UTILITIES AND SUSTAINABLE DEVELOPMENT

The Hon. Tom Roper

Board Member, Climate Institute

Project Leader, Global Sustainable Energy Islands Initiative (GSEII)

Pacific Power Association, CEO's Conference & Engineers Workshop, Fiji, August 2004

Climate Institute

Overview

- Climate Change
- Sustainable Development
- The Role of Utilities
- What is Renewable Energy?
- Energy Efficiency
- Funding Sources

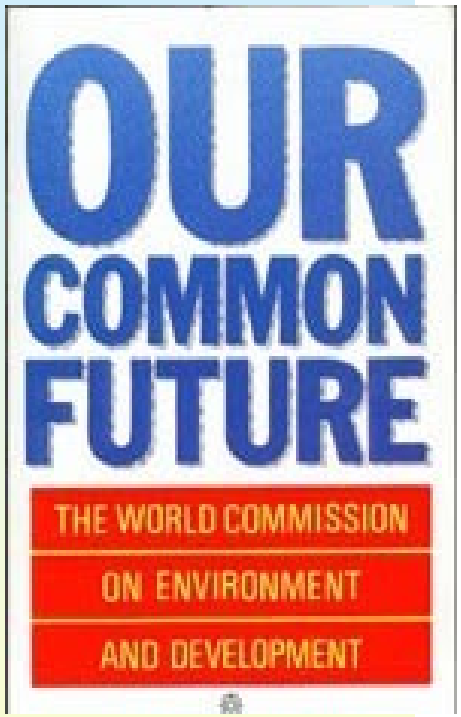
Climate Change and Small Island States

- Small Island States produce only a tiny fraction of global greenhouse gas emissions
- Island States are among the most vulnerable to Climate Change
