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ENERGY EFFICIENCY STRATEGY FOR THE DOMINICAN REPUBLIC

NOVEMBER 2004

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Energy Efficiency Strategy for the Dominican Republic



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Advanced Engineering Associates International (AEAI)
1666 K Street, NW, Suite 620
Washington, DC 20006
Phone: 202-416-6614
Fax: 202-955-9082

NOTE:

THIS DOCUMENT HAS BEEN PREPARED IN COLLABORATION WITH THE NATIONAL COMMISSION OF ENERGY (CNE) OF THE DOMINICAN REPUBLIC (DR) AND CONSULTANTS SPONSORED BY THE US AGENCY FOR INTERNATIONAL DEVELOPMENT (USAID). IT SEEKS TO PROVIDE A STRATEGIC FRAMEWORK FOR DEVELOPMENT OF ENERGY EFFICIENCY APPROACHES TARGETED TOWARD DEMAND-SIDE MANAGEMENT (DSM), PRIMARILY FOR ELECTRICITY. SUPPLY-SIDE APPROACHES ARE NOT ADDRESSED HERE DUE TO TIMING AND RESOURCE CONSTRAINTS AND ONGOING SECTOR REFORM EFFORTS THAT PROVIDE ALTERNATIVE AVENUES FOR ADDRESSING ENERGY EFFICIENCY OPPORTUNITIES IN THE GENERATION, TRANSMISSION, AND DISTRIBUTION OF ELECTRICITY. SIMILARLY, WHILE THIS PAPER TOUCHES ON FUEL EFFICIENCY AND TRANSPORTATION, THESE SUBJECTS WILL REQUIRE ADDITIONAL RESEARCH AND CONSIDERATION BEFORE THEY CAN BE FULLY INTEGRATED INTO THE DR'S ENERGY EFFICIENCY STRATEGY.

THE DSM RECOMMENDATIONS PROVIDED HERE ARE DESIGNED TO SUPPLEMENT THE ANALYSIS PROVIDED IN THE JUNE 2003 AEAI REPORT *ANALYSIS OF THE SUSTAINABILITY OF THE ELECTRICAL POWER SECTOR*, ALSO SPONSORED BY USAID, AND THE JUNE 2004 *PROPUESTA DE REFORMA DEL SECTOR ELECTRICO*, PREPARED BY FOREIGN DONORS, THE PRIVATE SECTOR, AND THE GOVERNMENT OF THE DR. DSM-TARGETED EFFICIENCY MEASURES CAN HELP PROPEL THE REFORM STRATEGY OUTLINED IN THESE TWO DOCUMENTS BY REDUCING ELECTRICITY DEMAND, THEREBY REDUCING FUEL IMPORTS NEEDED FOR ELECTRICITY GENERATION. DSM CAN ALSO REDUCE PEAK LOADS AND ELECTRICITY THEFT WHILE REDUCING CONSUMER BILLS AND INCREASING INDUSTRIAL COMPETITIVENESS.

THE APPROACH OUTLINED IN THIS STRATEGY IS NOT COMPREHENSIVE; INITIATIVES CONSIDERED TOO LABOR OR RESOURCE INTENSIVE HAVE BEEN DELIBERATELY OMITTED FROM RECOMMENDATIONS FOR THIS START-UP PHASE. GIVEN THE CURRENT POWER CRISIS AND PROLIFERATION OF SYSTEM BLACKOUTS, THIS STRATEGY SEEKS TO OFFER A SET OF IMMEDIATE, LOW-COST MEASURES THAT CAN HELP ALLEVIATE SOME OF THE MAJOR CONSTRAINTS IN THE SHORT-TERM. IN ADDITION, THIS STRATEGY OUTLINES A RANGE OF LOW-COST AND NO-COST ACTIVITIES INITIALLY, REFLECTING THE DR'S STRAINED FINANCIAL CIRCUMSTANCES AND THE NEED FOR GOVERNMENT AND PRIVATE-SECTOR EXPERTS TO GAIN EXPERIENCE AND CREDIBILITY. ONCE THE DR BEGINS TO BUILD ITS ENERGY EFFICIENCY CAPACITY, CNE CAN INTEGRATE SUPPLY-SIDE APPROACHES AND FUEL AND TRANSPORTATION ISSUES INTO THIS STRATEGIC FRAMEWORK IN ORDER TO DEVELOP A COMPREHENSIVE, NATIONAL ENERGY EFFICIENCY PLAN.

SPECIAL THANKS TO STEPHANIE CAMPBELL AND ARTURO PEDRAZA OF THE ALLIANCE TO SAVE ENERGY; PHILIP COLEMAN OF LAWRENCE BERKELEY NATIONAL LABORATORY; MARY LOUISE VITELLI AND ODÓN DE BUEN OF AEAI; AND DOROTEO RODRIGUEZ AND LUCAS VICENS OF CNE FOR THEIR CONTRIBUTIONS TO THIS STRATEGY.

Contents

Section	Page
I. OVERVIEW	1
Section 1 Introduction and Strategic Objective.....	1
Section 2 Overview and General Assessment of Energy Use in the Dominican Republic.....	3
2.1 Industrial Sector	3
2.2 Residential Sector	3
2.3 Commercial Sector.....	4
2.4 Government Buildings	5
2.5 Transport.....	5
Section 3 Strategy Approach	7
II. STRATEGY FRAMEWORK.....	9
Section 4 Stakeholder Roles and Responsibilities	9
4.1 National Government.....	9
4.2 Other Government Stakeholders.....	10
4.3 Non-government Stakeholders.....	10
4.4 Coordinating Stakeholder Participation.....	11
III. RECOMMENDATIONS.....	12
Section 5 Short-Term Energy Efficiency Activities (1-18 Months)	12
5.1 Institutional/Capacity Building	12
5.1.1 CNE Capacity Building	12
5.1.2 Energy Efficiency Market Priority Assessment.....	13
5.2 Public Sector Support	13
5.2.1 Public Information/Outreach Campaign.....	13
5.2.2 Municipal Government Roundtable on Energy Efficiency	16
5.2.3 Residential Sector	16
5.2.4 Government Buildings Efficiency Pilot.....	16
5.3 Private Sector Support Activities.....	17
5.3.1 Hotel Sector	17
5.3.2 Electric Utilities	17

Section	Page
Section 6 Medium-Term Energy Efficiency Activities (18 Months – 5 Years).....	18
6.1 Institutional/Capacity Building.....	18
6.1.1 CNE Capacity Building	18
6.1.2 Young Energy Professionals Programs	18
6.1.3 Commercial Energy Efficiency Service Providers Training/Support Program.....	18
6.2 Public Sector Support Activities.....	19
6.2.1 Training for Other Government Agencies	19
6.2.2 Public Information/Outreach Campaign.....	19
6.2.3 Energy Efficiency Awards Program	19
6.2.4 Municipal Governments.....	19
6.2.5 Water Sector.....	19
6.2.6 Lighting.....	20
6.3 Private Sector Support Activities.....	21
6.3.1 Industry Best Practices and Benchmarking	21
6.3.2 Shopping Mall Audits.....	21
6.3.3 Cogeneration.....	21
6.3.4 Energy Efficiency Funding.....	22
Section 7 Long-Term Energy Efficiency Activities (5 Years and Beyond)	23
7.1 Institutional/Capacity Building.....	23
7.1.1 CNE Capacity	23
7.2 Public Sector Support Activities.....	23
7.2.1 Energy Efficiency Law	23
7.2.2 Standards and Labels	24
7.2.3 Building Standards/Codes.....	24
7.2.4 Energy Efficiency Education	24
7.3 Private Sector Support Activities.....	25
7.3.1 Energy Efficiency Service Companies	25
7.3.2 Energy Efficiency Financing Mechanism(s)	25
Appendix A Illustrative Energy Efficiency Definitions	27
Appendix B Donor Coordination with the DR Energy Efficiency Strategy	29
Appendix C Residential Lighting Program	31
Opportunities	31
Design and Implementation Process.....	31

List of Acronyms

Acronym	
AEAI	Advanced Engineering Associates International
CNE	National Commission of Energy of the Dominican Republic
DR	Dominican Republic
DRNEB	Dominican Republic National Energy Balance
DSM	Demand-Side Management
EE	Energy Efficiency
ESCO	Energy Service Company
GWh	Gigawatt Hour
HVAC	Heating, Ventilation, and Air Conditioning
IDEE	Economic Institute of the Bariloche Foundation of Argentina
KTOE	Thousand Tonnes Oil Equivalent
Kwh	Kilowatt Hours
IDB	Inter-American Development Bank
LPG	Liquefied Petroleum Gas
MBOE	Million Barrels Oil Equivalent
MIC	Ministry of Industry and Commerce
MTOE	Million Tonnes Oil Equivalent
MWh	Megawatt Hour
NGO	Non-Governmental Organization
SIE	Superintendent of Electricity
SME	Small-Medium Enterprise
USAID	United States Agency for International Development

I. OVERVIEW

Section 1

Introduction and Strategic Objective

Since 2001, dramatic changes have occurred in the structure and operation of the energy sector in the Dominican Republic (DR), especially the electricity sector. The government has established the National Commission on Energy (CNE) to develop energy sector policy and a regulatory body (Superintendent of Electricity – SIE) to license sector operations and assure transparent and accountable operations in the sector. As part of the sector restructuring, CNE has commissioned a National Energy Balance (DRNEB), which provides a clearer picture of energy usage in the country and serves as the basis for many of the energy savings estimates described in this document.

