



Petroleum Corporation of Jamaica

RENEWABLE ENERGY

**Our Energy Future
Our Energy Security**

Presented by: Dr. Gary Jackson



CERE
Centre of Excellence for
RENEWABLE ENERGY

September 2008



WIGTON
WINDFARM LTD

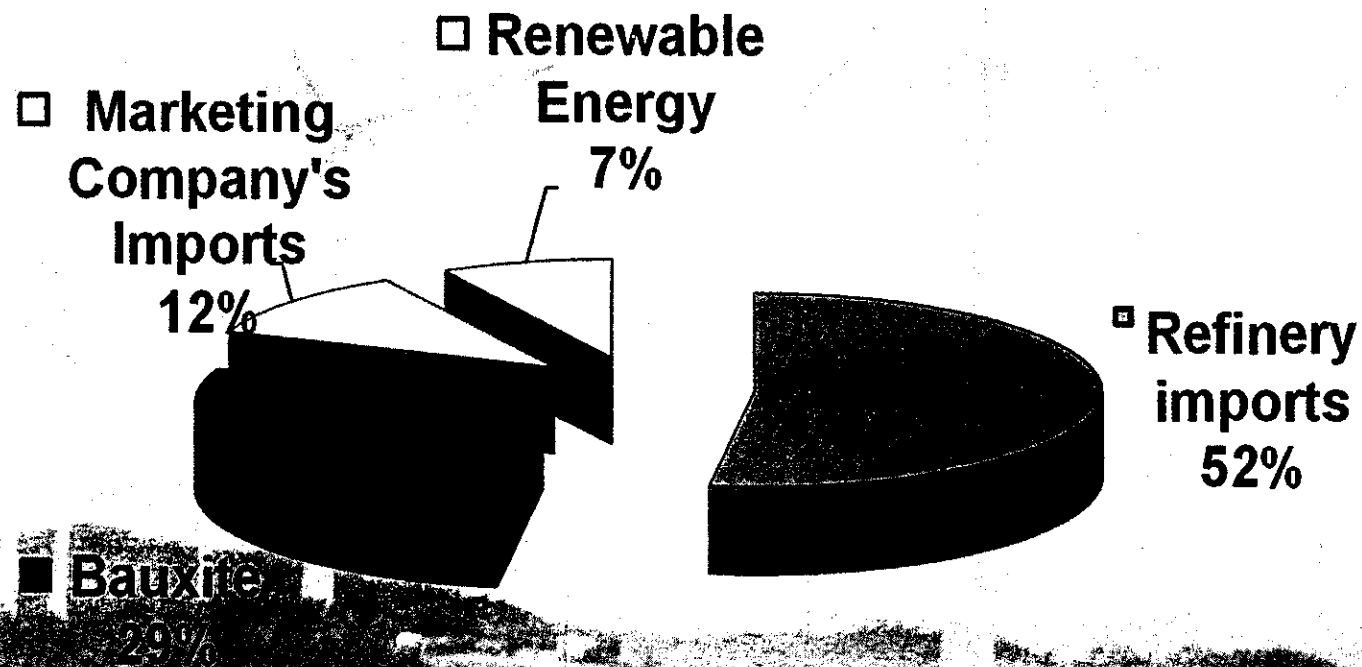
- Renewable Energy
 - Continuous resupply of energy
- Viable?
 - Practical?
 - Economical?



Jamaica's Current Energy Supply by Source

(ECLAC: 2005)