- Most island nations are dependent on high-cost fossil fuels and very expensive electricity
- A significant number of people don’t have access to electricity
- Island States are especially suited to utilize modern renewable energy and energy efficiency technologies due to their economic and geographical conditions

Impacts

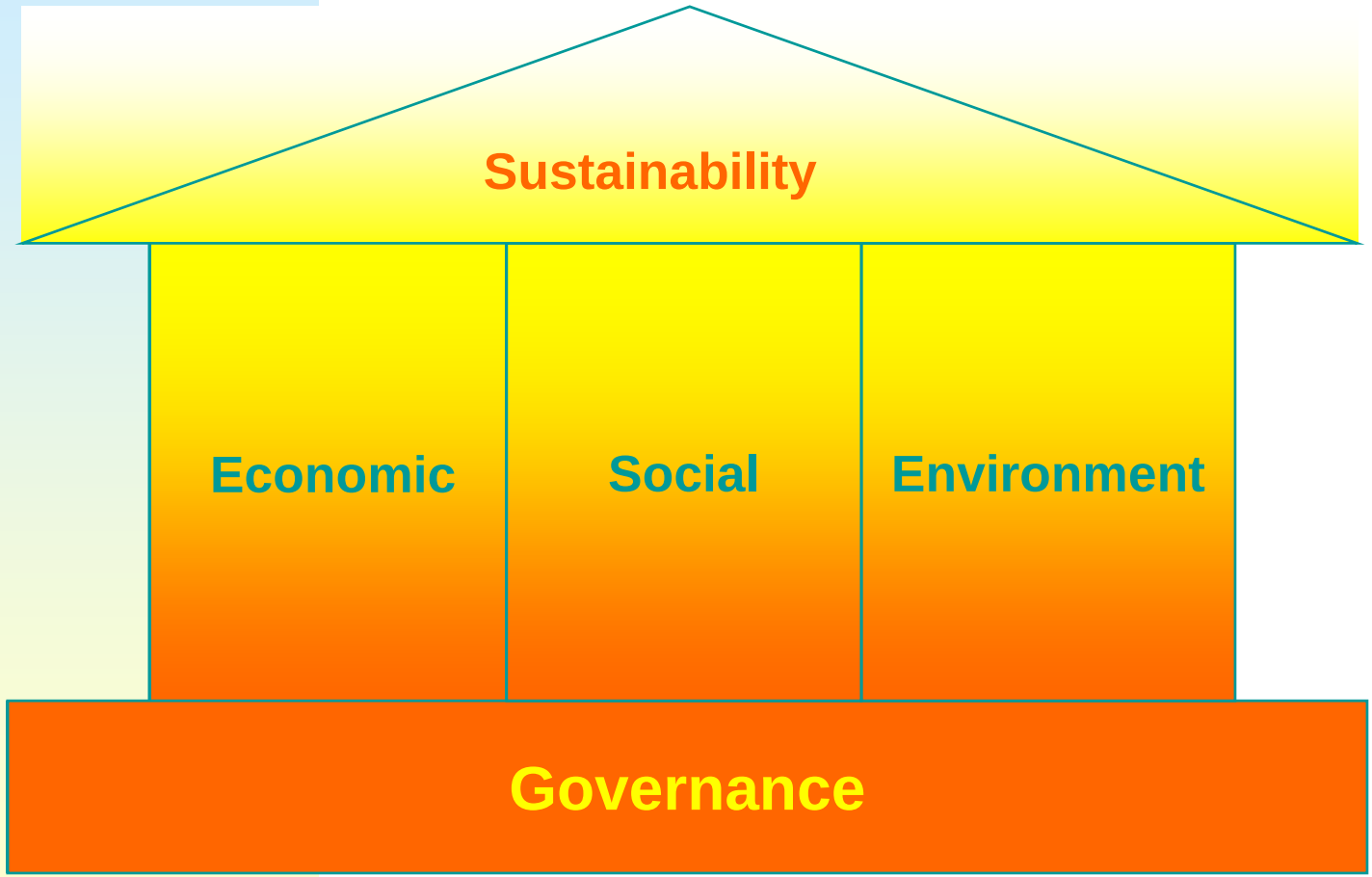
- Sea level rise – beach erosion, coastal inundation, coral damage
- Increase in extreme weather events
- Higher temperatures – 2 to 4 degrees
- Loss of habitat and species
- Economic, social and health impacts