Currently, the DR relies on imported fuel (29% crude oil, 22% fuel oil, 22% diesel, 12% gasoline and aviation fuel in 2001) to support more than 80% of its domestic energy needs. Of the island's 8.5 million residents, only 65% are legally connected to the electricity grid. A history of poor service and heavy government subsidization has helped inculcate a culture of non-payment and public skepticism of government and utility claims. Electricity theft is a large problem. According to the DRNEB, the DR consumes more than 7.4 MTOE (54.32 million barrels of oil equivalent, MBOE) of energy annually, with 2.05 MTOE (15.05 MBOE) supporting power generation. However, the decline of the peso over the past year, soaring international fuel prices, and inadequate management have all combined to leave the sector crippled with debt and the public suffering extended periods of black-outs.

Despite these problems, no formal energy conservation program has been conducted by the government of the DR since the 1980s. The recent creation of the Energy Efficiency and Renewable Energy Unit within CNE and the dire circumstances of the energy sector now provide an excellent opportunity for the government of the DR to embrace energy efficiency as a means of ameliorating current energy shortages, reducing government debt, and improving economic and environmental conditions. As demand for energy in general and electricity in particular increases in the DR, efficiency measures can encourage major changes in energy use habits that will lessen the occurrence of power outages, improve commercial competitiveness (through reduced energy costs) and promote energy access in previously unserved or underserved markets.

In collaboration with CNE, USAID has supported a brief assessment of energy savings potential from demand-side management (DSM) measures in the DR. Following two initial fact-finding visits in November 2003, USAID supported a workshop in Santo Domingo hosted by CNE in February 2004. The workshop provided information on international experience in energy efficiency; legal, institutional, and financial aspects of energy efficiency programs; and specific case studies of lighting programs, standards and labeling programs, efficient product purchasing initiatives and water utility efficiency programs. Valuable contributions from the attendees informed the preparation of this strategy.

The strategy has been collaboratively formulated with a view to facilitating energy savings throughout society, improving efficiency and economic benefits of energy use, protecting the environment, guaranteeing national economic and social development, and improving peoples' livelihoods. Specifically, this strategy aims to:

- Encourage the development, commercialization, promotion and use of sustainable energy technology and practices;
- Contribute to the reduction of blackouts and rolling brownouts now regularly experienced throughout the system;
- Reduce fuel imports, thereby easing government debt, reducing inter-company arrears within the electricity sector, and helping stabilize electricity prices and service;
- Assist government, citizens, business and industry to save money through energy savings; and
- Reduce the levels of greenhouse gas emissions and other pollutants generated by the production and use of energy.

USAID consultants interviewed government officials to identify priority sectors and examined the DR's Energy Balance for 2001 as well as a preliminary assessment of energy efficiency opportunities prepared by the Spanish consulting firm Enerbus to identify energy consumption patterns and opportunities for energy savings in the DR. A brief summary of key energy use by key sectors in the Dominican Republic follows.

2.1 INDUSTRIAL SECTOR

The industrial sector in the Dominican Republic includes sugar mills, other food industry, tobacco processing, textiles and leather, chemicals and plastics, cement and ceramics, "zonas francas" (free economic zone production generally for export), and a number of small, miscellaneous factories. Annually, the sector consumes 7.34 MBOE annually, about 35% in the form of electricity (4,070 GWh/year). Cement and ceramics (27%), other food industries (24%) and zonas francas (24%) are the largest industrial consumers of electricity in the country.

Table 1: Energy Consumption by Industry (KTOE)

	Bagasse	Biomass	Elec	LPG	Aviation Oil	Diesel	Fuel oil	Coal	TOTAL
Sugar mills	265	0	7	0	0	19	0	0	291
Other food industry	0	13	84	14	1	17	49	0	177
Tobacco	0	0	1	0	0	0	1	0	2
Textiles and leather	0	0	11	0	0	1	14	0	25
Chemicals and plastics	0	0	39	0	0	20	2	0	61
Cement and ceramics	0	0	92	4	0	12	75	72	255
Other	0	0	31	5	0	4	21	0	60
Free zones	0	0	82	5	0	44	3	0	133
TOTAL	265	13	346	27	1	116	164	72	1,004

Source: IDEE/FB-CNE: Informe sobre Balances, 2001, page 88

Based on international experiences, a number of efficiency opportunities exist for the industrial sector in Dominican Republic. Simply introducing best practices and improving energy management could result in energy savings of 5-10% (up to 0.73 MBOE or US\$22 million, at US\$30/barrel of oil, or US\$36.5 million at US\$50/barrel of oil). Specific recommendations for initiatives to improve energy efficiency in industry may be found on page 21.

2.2 RESIDENTIAL SECTOR

There are approximately 8.5 million people living in the DR. On average, each household has 4.2 persons, resulting in approximately 2.0 million households. 1.3 million of these households are formally connected to the power grid (with meters), 0.5 million have informal connections (no meters), and some 685,000 people lack electricity completely.

According to the DRNEB, the energy consumption of Dominican households is close to 9 MBOE per year (*see* Table 2 below). Over 20% of this amount is consumed by urban households as electricity (3,652 GWh). Half of the energy supplied to the urban households is used for cooking, while 26% is used for cooling, 7% for refrigeration and 6% for lighting.¹ The high price of electricity makes energy efficiency a good investment for households that pay their electricity bills. For instance, replacing/upgrading 1 million refrigerators could save at least 300 GWh (with a value of at least US\$36 million).² Approximately 200,000 households could save up to 200 GWh (with a value of at least US\$24 million) in air conditioning costs by using smarter envelopes (insulation, windows and shading) and high-efficiency units.³

Table 2: Energy Consumption by Source and End Use in the Residential Sector (KTOE)⁴

End-Use	LPG	Kerosene	Fuel wood	Coal	Biomass	Solar	Electricity	Total
Lighting	1	10	-	-	-	-	40	51
Cooking	374	-	429	51	2		2	858
Water heating	14	-	12	3		4	6	40
Food conservation	-	-	-	-	-	-	56	56
HVAC	-	-	-	-	-	-	171	171
Other	-	-	-	-	-	-	57	57
TOTAL	389	10	441	54	2	4	332	1,232

Source: IDEE/FB-CNE: *Informe Sobre Balances, 2001, Page 135*

2.3 COMMERCIAL SECTOR

The energy balance also includes aggregate energy data for buildings, which include commercial buildings, government facilities and the services sector. Consumption in this sector in 2001 was 1.72 MBOE, with hotels representing 43% of this total, while restaurant consumption is approximately 11%.

This sector consumed 2,093 GWh of electricity—75% of its total energy consumption. Diesel (0.3 MBOE) and LPG (0.15 MBOE) are also used.

Table 3: Energy Consumption in the Commercial and Service Sector (KTOE)

	EE	LP Gas	Diesel	Coal	TOTAL
Restaurants	16	15	0	1	33
Hotels	67	14	21	0	101
Other	92	8	0	0	100
TOTAL	175	38	21	1	234

Source: IDEE/FB-CNE: *Informe Sobre Balances, 2001, pages 155-164*

¹ 46% of consumption in high-income households is for HVAC while 70% of consumption in low-income households supports cooking.

² Assuming a 300Kwh/yr reduction per refrigerator

³ 30% of 3 MWh/per household

⁴ 2001 Dominican Republic National Energy Balance

Based on international experience, improving energy management practices could generate energy savings of 5-10% (up to 0.17 MBOE). Specific recommendations for energy savings activities in the commercial sector (especially hotels) may be found on p. 17.

2.4 GOVERNMENT BUILDINGS

According to studies recently conducted by CNE, in conjunction with the National Rural Electric Cooperative Association (NRECA) and supported by USAID, the entire public sector consumes around 53 GWh of energy each month—around 6.5% of total national energy use. Given the scale of government electricity consumption, efficiency gains in public buildings can have a significant impact on the system as a whole. In addition, the government can use its purchasing power to create demand for energy-efficient products and services, helping build markets for such products. These actions not only can have positive impacts on the government’s finances, but they can also set an example for the rest of society and identify the government as a leader in energy efficiency efforts. Recommendations for energy saving activities in the public sector may be found on pages 16-19.

2.5 TRANSPORT

This sector is the largest fuel consumer in the Dominican Republic (15.56 MBOE). Gasoline accounts for 50% of total use (7.56 MBOE), while diesel accounts for approximately 25% (4.04 MBOE). Aviation fuel (19%) and LPG (6%) are the other fuels consumed by the sector.

In the year 2000, there were close to 2 million registered vehicles in the DR. More than half were motorcycles, and close to 25% automobiles. The vehicle stock jumped 7-fold between 1995 and 2000, increasing air pollution and traffic congestion in the nation’s capital, Santo Domingo.

Table 4: Automotive Stock in Use in the Dominican Republic

December 31, 2001

Type of Vehicle	Number	% of Total
Autos and Jeeps	500,404	31.0
Motocycles	824,553	51.1
Buses	2,398	0.1
Mini Buses	5,529	0.3
Micro Buses	7,085	0.4
Vans	19,205	1.2
Trucks	210,378	13.0
Volteo y Maquinaria Pesada	18,863	1.2
Taxis (city)	2,573	0.2
Taxis (inter-city)	6,872	0.4
Tourist Cars	738	0.0
Others	13,944	0.9
Total	1,612,542	100.0

Source: IDEE/FB - CNE: Energy Balance Information, May 2003, p. 217;

The estimation of the active car stock was done after a screening process of the database provided by the DGII to the SIEN project.

