thrust towards a clean energy scenario? We have new global and local environmental concerns, technological advances, falling costs, and an accumulated experience in renewable energy.

Developing countries need partnerships in creating energy enterprises and projects with or without government, to attract private sector investors and financers, to attract technology developers and suppliers, and to remove policy barriers to renewable energy.

An evolving shared goal internationally is the securing of a greater share of renewable energy sources in the national energy mix. The cardinal issues in clean energy development show that achieving a lessened adverse effect on climate change will require the concerted effort of all levels of government, the private sector, the international community, and civil society.

Policies that are implemented, together with nationally and internationally coordinated approaches, will stimulate the use of clean renewables; their environmental benefits will become economic benefits.