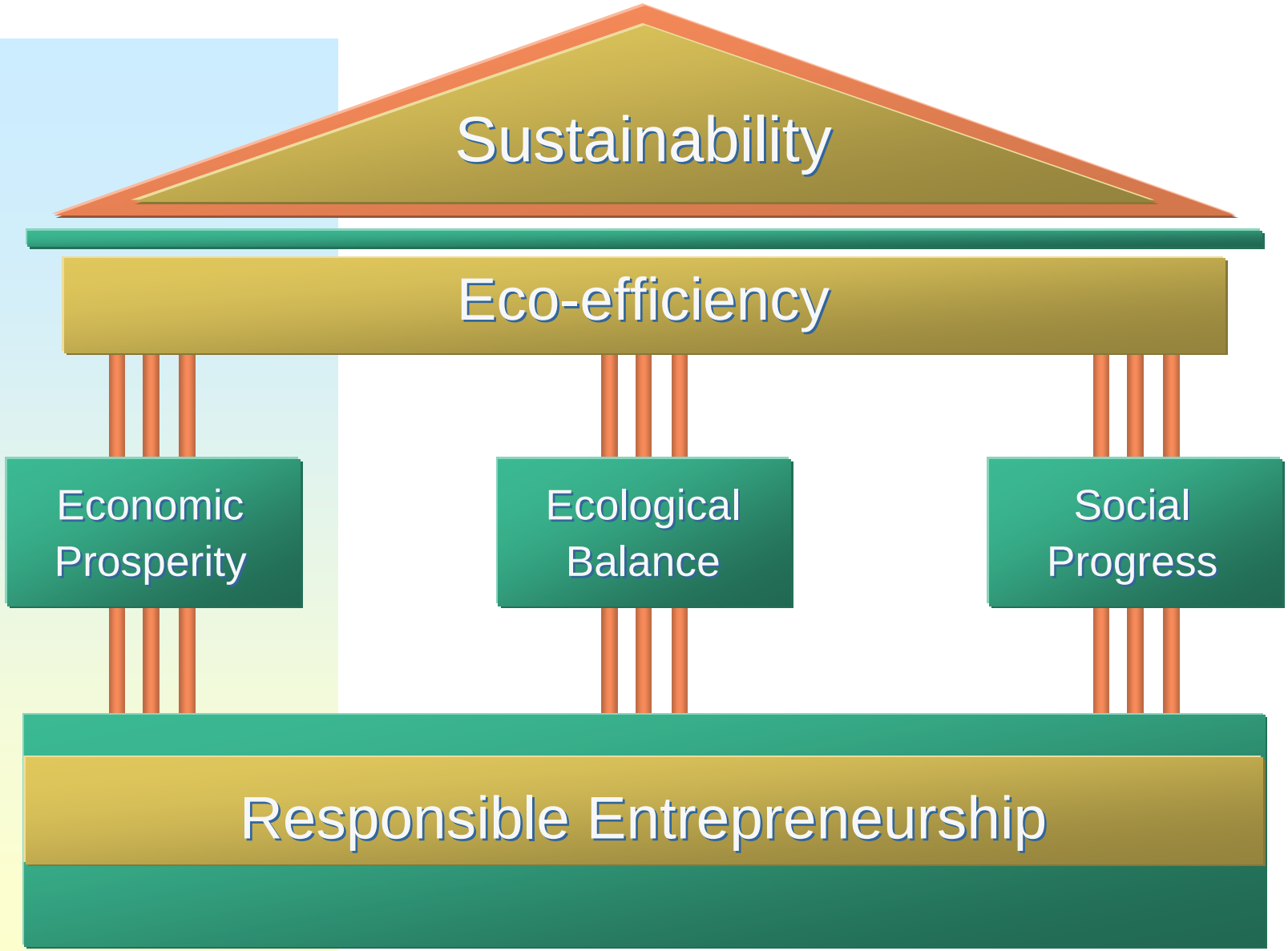
Origins of Sustainable Development



'Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.'

The Sustainability Model




Sustainability
Eco-efficiency
Economic Prosperity
Ecological Balance
Social Progress
Responsible Entrepreneurship

An Example For The World

"The Small Island States can by promoting a clean energy environment set an example for the rest of the world. Too much of our national budgets (up to 12%) are spent on fossil fuels for diesel generation of electricity. This is a drain on our national budgets and does not work towards a solution to the problems of climate change. When the tanker comes in the foreign reserves go out.

Far too little attention has been given - amongst the Small Island States leadership and by the donor countries - to the development of alternative means of energy"

T. Neroni Slade

Chairman of Alliance of Small Island States (AOSIS)

Ambassador of Samoa to the UN

Tuvalu Speaks

"Our islands' peoples, irrespective of occupation - in government, the private sector, in the villages or in service providers like the utilities – are going to be the first to suffer. My country, Tuvalu, barely six feet above sea level, is already seeing the impacts of extreme weather events including foreshore erosion, unusual flooding and the increased intrusion of seawater into freshwater lenses. Our people are already discussing resettlement and refugee status.

The urgency to switch to efficient, affordable and renewable energy sources is real. Every contribution counts. Our interest in moving to a less carbon intensive world is not just self-serving. The consequences of global warming that our nations encounter first will be felt later by others. "

Ambassador Enele S. Sopoaga of Tuvalu
Vice Chairman, AOSIS

What's in it for you?

- A clean, green, dynamic image and marketing tool for your country and utility
- Preserving natural and tourism resources
- Economic benefits for the economy – creating employment, generating income, replacing imports
- Cheaper and more reliable energy for business and individuals

Small Utility Characteristics

- Geographic Isolation (high cost transport, tenuous supply line)
- Few generation sources (low diversity)
- High Energy Costs (imported equipment, spares, fuel & oil, external expertise)
- Variable loads (daily, seasonal, growth)
- Variable Power Quality and Reliability