The immediate opportunities for energy conservation in the transport sector are numerous but require disciplined if not stringent policies, strong intra-governmental coordination, considerable public participation, and some investments in new vehicle stock and infrastructure. Some measures have already been analyzed and proposed, in a general manner, in a recent study by Generalitat de Catalunya. The long-term measures, including construction of mass transit systems, fuel switching and vehicle retrofits, would require substantial investments. For these reasons, transportation is not covered in the strategy outlined in Section II of this document, beyond some emergency fuel conservation tips (*see* p. 13). However, we list below several possible transport-related efficiency strategies for future consideration by Dominican planners.

- ***More efficient vehicles and/or alternative fuel vehicles*** These goals can be achieved through regulation and/or economic incentives. For example, regulations could mandate minimum fuel efficiency for new vehicles, with a phase-in period for older vehicles. Economic incentives, such as tax breaks for purchasers of more efficient or alternative fuel vehicles, could also be provided.
- ***Promotion of public transportation and improved traffic management*** Mass transit may be one of the most socially cost-effective measures and may help reduce traffic congestion and air pollution problems in urban areas. Dedicated bus lanes, functioning traffic signals, and well-designed feeder bus routes could all help improve traffic flow and reduce travel time, thereby reducing fuel consumption and vehicle emissions.
- ***Awareness and education campaigns*** Simple informational measures to encourage informed purchasing decisions, driving habits and maintenance practices by vehicle owners may help reduce fuel consumption (*see* p. 13).
- ***Best truck and fleet operations*** Best practices could generate savings of up to 10% of energy used in fleets of large vehicles in the Dominican Republic.

The data from the DR's energy balance and our preliminary assessments of key sectors indicate there are numerous opportunities for energy savings in the DR. However, there are also considerable obstacles that must be overcome if energy efficiency opportunities are to be realized. The following chart summarizes the key barriers to implementing energy efficiency activities in the DR. They are grouped into four major categories: government/policy obstacles; lack of capacity; financing constraints; and market barriers. Beside each category of obstacle are specific actions that may remove or mitigate the barriers. These actions are also grouped into three broad categories: public-sector activities, private-sector activities, and capacity building.

These remedy categories present the framework for the energy efficiency strategy outlined in the following pages of this document. The strategy suggests short, medium and long-term activities for each category. The measures proposed under the short-term actions section are low-cost/no-cost and primarily target institutional capacity building and energy efficiency information and outreach; the medium-term activities focus on training and implementation of projects. The long-term activities seek to reinforce elements under the short and medium-term strategies and ensure sustainability of energy efficiency policies and programs by addressing financing and market transformation issues.

The overall approach follows a common international pattern whereby the national government sets forth an agenda for efficiency initiatives that ultimately can be accepted and implemented by government agencies, the private sector, academic and other institutions, and the general population. Government leadership, a clear plan to support an efficiency strategy, and sufficient financial and other support to implement efficiency programs will all be key to integrate energy efficiency into the Dominican economy.

Table 5: Key Energy Efficiency Barriers and Remedies for the Dominican Republic

Energy Efficiency Barriers	Specific Challenges	Remedy (specific actions)
<i>Government Policies to Support Energy Efficiency</i>	<ul style="list-style-type: none"> • Government commitment to energy efficiency has been unclear, reflected in low budget and staffing levels • Government priorities have been focused on solving supply problems and non-payment by end-users • High import tariffs for EE^s equipment • Public procurement guidelines may prevent purchase/use of EE equipment/services 	<p><i>Public Sector Initiatives and Public Outreach</i></p> <ul style="list-style-type: none"> → Incorporate EE into national economic and energy plans → Incorporate EE into sector reform efforts → Incorporate EE criteria into public procurement guidelines → Create tax waivers and/or incentives for EE equipment purchases/investments → Foster the creation of NGO and association advocacy groups
<i>Capacity: Government and Institutions Able to Support Energy Efficiency Initiatives</i>	<ul style="list-style-type: none"> • National government entities (i.e., CNE) tasked with energy efficiency activities are themselves newly established and staff possess little capacity to design, supervise, or implement EE activities • Municipal governments possess even less understanding or ability to implement EE 	<p><i>Capacity Building</i></p> <ul style="list-style-type: none"> → Training → Development and dissemination of targeted EE info and technical guides → Development of energy use and EE project databases → Development and dissemination of EE case

Energy Efficiency Barriers	Specific Challenges	Remedy (specific actions)
	projects. <ul style="list-style-type: none"> • Little information is available to specialists or the public on energy efficiency • University programs are non-existent to support energy efficiency training; they lack curricula and equipment • Government authorities lack credible baseline data on energy use, markets, and EE projects 	studies →Design and promote university curricula →Promote ESCO industry →Create public sector EE programs for public employees (awareness, procurement, etc)
	<ul style="list-style-type: none"> • Little/no public awareness of EE • Public skeptical of government and utility electricity policies • Tradition of non-payment of electricity bills (no incentive to save) 	Public Information/Outreach →Development and dissemination of EE information → Public awareness campaigns → Power sector reforms →Standards and labels for consumer goods
<i>Financing Energy Efficiency</i>	<ul style="list-style-type: none"> • Weak banking sector • Financial sector unaware of efficiency options • High transaction costs for small projects • Poor customer creditworthiness • Lack of affordable term financing, especially for SMEs⁵ • Volatile exchange rate • High capital investment (first) costs • No clear guidelines for accessing public funds. 	Public and Private Sector Initiatives →EE info dissemination/training →Development of tax incentives and/or waivers for EE equipment/investments →Demos/pilots →Creation/utilization of dedicated EE funds and clear instructions on how to access them → Development of credit enhancement for EE projects →Development of ESCO industry
<i>Market/Private Sector Energy Efficiency Initiatives</i>	<ul style="list-style-type: none"> • Little knowledge of energy efficient technologies or strategies • Modern audit equipment not readily available in-country • Little to no reliable, regularized market data to encourage private sector participation • Limited supply of and demand for EE equipment and services • High first costs 	Private Sector Initiatives →Development and dissemination of technical brochures/information →Training →Development and dissemination of EE case studies →Public/industry awareness campaigns →Development of EE databases →Development of ESCO industry →Demos/pilots →Development of EE standards and codes →Market transformation (i.e., bulk purchase)

⁵ Small and medium-sized enterprises

II. STRATEGY FRAMEWORK

Section 4

Stakeholder Roles and Responsibilities

Clear understanding and acceptance of their respective roles and responsibilities will be required of all actors participating in the DR's energy efficiency strategy if it is to succeed. This section lays out the basic roles of key players, specifying institutional responsibilities and detailing the types of support required to implement activities suggested under the strategy.

4.1 NATIONAL GOVERNMENT

The institutional roles of government bodies are important in the design and implementation of energy conservation efforts in the Dominican Republic. It is important that relationships among government bodies be clearly defined and efforts to promote efficiency well coordinated. Moreover, government commitment to the energy efficiency strategy must be serious, long term, and declared publicly. The national government attempted to support efficiency regimes in the early 1980s but programs were not sustained and virtually all the capacity built during that era has disappeared. In order for a viable, sustainable energy efficiency program to take root in the DR, government must commit appropriate financial and human resources as well as policy and market support to make the Dominican Republic an energy-efficient country. This commitment must be such that even with a change in government, national policy continues to support energy efficiency.

- ***Office of the President*** will state publicly its commitment to integrate energy efficiency into the economy and will confirm the authority of CNE to design, develop, implement, and monitor the national energy efficiency program. This authority will give CNE an appropriate budget to support energy efficiency activities, power to facilitate market support for energy efficiency and the ability to hire and train necessary staff. This authority does not mean all energy efficiency activities will be implemented by CNE—in many cases CNE's role will be to facilitate/monitor activities of other institutions and the private sector.
- ***National Commission of Energy (CNE)*** will be the government agency responsible for the design, implementation, and oversight/monitoring of the national energy efficiency program. It will liaise with other government bodies, the private sector, and foreign donors on all energy efficiency matters. Specifically, CNE will maintain an Energy Efficiency Office, staffed and equipped to carry out energy efficiency activities. CNE will be responsible for the initial design and development of the DSM activities outlined in this energy efficiency strategy. Eventually, CNE will identify other energy efficiency efforts in the transportation and power sectors. At a minimum, CNE will facilitate and support programs that promote an energy efficient economy in various sectors. As the primary energy-efficiency coordinating body, CNE will collaborate with various government and private sector players to assure continuity in activities and to optimize resources.

4.2 OTHER GOVERNMENT STAKEHOLDERS

Municipal government leaders will be consulted and encouraged to develop local energy efficiency plans with assistance from CNE. Where possible, CNE will support pilot efficiency activities at the local level.

Utilities (i.e., electricity, water) Participation from power plants, water utilities, distribution companies and related entities will be important to assure that large energy users promote energy-efficiency technologies in their operations, require “best practices” to ensure conservation, and promote energy use that is economically viable.

National test labs/facilities will be identified as the energy efficiency program evolves to support appliance and equipment testing and compliance with efficiency standards.

Parliament members may also be invited to participate in the development of energy efficiency initiatives, and should be kept informed of efficiency gains.