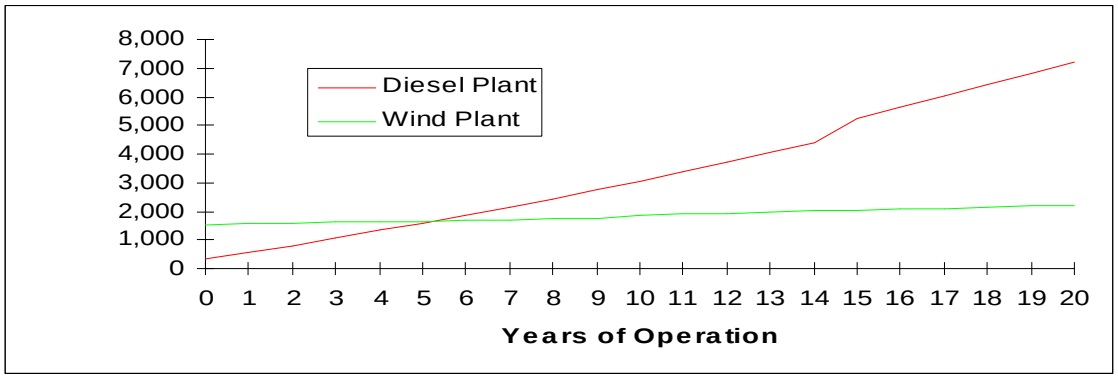
Pacific Utilities

PPA Members	Max Demand (MW)
Guam Power Authority	278.5
Papua New Guinea Electricity Commission	133.6
Fiji Electricity Authority	91.5
New Caledonia, Enercal	79.1
Saipan	71.5
Électricité de Tahiti	71.3
New Caledonia, EEEDC	65.5
American Samoa Power Authority	23.0
Samoa, EPC-	15.3
Solomon Islands Electricity Authority	10.7
Marshalls Energy Company	10.1
Vanuatu SDED	8.7
Tonga, TEPB	7.6
Pohnpei Utility Corporation	6.2
Chuuk, PUC	3.4
Cook Islands, TAU	3.0
Yap, PSC	2.7
Kiribati, PUB	2.4
Wallis & Futuna, EEEDWEF	2.0
Kosrae, KAU	1.8
Marshall Is, KAJUR	1.5
Samoa, POWERTOK	1.0
Niue, NPC	0.6
Tuvalu, TEC	0.6
Total	905.6 (MW)

What is Renewable Energy?

- Those sources of energy ultimately derived from the sun which we use at a slower rate than being produced
- Examples are solar, wind, hydro, wave, tidal, geothermal and biomass
- Characterised by being intermittent, diffuse, site specific, non-polluting (CO_2)

Lifecycle Costs (20year)



Diesel (300kW, 60%cf)

- **Low initial cost, familiar**
- **High, uncontrolled running cost (not future proof)**
- **polluting (CO_2, SO_2, NO_x)**

Wind (2 x 300kW, 30% cf)

- **High initial cost, unfamiliar**
- **Low, controlled running costs (future proof)**
- **Non-polluting**

Thursday Island Wind System

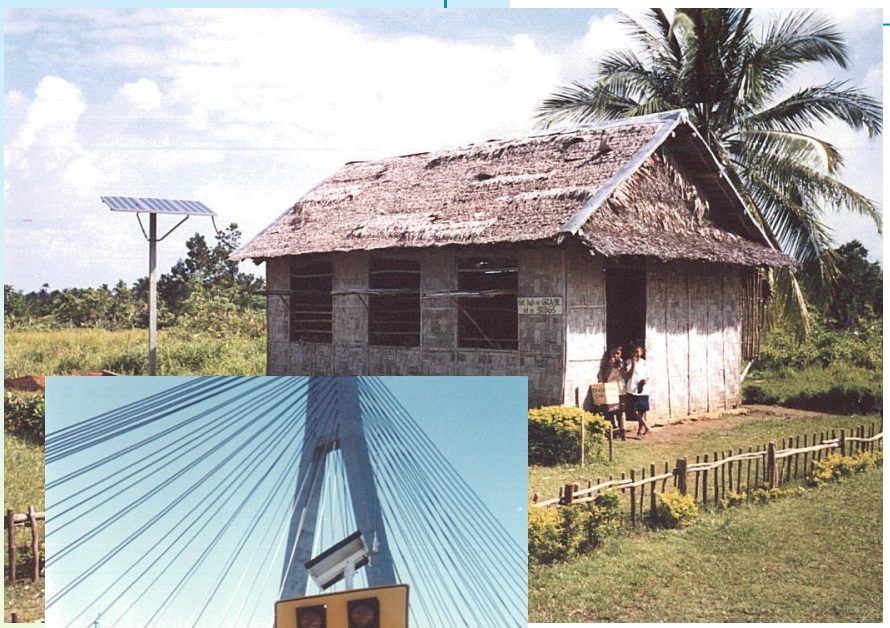
Ergon Energy, Torres Str

- 2 x 225kW Vestas Turbines
- Peak demand about 3.7MW on diesel system
- low penetration (modern PS controls already installed)
- fuel savings were 440,000 litres of diesel per year with both turbines
- No major outages, performance has exceeded expectations, longer service intervals and diesel life

French Leadership - Guadeloupe

- Renewables supply 25% of all energy needs and costs less:
  - Geothermal – from the volcano
  - Small hydropower – the mountain foothills
  - Wind turbines – designed to resist hurricanes
  - PV Solar for rural power supply – 2000 units
  - Solar thermal for water heaters – 15000 units
  - Bagasse as a sugar industry byproduct
  - Ethanol from molasses
  - Energy from waste
- 350,000 energy efficient lamps installed in 44,000 households