4.3 NON-GOVERNMENT STAKEHOLDERS

General public/consumers must be included in the development and implementation of energy efficiency activities in the Dominican Republic. Consumers need to understand their energy consumption habits and be aware of measures they can utilize to improve energy use and save money. Consumer awareness can lead to increased market demand for efficient equipment and appliances and behavior changes at the individual consumer level can bolster national energy savings. Specific recommendations may be found on p.13.

Private sector representatives will be consulted regularly by CNE and encouraged to develop their own energy efficiency activities. Industry, business, energy service companies, law firms, media, and other private entities should become regular contributors to development of the country’s energy-efficiency regime.

Academic community including technical institutes, university departments and scholars will be encouraged to participate in CNE’s design, development, and implementation of energy efficiency activities. This community should also be enlisted to assist in the development of academic curricula and certification programs that support energy-efficiency initiatives.

Importers and other market players must be included in discussions and plans regarding viability of proposed standards, financing options, etc., to ensure that the emerging efficiency regime is not too burdensome.

Non-government organizations (NGOs), including consumer and environmental organizations, can play a vibrant role in outreach activities as well as in the development of local capacity to implement and monitor energy efficiency projects. Business associations such as chambers of commerce as well as consumer organizations should be consulted and invited to initiate and participate in efficiency programs.

COORDINATING BODY MEMBERS

<p>CNE should chair the body and be represented by the director of the office of energy efficiency and renewable energy and one other official. (2 members)</p>
<p>Ministry of Industry and Commerce (MIC) can help conduct energy efficiency work with industry and is implementing an alternative energy program that should be coordinated with the objectives of this strategy. (1 member)</p>
<p>Ministry of Environment has initiated greenhouse gas reduction activities and industrial best practice guides that could incorporate energy-efficiency actions. These actions should continue and be coordinated with CNE. (1 member)</p>
<p>Ministry of Education will support a student curriculum that encourages energy efficiency, generally transferred via the science curriculum. The ministry will also play an important role in terms of its own facilities management and at schools throughout the country. (1 member)</p>
<p>Private Sector Representatives from such fields as manufacturing; importing and retailing; and engineering, banking and law will be invited to serve on the coordinating body. Chambers of Commerce or industry/professional association representatives could participate on behalf of their members. (2 members).</p>
<p>NGO Representative from a consumer protection or energy/environmental group will be invited to participate on behalf of the public. (1 member)</p>
<p>Academic Community will provide representatives that are familiar with efficiency and can assist in developing technical standards and curricula. (1 member)</p>

4.4 COORDINATING STAKEHOLDER PARTICIPATION

In order to advance this strategy and implement a national energy efficiency plan, CNE should establish and operate a coordinating body that reviews the present strategy and helps in the preparation and implementation of more specific actions. Led by CNE and comprised of key public and private sector representatives, the body should meet on a quarterly basis under the auspices of CNE. CNE should create guidelines for the selection and rotation of coordination members. Possible participants in the coordinating body are included in the table above.

III. RECOMMENDATIONS

The rest of this strategy suggests a staged approach to development of the DR's energy efficiency plan. The strategy is divided into short, medium and long-term activities designed to reinforce each other and build capacity within CNE and other actors in the DR. Within each section, activities are divided into three categories: institutional/capacity building, public sector support activities, and private sector support activities.

Institutional/capacity building encompasses activities specifically designed to improve the ability of CNE and other key institutions to carry out energy efficiency activities. The public and private sector support categories include activities designed to benefit entities within these sectors, even though the implementer of the activities might come from a different sector. In other words, the recipients of the energy efficiency services in the private-sector support category will be businesses, even though CNE or some other public body might provide the assistance. Public-sector support activities target the general public and government-owned properties or businesses, even though a private company might provide the services. Many of the activities cited for public and private-sector support involve pilot projects or program interventions, while the capacity building exercises focus on training and data collection.

Section 5 Short-Term Energy Efficiency Activities (1-18 Months)

5.1 INSTITUTIONAL/CAPACITY BUILDING

5.1.1 CNE Capacity Building

During the first three months of this strategy, CNE will emphasize building its own staff capacity and collecting relevant data. CNE must have an appropriate budget and the ability to hire and train appropriate staff to support its role as the primary energy-efficiency policy maker in the DR. In addition, as designer and monitor of the country's energy-efficiency agenda, CNE must support and facilitate market development toward efficiency. Specifically:

- CNE will assist in the start-up and development of the Energy Efficiency Coordinating Body (EECB, described on p. 11), commencing with an initial “kick-off” meeting during which priority areas will be determined. A national energy-efficiency “work plan,” informed by this strategy, will be drafted for implementation by CNE and other identified partners. The EECB will meet quarterly and review plan implementation. The work plan will be modified as necessary.
- CNE will seek regional and international assistance on energy-efficiency planning, project implementation, financing, and monitoring (*see* Appendix 2). Incorporating this assistance, CNE will prepare a realistic internal work plan, taking into account staff capability, based on internal priorities and those determined by the Coordinating Body. CNE will include on its web site information on its energy efficiency staff and work.
- CNE should organize several workshops and training courses for its own staff during this first stage. The workshops should feature training provided by in-house experts

as well as from other organizations (including international ones). Training will focus on activities already identified as energy-efficiency opportunities for the Dominican Republic. Eventually, CNE should organize workshops by sector as well as by end use, in collaboration with technology and finance providers.

- CNE will identify one or more institutes/departments where energy audit training (industrial, commercial, residential) can be given. Similarly, CNE will identify audit equipment needs and sources for obtaining the required goods. Energy audits, assigned by CNE to different qualified institutions, will form an important component of future energy efficiency work under this strategy.

5.1.2 Energy Efficiency Market Priority Assessment

Within the first 6 months of CNE's program, staff will conduct market assessments building on information collected during various energy planning and energy balance exercises in 2002-2003. Based on existing energy balance information, initial sectors to assess will include: residential (lighting and refrigeration); hotels; cement and food industries (and possibly free trade zones); and government buildings. Donor assistance may be requested to assist this effort. Focus will be given not only to current and projected sector energy consumption, but also the location profile of energy usage. This information will provide a critical baseline starting point from which CNE can identify priority programs and monitor energy savings. Quantifiable energy savings can then be translated into cost savings with which officials and consumers can measure the cost effectiveness of energy efficiency measures. Ideally, an ongoing monitoring point at CNE will be established to house an energy efficiency market database in order to build on this baseline and improve the quality of its data.

Areas to assess will include:

- Equipment/appliances/products available in key markets (i.e., three primary cities), as well as the energy use and cost of these products.
- Assessment of the second-hand appliance and equipment market in the same markets.
- Standard products currently used by various consumers (i.e., lamps/bulbs, refrigerators, air conditioners, water heaters).
- Any import, market or other barriers for efficient products.

5.2 PUBLIC SECTOR SUPPORT

5.2.1 Public Information/Outreach Campaign

Blackouts currently plaguing the energy sector in the DR and anticipated increases in both electricity and fuel prices are putting the Dominican government and public under great pressure. CNE can engage in low-cost public awareness building exercises for government, commercial, industrial and residential energy users that should help reduce energy demand immediately. The approach will require CNE to work with other ministries, the private sector and non-government organizations to prepare information materials, and to work with media on an immediate and regular basis to promote awareness of energy efficiency actions. CNE should conduct interviews/hold press conferences for newspapers and trade journals, as well as television and

radio stations. If funding allows, public service announcements can be created for television and posters can be displayed throughout major metropolitan areas.

A public information campaign could be particularly useful as a first step for the new government of President Fernandez. Such a campaign could help ease tight fuel supplies, demonstrate the government's commitment to solving the energy crisis and stimulate positive behavior by the public. A public information campaign would also enable CNE to position itself as the leader on energy efficiency activities in the public's eye. CNE should appoint a public information officer with responsibility for energy efficiency to coordinate the campaign.

The public information campaign should provide simple energy savings tips that are easy for the public to understand and act on. Possible tips for inclusion in the campaign, focusing on driving and residential energy and water use, follow.

Residential Energy and Water Use

- Replace incandescent bulbs with compact fluorescent lamps.
- When not in use, turn off lights, TVs, stereos, computers and other electronic equipment. Activate "sleep" features on computers and office equipment when not actively using them.
- Clean refrigerator coils to reduce energy bills and improve the life of the refrigerator.
- Reduce air conditioning (AC) usage and related energy bills by cleaning or changing filters regularly.
- Where possible, plant leafy trees and vines around the house, and/or by the window. Install reflective tiles on the roof, and/or install window treatments. Blinds or shades inside and trellises or awnings outside can reduce heat and need for air conditioning.
- Do full loads when washing clothes and dishes so as to use water and energy most efficiently.
- To reduce water usage, use a low flow showerhead—it saves up to five gallons a minute. Take showers instead of baths and take shorter showers instead of long ones.
- Fix dripping, leaky faucets and toilets around the house. A leaky toilet can waste up to 52,800 gallons a year. Replace old faucet aerators. Newer models use less water and provide more water pressure. Consider water-saving faucet attachments and check for leaks in pipes, hoses, and couplings.
- Turn off the water when brushing teeth and save four gallons a minute. A family of four can save 200 gallons a week. Turn off the water when shaving/shampooing. Rather than letting the water run, soak pots and pans while scraping them clean.
- Don't let water go down the drain when there may be another use for it. Collect rainwater, water used to wash off fruits and vegetables, and perhaps water from cleaning a fish tank, and reuse it to water plants. Connect gutter downspouts to rain-barrels or direct them to trees or plants.

Vehicles

Maintenance

- Keep tires properly inflated. Properly inflated tires are safer, last longer, and can improve gas mileage by more than 3%.
- Use the recommended grade of motor oil. Gas mileage can improve 1-2% by using the manufacturer's recommended grade of motor oil.⁶
- Keep engines properly tuned. Fixing a car that is noticeably out of tune can improve its gas mileage by about 4%.⁷
- Check and replace air filters regularly. Replacing a clogged or dirty air filter can improve the car's gas mileage by as much as 10%, and keeps impurities from damaging the inside of the engine.
- Plan ahead for the most gas-saving itinerary. Several short trips taken from a cold start can use twice as much fuel as a longer, multi-stop trip of the same distance with a warm engine.

Driving Habits

- Fast driving uses more fuel - don't speed!
- Aggressive driving wastes gas and can lower gas mileage by 33% at highway speeds and 5% in town. Stop jackrabbit starts in favor of slow acceleration from a dead stop.
- Avoid excessive idling.
- Use overdrive gears to lower engine speed, save gas, and reduce engine wear.

Vehicle Use

- Stagger work hours to avoid peak rush hours. This results in less time sitting in traffic, less fuel consumption, and less stress.
- Promote carpools and public transportation.
- Avoid carrying items on the vehicle's roof. A loaded roof rack or carrier increases aerodynamic drag, which can cut mileage by 5%. Place items inside the trunk whenever possible to improve fuel economy.
- Travel light. Avoid carrying unneeded items, especially heavy ones. An extra 100 pounds in the trunk cuts a typical car's fuel economy 1-2%.

6 Where possible, select motor oil with "Energy Conserving" on the API performance symbol. It contains friction-reducing additives.

7 Estimates indicate that replacing a faulty oxygen sensor can improve gas mileage up to 40%.

Aside from the public information campaign, CNE should conduct other outreach activities as well. These include the following:⁸

5.2.2 Municipal Government Roundtable on Energy Efficiency

CNE will conduct 1-2 municipal government roundtables during the first 18 months of energy efficiency workplan implementation. Local government leaders will learn of comparable international experience and receive ideas on efficiency in local water supply, street lighting and other areas. CNE will work with municipalities to help them assess their existing systems and train municipal energy efficiency managers.

5.2.3 Residential Sector

CNE will prepare basic energy efficiency “home savings” information for wide distribution throughout the country, based on the emergency public information campaign and review of earlier prepared materials by the Ministry of Industry and Commerce. Emphasis on the importance of paying for electricity and the consequences of not – i.e., more and longer blackouts, increased government deficits, etc, should be included in the messages.

5.2.4 Government Buildings Efficiency Pilot

Government facilities constitute the largest consumer of electricity in the country. Following up on the joint NRECA-CNE representative audits conducted with USAID support, CNE will identify two or three excellent candidates for thorough retrofit projects. The NRECA audits should be complete by January 2005.

Project buildings should be selected based upon savings potential, public prominence, and the perceived potential for CNE/NRECA to measure and then publicize the results. The projects should be conducted with close oversight, to assure maximum gains are achieved. The goal will be to demonstrate the worth of energy efficiency upgrades and build consensus toward expanding energy efficiency projects, while also demonstrating the national government’s leadership in promoting energy efficiency.

There are two main areas where most of the energy efficiency opportunities will be located: air conditioning systems and lighting.

- **Lighting:** cursory audits of two buildings, along with informal interviews conducted with CNE, MIC, and NRECA staff indicate that T12 lamps and magnetic ballasts still greatly predominate in national government buildings; savings of up to 30% could be achieved by swapping these materials with more energy efficient technologies already available in the Dominican market.
- **HVAC:** These systems may have large future savings potential, depending upon the technology being used. Split systems, both ducted and ductless, predominate in the DR, even in high-rise buildings. Chilled water systems, which are generally 50% more efficient, seem to be a rarity. Though conversion of existing high-rises may not

8 Free Economic Zones and Government Procurement are not yet included in this plan; incorporating these will require more information on energy use and existing procedures for procurement.

be feasible, developers of new buildings should consider chillers rather than split-duct air conditioning systems.

5.3 PRIVATE SECTOR SUPPORT ACTIVITIES

5.3.1 Hotel Sector

The DR is the primary tourist destination in the Caribbean and tourism is a critical sector for the Dominican economy. Hotels represent 43% of total energy use in the commercial and service sector in the Dominican Republic and energy represents the second highest cost in hotel operation. There are approximately 55,000 hotel rooms in the country; 61% of these are in hotels with more than 300 rooms. 83.4 % of electricity for hotels in the country is provided by the grid; it is estimated that large hotels produce close to 20% of the electricity they consume. Surveys indicate that this energy generation absorbs 11.5% of the net income of hotels.

CNE will work with SEMARENA, the various established hotel associations, and chambers of commerce to introduce “best practices” in energy management and use, including fuel switching for water heating (i.e., diesel to solar) and power self-supply systems (e.g., diesel to natural gas). CNE will explore with hotel managers their current approaches to efficiency and identify areas for audits and/or their need for in-house or consultant energy efficiency managers. Key hotel association groups for this effort include The Bayahibe-La Romana Association, given its Green Globe certification program and the Punta Cana Group, which completed an environmental audit in February 2004. Furthermore, SEMARENA is drafting an environmental best practices manual, which could benefit from more detailed description of hotel energy conservation measures. CNE should meet periodically with SEMARENA staff to review this guide and to try to set energy benchmarks for the growing hotel sector.

5.3.2 Electric Utilities

CNE should work directly with the utilities to share information and develop on-site programs for increased efficiency. Although this strategy emphasizes demand-side, rather than supply-side management, there are some areas to be explored with utilities that may offer immediate efficiency gains for the country. These include:

- Load management programs at the utilities.
- Partnerships with large users to provide incentives for energy use off-peak (i.e., cash rebates, preferential tariffs, discounts, guaranteed power supply).
- Encouraging utilities to become efficiency providers themselves, e.g., disseminating information in electricity bills, providing energy audits at low/no cost, building community awareness, etc. Such programs represent “least-cost planning” strategies that would help the utilities meet their demand with less expense. This approach is often referred to as “integrated resource planning”.

During the mid-term phase of implementation of the energy efficiency strategy, the Energy Efficiency Coordinating Body (EECB) will continue to meet on a quarterly basis; from these meetings it is anticipated that enhanced capacity and understanding of energy efficiency will build interest and support in the market to implement this strategy. CNE's staff capacity should be considerably enhanced during this phase, and key consultants (local and possibly international) identified to continue to support implementation of the strategy. CNE should also seek to identify or develop funding sources for energy efficiency initiatives in order to make the strategy viable over the long term.

6.1 INSTITUTIONAL/CAPACITY BUILDING

6.1.1 CNE Capacity Building

CNE will continue to build its own staff capacity through a variety of training measures and site-visits for staff to observe best practices in industry, business and other sectors. CNE staff should establish contact with international energy efficiency experts via newsletters, conferences, etc, in order to obtain the most up-to-date information on best practices and to share lessons learned.

6.1.2 Young Energy Professionals Programs

Early to midway through this phase, CNE will embark on establishing collaborations with relevant university and graduate training programs to establish a young energy professionals program. CNE and other efficiency experts can provide opportunities such as student internships for engineering, law and journalism students to receive information on efficiency (technical, financial, and social aspects) as part of their training. This program may be designed as a prestigious measure for young professionals to enter the efficiency market while learning and obtaining class credit. A number of international programs exist that can be adapted for the Dominican Republic.

6.1.3 Commercial Energy Efficiency Service Providers Training/Support Program

CNE (or its consultant) will identify and determine the potential for commercial energy efficiency service providers within relevant sectors in the Dominican Republic. The outcomes of the short-term activities will dictate when CNE should initiate this work (earlier or later in the program) and in which sectors. An initial market survey would be required to assess the views and capabilities of industry, commercial and municipal managers to understand opportunities for commercial service providers to identify, develop, implement and maintain energy efficiency projects, as well as existing barriers to their development. Such service providers may include energy service companies, (ESCOs), energy audit/engineering companies, energy efficiency equipment suppliers and leasing companies.

Based upon the results of the market survey, CNE should consider supporting the energy efficiency industry. Possible types of support include utilizing commercial energy efficiency companies to conduct audits or demonstration projects in the private or public sector; providing education materials on commercial service companies; and providing training on energy

performance contracts to potential ESCOs, banks and customers. “Lessons learned” from international experiences with such business models will be essential, notably in terms of creating a sustainable private-sector support system for these companies. CNE will also work with existing utilities to determine viable business opportunities to hive off existing activities and house them in an ESCO run by the utility. Finally, CNE will begin to identify and assess potential sources of finance—government, donor, commercial bank—for the commercial energy efficiency industry.

6.2 PUBLIC SECTOR SUPPORT ACTIVITIES

6.2.1 Training for Other Government Agencies

CNE, with its own staff or through hired consultants, will assess training needs and provide information materials and training to representatives of government ministries on energy efficiency approaches, the government’s efficiency strategy, and how to monitor energy savings. Such training will provide an opportunity to propose infrastructure/equipment improvements. CNE will encourage these entities to appoint their own energy officers to manage internal energy efficiency activities (with support from CNE).