Off-Grid Stand-Alone Uses



Remote Villages/ Houses

- Water Supply
- Lighting, Street Lighting
- Refrigeration, Freezers
- Communications, Signals

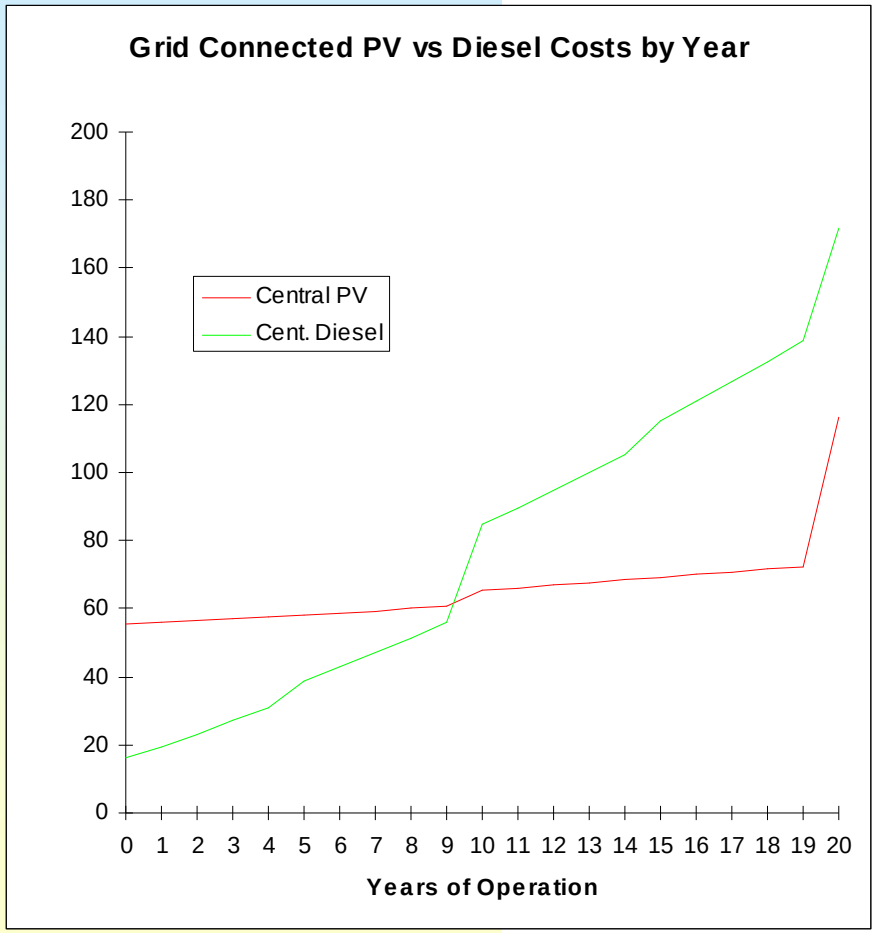
TownShips (near grid)

- Street and Billboard Lights
- Warning signs and Lights

Life Cycle Costs - Cumulative

Year	Diesel GenSet	PV System	Difference
1	$43,400	$151,250	-$107,850
2	$59,300	$151,250	-$91,950
3	$75,200	$151,250	-$76,050
4	$91,100	$151,250	-$60,150
5	$119,500	$151,250	-$31,750
6	$135,400	$160,850	-$25,450
7	$151,300	$160,850	-$9,550
8	$167,200	$160,850	$6,350
9	$183,100	$160,850	$22,250
10	$211,500	$160,850	$50,650
11	$227,400	$160,850	$66,550
12	$243,300	$170,450	$72,850
13	$259,200	$170,450	$88,750
14	$275,100	$170,450	$104,650
15	$303,500	$170,450	$133,050
16	$319,400	$170,450	$148,950
17	$335,300	$170,450	$164,850
18	$351,200	$180,050	$171,150
19	$367,100	$180,050	$187,050
20	$395,500	$180,050	$215,450

Lord Howe Island PV System



LHI Board, off NSW

- 8kWp BP Solar array on airport terminal building
- Peak demand about 400kW on diesel system
- up to 3% instantaneous penetration
- fuel savings about 5000 litres of diesel per year
- installed August 1997