6.2.2 Public Information/Outreach Campaign

CNE will provide pilot training for 10 journalists (ideally those already covering the energy sector) to enhance their knowledge of energy efficiency. The role of energy efficiency in reducing blackouts and decreasing government deficits should be included in this training. Ideally, CNE will establish contacts with local radio/television and print media allowing for regular dissemination of “success stories” as well as informational interviews on how segments of the market, including individuals, can contribute to energy savings. CNE could also commence a national consultative process/dialogue by sponsoring local forums on energy efficiency targeted at the commercial and residential sectors.

6.2.3 Energy Efficiency Awards Program

Toward the latter half of this phase of work, CNE should consider developing a national energy efficiency awards program. Such a program would be supported by the President and/or head of CNE. The goal will be to provide incentives and publicity for energy-efficiency advocates and actors in the industrial, commercial, and residential sectors--and possibly even school children--by honoring their initiatives in energy efficiency.

6.2.4 Municipal Governments

CNE will work with municipalities to help them assess their existing systems and train municipal energy efficiency managers. Ideally, a network of municipal government and private-sector leaders will emerge to champion efficiency at the local level. Some pilot municipality programs may be identified based on the roundtables conducted during Phase I.

6.2.5 Water Sector

The Dominican Republic faces critical problems in its water sector. Some challenges include low levels of wastewater coverage (CAASD 21%), high rates of unaccounted for water loss (approximately 50% INAPA, CAASD), low coverage of macro and micro measurement, and incomplete water service coverage of local populations. In addition, the Dominican Republic

faces potential water shortages. In 2000 the amount of water available per person per year was 2,472 m³. Given that the world average is 7045 m³/ person/year, the DR has one of the lowest levels of water supply in the world, and these supplies can be expected to be strained further by the country's extremely ambitious tourism development plans.

On an annual basis, the water and wastewater sector consumes 207.7 GWh of energy, equivalent to 2.2% of national electricity consumption. However, this figure does not factor in the energy use of approximately 100,000 private re-pumping stations in residential, commercial and industrial areas to pump non-pressurized water in the system. Local groups estimate this energy demand is equal to 500 MW.

To help ensure that Dominican water resources are used efficiently, CNE can identify 1-2 key water cooperatives on which to perform energy audits that would identify low and no-cost activities that could be quickly implemented. Interviews with local water sector institutions (INAPA, CAASD) indicate that few energy audits and maintenance programs for pumping systems exist and a preliminary estimate of the energy index for water utilities (0.168 kWh/m³) indicates there is large potential for efficiency improvements. As a general rule, savings of at least 15-20% of annual energy costs savings in the water sector can be achieved, based on audit results from municipal water organizations around the world. This potential could be larger (30% or more) with water recovery programs linked to the energy audits.

CNE can also explore the international Alliance to Save Energy program "Watergy," which links energy and water efficiency aspects and can provide direct assistance to a few key water cooperatives and initiate a leak reduction program. USAID has already funded a preliminary ASE evaluation of the DR for a Watergy program; the results will be submitted directly to relevant parties.

CNE should also propose the creation of a water and energy subcommittee within the Ministry of Environment's (SEMARENA) Water Work Commission (Comisiones de Trabajo), which already meets periodically with all key players in the water sector. This subcommittee can explore options for improving energy efficiency in the water sector. Furthermore, the subcommittee can coordinate national summits targeting policy makers and water cooperative managers, as well as coordinate efforts with development banks (e.g. IDB), ESCOs, and other financial institutions to develop funding mechanisms.

6.2.6 Lighting

The high price of electricity should make energy efficiency a good investment for many households in the Dominican Republic. For instance, the pay-back period for replacing incandescent bulbs with efficient lighting (compact fluorescent lamps) should be less than 6 months for lamps used for more than two hours a day. These conditions present a good opportunity to implement a large-scale energy-efficient lighting program. Replacing an average of two bulbs in each of the more than 2 million households in the DR could save up to 130 GWh per year (with a value of at least US\$15 million).⁹ As almost all of the electricity generated in

⁹ Based on replacing two 60 watt incandescent bulbs with two 15 watt CFLs and assuming the lamps are used 4 hrs/day at 0.12 \$US/kWh.

the DR comes from imported fossil fuels, the energy savings would result in reducing fuel use by more than 150,000 barrels of oil.

A successful lighting program would take CNE 1-2 years to prepare. The first step would be to examine both the technology available locally and in the world market. The second step would involve conducting a household survey that clarifies, with the greatest precision possible, consumer attitudes and behaviors, in order to determine a realistic size and the scope of the program. The third step would involve determining technical standards to ensure the quality of the products (cursory research indicates that CFLs are available in the DR at around US\$2/bulb, but their quality is suspect). Once the size of the potential market is defined, analysts must examine the costs and benefits to consumers, distribution companies and the country to define the size of the program, the ranking and differentiation of delivery mechanisms, and the amount of money realistically required in order to finance the program and its expected results. If economic and financial analysis is positive, resources to finance the program must be obtained. The Global Environmental Facility (GEF) might represent a good source of funds, although it is unlikely to provide all of the resources required. More details on a residential lighting program (based on a similar exercise conducted in Mexico) may be found in Appendix 3.

6.3 PRIVATE SECTOR SUPPORT ACTIVITIES

6.3.1 Industry Best Practices and Benchmarking

During this phase, the strategy should increase emphasis on energy conservation management and sophisticated “best practices” in industry based on the findings of the market assessments conducted during Phase I. CNE can “hand hold” selected industries by helping them conduct audits and identify technologies, operations, and funding to support efficiency improvements. CNE should also investigate the feasibility of establishing industry benchmarks to improve energy efficiency. The approach could be mandatory (perhaps for industries that receive government support) or voluntary (perhaps implemented through a trade association). Benchmarks set standards for energy use and performance within a certain sector and/or for certain activities, and enable companies to compare their performance to others in their sector. In a mandatory system in which the government stipulates the standards, it must monitor company performance and punish sectors or companies that do not comply. Voluntary benchmarks do not require such rigorous monitoring or enforcement, but will require some training to implement.

6.3.2 Shopping Mall Audits

CNE, using its own staff or outside consultants, will conduct energy audits of 2-5 malls in Santo Domingo and/or Santiago. In collaboration with mall management and relevant industry representatives, CNE will lead discussions of energy efficiency management, best practices, and options for improvements, perhaps via a “Mall Roundtable.” The “Green Malls” program implemented in Asia may serve as a model for mall managers in the DR. Depending on the outcome of the initial findings, an energy efficiency program for malls may emerge.

6.3.3 Cogeneration

Given the large self-supplied electricity capacity in Dominican hotels and industry (*see* Table 6 below), an analysis of the potential for cogeneration as a means of decreasing fuel consumption should be performed no later than mid-way through this phase. Cogeneration could be used to

produce refrigeration and air-cooling through the use of absorption systems (especially in large hotels), or for steam production and/or water heating. At least 10% of the fuel used for power self-supply likely could be saved by converting the systems to cogeneration.

Table 6: Industrial Self-Supply of Electricity in the DR

Subsector	Installed capacity (MW)	Generation (GWh)	Self generation as % of Electricity Use (%)
Sugar mills	27.1	76.4	97.5
Food industry	445.2	429.3	43.8
Tobacco	6.6	2.3	15.1
Textiles and leather	133.9	76.9	61.2
Paper and print	81.7	27.2	18.0
Chemicals and plastics	37.4	217.0	47.8
Cement and ceramics	97.3	516.7	48.3
Other industry	251.1	114.56	56.7
Free zones	576.4	114.4	12.1
TOTAL	1,656.7	1,574.8	39.1

Source: IDEE/FB-CNE: Energy Balance Information, 2001, page 200-201.

6.3.4 Energy Efficiency Funding

By years 2-3 of this program, an established mechanism (s) for funding energy efficiency projects will have to be developed and functioning in order to support CNE's strategy. Such funds would be used to support government-sponsored programs, including costs for program development, marketing and monitoring, demonstrations, subsidies/incentives, start-up capital for financing programs, etc. All sources of funding should be explored, including budgetary support, donor funds, the MIC's fuel surcharge fund, other energy user taxes (e.g., electricity), etc. During this phase, a series of roundtables on energy efficiency funding should be conducted with government, donors and private sector stakeholders on funding needs and likely sources. Discussions with commercial banks and other market players will also be important to assess leverage opportunities. "Lessons learned" from other transitioning economies will also be important.

The long-term activities seek to reinforce activities begun during the short- and medium- term phases of the strategy; activities begun during those phases may well continue into the long term and are not listed again here. The overall goal of the long-term phase will be to assure sustainability of the DR's overall approach to energy efficiency, and ensure that efficiency goals are integrated into overall economic development goals.

7.1 INSTITUTIONAL/CAPACITY BUILDING

7.1.1 CNE Capacity

Based on earlier activities, energy efficiency measures should begin to be integrated into market development in the Dominican Republic. Reassessment of the program by CNE and the Coordinating Body should occur early in this stage to determine the total energy savings to date, as well as to identify and address any problems or gaps in the strategy. The reassessment should include:

- Actual measurable results from past CNE-sponsored efforts and their relative costs
- Review of the energy efficiency database to determine what data is still missing
- Assessment of the past effectiveness and continued value of the Energy Efficiency Coordinating Body
- Feedback from industry/business on CNE programs and remaining barriers to energy efficiency
- Estimation of costs and benefits of increased replacement/refurbishment of equipment/appliances
- Review and clarification of roles of government institutions
- Impact of public information campaigns and assessment of media coverage of energy efficiency issues
- Contribution of efficiency contributions to black-out reduction
- Financial support for energy efficiency activities

CNE will report the findings of the assessment to the President and public for review and comment.

7.2 PUBLIC SECTOR SUPPORT ACTIVITIES

7.2.1 Energy Efficiency Law

As CNE and the Coordinating Body analyze the successes and shortcomings of energy efficiency implementation, they should consider whether there might be some need or advantage to drafting an Energy Conservation Law. In some cases such a tool is necessary to ensure government entities have the authority to enact and enforce energy efficiency standards and mandates (e.g.,

Thailand, India), though many countries successfully operate energy efficiency programs without national energy conservation laws.

7.2.2 Standards and Labels

By this time, institutional capacity and national awareness on efficiency should be increasing sufficiently to consider the use of equipment and appliance standards and labels. The process for designing and securing standards as well as assuring that labels are effective is complicated and requires sophisticated staff capacity, testing facilities, government commitment, public understanding and buy-in, and effective enforcement. CNE will explore whether resources are available to support the various long-term elements required to make this type of program work. Based on additional information, it may be useful to begin to establish or adapt existing standards and labeling systems/practices (from the US, Mexico, or other key trading partners), notably for residential appliances such as air conditioners, refrigerators and generators. CNE will work with local academic institutions and the MIC to determine areas where this approach can be implemented to yield practical results. Particular focus will be given to the difficulty posed by the numerous product sources (Asia, Europe, North America, etc.) and the implications of inconsistent test methods and labels for products from these diverse origins. This activity has the potential for great savings, but only after years of sustained effort to adopt test methods, develop the regulatory support infrastructure, design the labels, etc.

7.2.3 Building Standards/Codes

The development and refinement of guidelines for construction and maintenance of residential housing, government buildings, hotels, office buildings, factories and industrial facilities can provide clear, long-term policy that encourages efficiency. Buildings in the DR should begin to comply with international standards for efficiency in comparable climates, and an enforcement entity must ensure that developers comply with the codes. CNE should explore the costs of developing and administering such codes and weigh them against their expected energy savings potential and other benefits. Such analysis should consider the availability of improved construction materials, building envelope measures, office equipment and appliances and local expertise in improved building design and construction. Training/education will have to be provided to architects, engineers, and construction firms as well as government agencies tasked with administering and enforcing such measures.

7.2.4 Energy Efficiency Education

In collaboration with the Ministry of Education and universities, CNE will work to develop energy efficiency curricula for students throughout the country. Initial emphasis will include: (a) development of a university-level engineering efficiency curriculum that includes demand-side management approaches to efficiency, audit training, and analysis of efficiency cost-savings; and (b) a youth program that addresses grades 1-12 with activities to encourage student interest and engagement in efficiency. A variety of international programs can be modeled to meet the specific student needs of the Dominican Republic (samples can be provided by foreign donors and NGOs). Teacher training must be part of this curriculum development and ideally will be conducted before the school semester commences.

7.3 PRIVATE SECTOR SUPPORT ACTIVITIES

7.3.1 Energy Efficiency Service Companies

CNE will support the development of a commercial energy efficiency service industry by providing appropriate technical assistance and training to all relevant market actors, including customers, ESCOs, and financiers. To bolster market demand for their services, CNE could directly engage service companies to conduct audit and pilot project programs in public buildings. Toward the end of the strategy period, some private-sector ESCOs should be operating and performing services that promote energy efficiency. CNE will assess its own efforts and the activities of ESCOs to date to determine the need to further develop the market and appropriate actions to do so. CNE will also examine various methods of quality control to ensure that ESCOs perform adequately.

7.3.2 Energy Efficiency Financing Mechanism(s)

CNE will explore with key stakeholders a variety of ways to finance and/or provide incentives that promote and support energy efficiency activities and projects. These may include:

- **Public financing programs** Because commercial banks typically are cautious about financing energy efficiency projects, some government financial support may be justified to kick start energy efficiency projects and financing programs. Public support should seek specifically to overcome key identified market barriers, such as the unfamiliarity of banks with the technical issues associated with efficiency projects, lack of efficiency project performance data, unfamiliarity with how ESCOs operate and/or project risk profiles, high transaction costs due to the relatively small sizes of most energy efficiency projects, high upfront project development costs, etc (*see table on p.8*). Financing instruments could include revolving funds (borrowers would repay the fund directly, thus replenishing its coffers and permitting the fund to lend for other efficiency projects), credit schemes, and/or loan guarantee programs as well as some parallel non-debt facilities such as equity funds, audit support grants and project investment grants/incentives. Such facilities should be established based on specific predefined criteria for performance and monitoring and every effort should be made to address unserved markets and not compete with private financing sources. Interest rates and other terms should be established to provide incentives for participation without creating market distortions or moral hazard. Indicators should also be used to determine when a given facility has fulfilled its objectives and should be discontinued.
- **Tax incentives** In many countries, initial impetus to improve efficiency is provided by granting tax benefits to consumers and suppliers of energy efficiency products. Utilizing tax incentives requires considerable coordination with tax authorities as well as a clear understanding of market demand (in order to gauge the effect of the tax breaks on the country's finances). It would also require a clear understanding by taxpayers of the rules for such incentives and adequate protection against possible abuse. Another related approach provides ESCOs and producers of efficient products full or partial tax breaks for a specific number of years (i.e., 5 years).
- **Reduced import duties** An alternate approach to tax incentives is to reduce import tariffs on energy efficiency products paid for by import companies and their

customers. Such an approach would seek to remove penalties for using more efficient equipment and create a more level playing field with other products. This tactic is most successful in supporting small items but generally faces challenge where big-ticket products are involved.

- ***Equipment and appliance trade in/rebate options*** An effective approach to encourage consumers to purchase energy-efficient equipment and appliances, even before their existing ones have worn out, is to offer them discounts when purchasing more efficient products and/or to invite consumers to trade in their old, inefficient products for more efficient ones at a lower cost. In order for this approach to work, an assessment of equipment and appliances currently available in the market is required, as well as agreement with sellers of these products to support energy-efficiency initiatives that encourage consumers to buy more efficient products. This approach can also better ensure that old appliances are discarded safely, which can be an issue when environmentally sensitive materials are involved (such as mercury in lighting materials or CFC-based coolants often found in refrigerators and air conditioners).
- ***Establishment of efficiency lending at banks*** The most sustainable approach to financing energy efficiency has proven to be enticing the appropriate departments at established banks to support efficiency lending. In several countries, banks that have commenced small business lending have begun to include energy efficiency small businesses. In some countries, agriculture, transport and industry are treated as distinct market segments where efficiency projects can be supported by the relevant bank departments. Such efforts should be explored early on to ensure that any prospective government intervention does not conflict with the evolution of such business and, in fact, promotes such development.

Energy Audit – an analysis of a customer’s energy consumption, based on use profiles, key appliances and equipment, billing information, etc., coupled with recommendations on measures that could be taken to reduce overall consumption. Audits can be conducted to varying degrees of depth and specificity, ranging from preliminary to in-depth, investment-grade audits, and can focus on an entire facility or one or more systems/end-uses.

- **Energy Auditee** – a legal entity, enterprise or business owner that receives energy auditing services (i.e., factory, hotel, hospital, government building, school);
- **Energy Auditing Individual** – an individual business owner providing energy auditing services (i.e., electrical engineer, mechanical engineer);
- **Energy Auditing Organization** – a legal entity providing energy auditing services (i.e., engineering consulting firm).

Energy Conservation – refers to the reduction of losses in various stages from energy production to energy consumption, as well as using energy more efficiently through rational pricing, technical and management practices. Energy conservation is a long-term strategy for national economic development that includes adopting measures that are technologically feasible, economically sound, and environmentally and socially affordable.

Energy Conservation Plan – a plan that defines government policy for energy conservation as well as identifies what government seeks to achieve; it identifies areas in which energy efficiency will be promoted and establishes an institutional framework to support this effort. Some countries call this an “Energy Efficiency Plan”.

Energy Efficiency Indicator – absolute, weighted or relative volume of consumption in any type of production (service) or technological process established by normative documents;

- **Energy Efficiency Labels** – labels specifically designed in accordance with national efficiency and other product standards for appliances and other energy-using equipment.
- **Energy Efficiency Register** – a record of energy use, projections and measures to reduce energy use by plant, factory and facility on a regular (monthly, quarterly) basis.
- **Energy Efficiency Standards** – standards developed for appliances, equipment, and building materials to ensure that these goods meet certain levels of performance. The standards should be developed based on quantitative data developed through product testing.

Energy Resources – total natural and produced forms of energy, encompassing all the energy available for consumption.

Energy Service Company (ESCO) – a business that develops, installs, and sometimes finances projects designed to conserve energy and water costs of facilities. These projects can be paid for

outright, but are often financed over 1-10 years; in the latter case, sometimes the ESCO provides the financing directly or (more commonly) helps to identify a 3rd-party financier. ESCOs generally act as project developers for a wide range of tasks and assume the technical and performance risk associated with the project. Typically, they offer the following services:

- Develop, design, and arrange financing for energy efficiency projects;
- Install and maintain the energy-efficient equipment involved;
- Measure, monitor, and verify the project's energy savings; and
- Assume the risk that the project will save the amount of energy guaranteed.