Off-Grid Water Pumping

Remote Well Development

- improved water quality, reduced labour fetching water

Storage and Treatment

- storage allows gravity feed, central treat (filter, UV, chem, desalination)

Reticulation

- Level 1 - central collection
- Level 2 - distributed collection
- Level 3 - piped to user

Off-Grid Hospital/ Institution/ Clinic

Mains-style Power

- **AC power via Inverter**
- **Battery Storage**
- **Backup Generator**

Refrigeration/ Freezers

- **Separate System for critical loads (vaccine storage)**

Emergency Lighting

- **Portable Solar Lantern**

More Renewable Energy Examples

- Barbados
  - More than 30,000 Solar Hot Water Heater Systems – payback for individuals: 2.5 years
- Curacao
  - A 3 MW wind farm to reduce high fuel costs
- Galapagos
  - A wind farm to replace 50% of diesel power and reduce the risk of disastrous oil spills
- Cape Verde
  - 20% reduction in diesel use through energy efficiency measures and wind turbines

Identified Potential Projects in St. Lucia, Grenada & Dominica

St. Lucia	• LUCELEC Point de Caille 4.25 MW Wind Farm • St. Lucia Cooperatives League and Credit Unions Solar Hot Water Heating Financing Program • St. Lucia Ciceron Landfill Gas to Energy Project • Poultry Litter to Energy Project • Sulphur Springs Geothermal Project • Energy Efficient Lighting Project • Energy Audits & Training Project for Hotel Industry • Energy Efficiency and Renewables Awareness Campaign
Grenada	• 225 kW Wind Turbine on Carriacou island • Grenada Nutmeg Shell to Energy Project • Grenada Cooperatives League and Credit Unions Solar Hot Water Heating Financing Program • Energy Efficient Lighting Project • PV system for Grenada Chocolate Company energy supply
Dominica	• Large Scale Geothermal Project Pre-feasibility Development • Energy and Power Losses Reduction in DOMLEC Distribution System • Dominica Cooperatives League and Credit Unions Solar Hot Water Heating Financing Program • Pilot Phase for a potential 4MW Wind Farm • DOMLEC Micro Hydro Project • Energy Efficiency Lighting Project

“Eco-efficiency is more than just a convenient rallying cry for companies concerned about sustainable development and the environment. It’s actually one of the signs that a company is well managed.”

Frank Popoff

Chairman, Dow Chemical Company

Some Leaders in Efficiency

- The Maldives
  - Villa Shopping and Trading
  - Coco Palm Resort
- Accor Asia Pacific
- Barbados
  - Casuarina Beach
- Radison – SAS (Scandinavian Airlines)
- India – KAMAT HOTELS

Be Efficient – Cut Your Costs

Energy is normally 4 to 5 percent of hotel expenses

- Steps to reduce costs include:
  - Better original design, retrofits, energy audits
  - Staff training and involvement
  - Key cards for lighting, cooling and heating
  - Lighting upgrades, efficient lamps and sensors
  - Efficient room cooling and heating equipment, thermostats, fridges
  - Solar hot water heaters
  - More efficient kitchen and laundry equipment and maintenance
  - Waste water reuse
  - Waste reduction
  - Water efficient taps, shower heads, toilets
  - Involvement of guests in efficiency measures

Funding Mechanisms

- Kyoto – Clean Development Mechanism
- World Bank Prototype Carbon Fund
- Global Environment Facility/UNDP
- World Bank / Regional Development Banks / International Finance Corporation
- Donor Programs – European Union, US AID, AUSAID
- Private Sector Investments

CDM Project Types

- FUEL CONSUMPTION
  - Community or Large Scale PV
  - Wind Power
  - Hydro
  - Waste to Energy
  - Biomass
- ENERGY EFFICIENCY
  - Improve Generation and Distribution
  - High Efficiency Lighting and Appliances
  - Solar Water Heaters
  - Improved Building
- TRANSPORTATION
  - Vehicle Efficiency
  - Fuel Substitution
  - Transit Systems

“There are no easy answers. No silver bullets. Just steps on a journey which we should take together because we all have a vital interest in finding the answers.”

“The cultures of politics, of science and of enterprise must work together if we are to match and master the challenges we all face.”

Sir John Browne, CEO, BP

Conclusion

Sustainable energy is not only an environmental necessity…

It makes economic and social sense