These services can be bundled into the project's price and are repaid through cost savings generated. ESCO projects are often comprehensive, which means that the ESCO employs a wide array of cost-effective measures to achieve energy savings. These measures often include: high-efficiency lighting, high-efficiency heating and air conditioning, efficient motors and variable speed drives, and centralized energy management systems. What sets ESCOs apart from other firms that offer energy efficiency services, like consulting firms and equipment contractors, is the concept of performance-based contracting; when an ESCO undertakes a project, its compensation, and often the project's financing, are directly linked to the amount of energy that is actually saved.

Energy Savings – Quantifiable reductions in energy resource consumption.

Renewable Energy Resources (also referred to as “alternative energy resources”) – energy derived from wind, solar, hydro, biogas, geothermal and biomass.

Appendix B Donor Coordination with the DR Energy Efficiency Strategy

The international donor community has been a significant source of support to the Dominican Republic's energy sector, and likely will play a key role in supporting energy efficiency activities in the early stages of implementation of the DR's Energy Efficiency Strategy. CNE must be responsible for communicating with other government departments working with foreign donors the need to integrate energy efficiency into their programs/activities, in order to leverage resources and expertise and gain the greatest impact possible. Donors and program areas CNE may wish to consider for support of energy efficiency activities follow.

World Bank – has approved a Technical Assistance loan for the energy sector (yet to be implemented) that could integrate energy efficiency activities in a number of areas, including: providing training to CNE staff; integrating energy conservation education and technologies into urban barrios (through redesign of the PRA); and integrating efficiency benchmarks and fixes into the business plan of the Dominican Transmission Company. Should the World Bank resume sector lending, energy efficiency technologies could be integrated into loan procurement packages.

US Agency for International Development (USAID) – has supported development of this strategy as well as specific analyses of electricity pricing and subsidies, and is also supporting development of a public information campaign that can include energy conservation messages. USAID is supporting the Alliance to Save Energy to work on energy conservation with the hotel sector in the DR, and has also funded NRECA to conduct audits of public buildings. CNE should strive to coordinate USAID energy conservation efforts with those of other donors (especially GTZ and the World Bank), and should also look for linkages between energy-environment funding from both USAID and GTZ.

Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) – has established a 4-year energy assistance program focusing on alternative energy and energy efficiency projects and activities. GTZ would be an excellent source of support for some of the activities suggested in this strategy, such as the Energy Efficiency Market Priority Assessments (described on p.5. The residential sector and food and cement industries may be the best candidates based on the data from the national energy balance); and Industry Best Practices and Benchmarking (for the sectors selected for the market assessments). GTZ's collaboration with the Ministry of Industry and Commerce on utilization of the energy surcharge fund might also help build ties between MIC and CNE and strengthen CNE capacity on energy efficiency financing strategies.

Inter-American Development Bank (IDB) – The IDB has been working on a project to reform and modernize the water sector. Efforts with the water utility in Santo Domingo (CAASD) could integrate energy and water conservation pilot activities (such as those undertaken in the Watery program described on p.19). CNE should look for opportunities to collaborate with IDB in the water sector and in the power sector when the IDB's sector lending program resumes.

Global Environment Facility (GEF) - The GEF, established in 1991, helps developing countries fund projects and programs that protect the global environment. They provide grants to support projects related to climate change, which includes energy efficiency and renewable energy.

Typically, the GEF will support the incremental cost of using these more environmentally friendly technologies and practices. Grants can be accessed through the United Nations Environment Program, United Nations Development Program or the World Bank.

Only around 65% of the Dominican Republic's 8.5 million population are legally connected to the electric grid. According to the country's 2001 National Energy Balance (DRNEB), the energy consumption of DR households is close to 9 million barrels of oil equivalent (MBOE) per year. Of this total, 53% is consumed by rural households as fuelwood (63% of their energy supply) and LP gas (22%). The rest is consumed by urban households, which use nearly half (47.3%) in the form of electricity (3,652 Gwh). Half of the energy supplied to the urban households is used for cooking, while 26% is used for fans and air conditioning, 7% for refrigeration, and 6% for lighting¹⁰.

Given the inconsistent service of the electric utilities in the DR, more than 40,000 households have their own power generation capacity. These households consume at least 173 Mw of energy (a little more than 1% of total consumption).

The price of electricity in the residential sector is high and depends on the level of consumption. As of November 2003, a special, fixed-rate is applied to households with informal connections (at an average of 0.12 \$US/kwh) while the rest of the population is subject to prices that reach 1.94 \$US/kwh (for kwh consumed above 175 kwh/month). These rates will likely rise as the new government implements pricing reforms throughout the power sector.

Energy efficient products are available in the Dominican Republic but their quality may be suspect. Compact fluorescent lamps (CFLs) are relatively cheap (an average of \$2US a piece), but the quality is not certified and they are sold with very little consumer information on the packaging.

OPPORTUNITIES

The price of electricity should make energy efficiency a good investment for many households in DR. Pay-back time for efficient lighting (CFLs) is shorter than six months for lamps used for more than two hours a day, thereby providing a good opportunity to implement a large-scale efficient lighting program. As a simple estimate, installing two CFLs in each of the more than 2 million households in the DR could save up to 130 GWh per year (with a value of at least \$15US million).¹¹ As almost all of the electricity generated in the DR comes from imported fossil-fuels, this energy savings could result in fuel savings of more than 150,000 barrels of oil.

DESIGN AND IMPLEMENTATION PROCESS

Several steps must be taken in order to implement a successful residential energy efficient lighting program. The process will take from one to two years, depending on the resources available. The process can be initiated immediately and some of the steps listed below can be taken simultaneously.

Technology and Market Assessment It is necessary to have a clear picture of the present and—if different—future supply of products for the program. This assessment will include analysis of the following:

¹⁰ 46% of consumption in high-income households goes to HVAC while 70% of consumption in low-income households goes to cooking.

¹¹ Replace two 60-watt incandescent bulbs with two 15-watt CFLs. Lamps work 4 hrs/day. 0.12 \$US/kWh

- *Technology* This assessment must examine both the technology available in the local market and that available in the world market. A set of parameters, such as efficacy and harmonics generation, should be explored, as well as general product quality (*see* below). All parameters should be certified by tests in labs with world-class accreditation (not necessarily in the DR).
- *Market* In order to define the best delivery mechanism for the program, it is important to assess the market, not only in terms of the technical characteristics of the products (as stated above), but also in terms of how much of what products are sold, at what prices, and who is bringing them into the market (importers and retailers).

Household Survey This task is necessary to define with the greatest precision possible the size and the scope of the program. It should include the following information:

- *Number of replaceable lamps* A replaceable lamp is one that can be switched with a CFL with no space or aesthetic restrictions.
- *Patterns of use* It is very important to associate a replaceable lamp with its amount and time of use (i.e., how many and which hours per day).
- *Electricity supply* Given that many DR households generate their own power—at a higher than grid cost per/kWh and, thus have higher economic feasibility of investments in high-efficiency lamps—it is important to identify those households in which part of their electricity is self-generated.
- *Technology acceptance* Households should be asked about their knowledge and acceptance of efficient lamps in terms of quality of light, durability and price, as many currently available may be of dubious quality. In other words, chances are that the lamps in the market may not be lasting as long as they should and this may be a problem to deal with in the program design.
- *Delivery mechanisms* Households should be questioned about a set of possible delivery scenarios (rebates, payment through electricity bill, low interest financing through retailers, etc.) to help define preferred delivery options.

Technical Standards If the program will involve financing, it is necessary to assure the quality of the products. Two parameters—at least—must be determined for lamps supplied through the program: durability and harmonic distortion.

- *Durability* This parameter must consider not only product durability, but also the quality of power supply and its impact on the efficient bulbs. Thus, parameters of durability must consider voltage fluctuations.
- *Harmonic distortion* This parameter is the concern of the power supplier because wide use of CFLs may impact the power lines, so it should be taken into account under the terms defined by the power distributors.

Certification Also of great importance is how the technical parameters are certified. This requires determination of local capacity for testing and certification under world-class standards and, if local capacity is inadequate, determination of capacities elsewhere in the region.

Design of Delivery Mechanism The lamps to be promoted and sold through the program can be delivered via a number of entities: power distribution companies, retail marketers of goods and products, and/or via ESCOs. Also, the incentives for the customers may be in the form of lower prices, low-interest-rates, and/or rebates. All of these aspects should be established based on an assessment of the local capabilities of those who could be involved.

Economic and Financial Analysis Once the size of the market is defined, analysis should be performed from three perspectives: customer, distribution companies, and national interest. Analysis must be performed for different groups of customers (i.e., urban-rural, wealthy-poor, etc), and for each delivery mechanism. These analyses should result in the final definition of the size of the program, a ranking and differentiation of delivery mechanisms, the amount of money to be borrowed for the program, and its expected results.

Financing If economic and financial analyses are positive, resources to finance the program should be obtained. In the case of the DR, if it can resolve its problems with the IMF, the Global Environmental Facility (GEF) could represent a target source of funds, as a residential lighting program would help reduce greenhouse gas emissions. However, even if the DR can obtain GEF support, it might not be for the total amount necessary.

Implementation Once the resources are in place, and regardless of the delivery mechanism, an administrative and managerial body should be hired to organize and publicize the program.