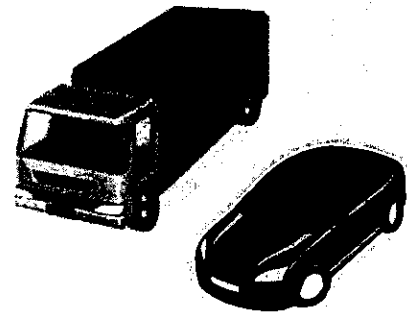
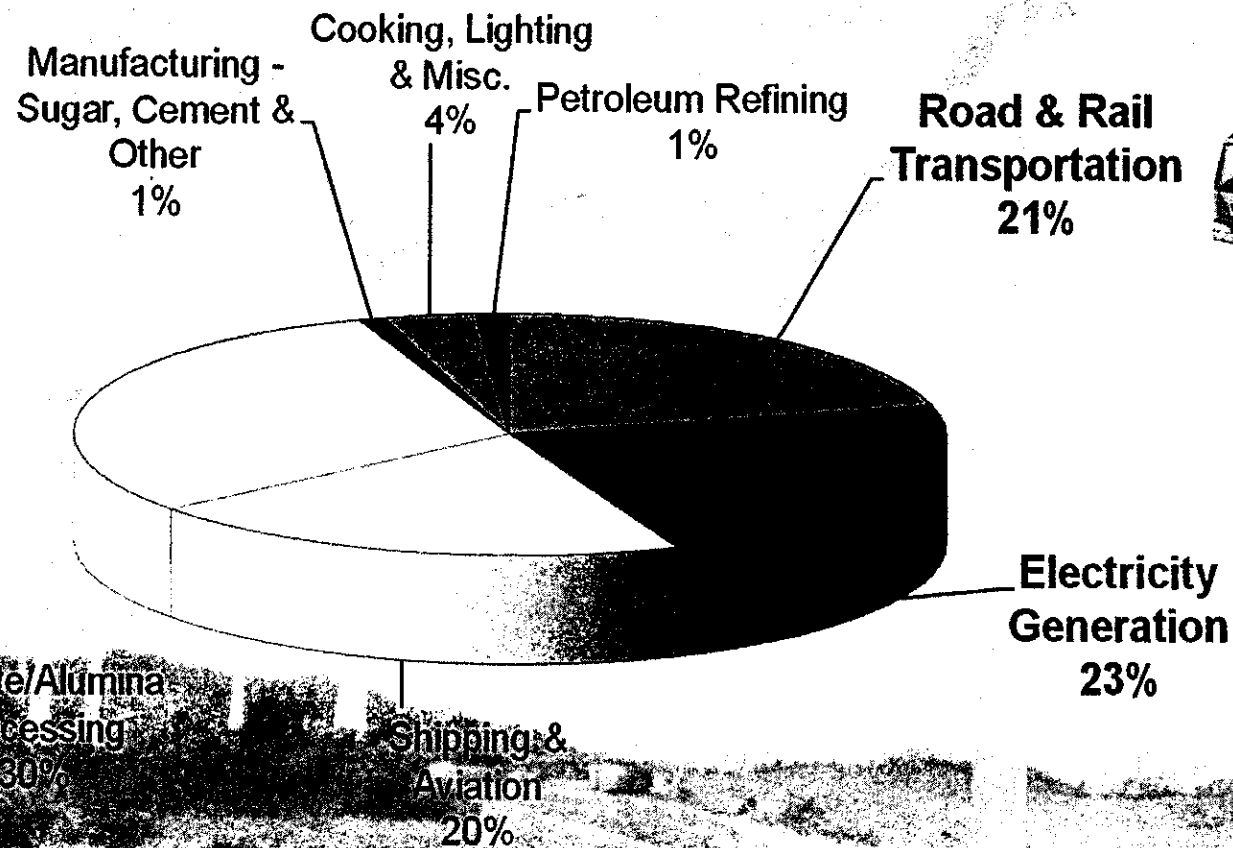
IMPORTS 93% RENEWABLE (LOCAL) 7%



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Petroleum Use by Activity

(Min of Energy: 2007)



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TOTAL ANNUAL PETROLEUM CONSUMPTION

(Min of Energy: 2007)

BBLS: 29,090,426

EST COST U\$ 2 billion



RENEWABLE RESOURCES

- Wind
- Water (hydro)
- Waste
- Biofuels
- Biomass
- Solar
- Human



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WIND ENERGY

- Environmental benefits
 - No pollutants emitted during electricity generation
 - No fuel source required
- Horizontal axis wind turbines works both upwind and downwind.
- Power in the wind is dependent on air density, air speed and cross sectional area through which the wind passes.
- Approaching wind slows and expands as a portion of its kinetic energy is extracted by the wind turbine.

- There is a 20.7 MW Windfarm in Manchester.



Commissioned in Jamaica 1945-1988

Commissioned in Jamaica 1945-1988

- Jamaica's total hydro generating capacity is 21MW

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WASTE to ENERGY (WTE)

- Uses waste treatment that creates energy (electricity or heat) from a waste source.
 - Reduces or eliminates waste that otherwise would be transferred to a "greenhouse gas" emitting landfill.
- Advanced waste to energy technologies
- Jamaica has eight (8) Solid Waste Disposal sites
 - ≈ 1.3 M tonnes of Municipal Solid Waste (MSW) is generated island-wide annually.



BIODIESEL

- Uses oleaginous plants, animal fats and waste oils.
- It can be blended at any percentage with diesel.
- Biodiesel feedstocks which would be suitable for cultivation in Jamaica include jatropha, castor, sunflower, palm and rapeseed.

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SOLAR ENERGY

- Uses the sun's heat and light rays for conversion into thermal or electrical energy.
- Jamaica has high average solar irradiation of about 5 kWh/m².day
 - An available area of ~18 m² would be required to power one residence.
- Jamaica has a huge potential for solar photovoltaic (PV) and solar thermal applications.



BIOMASS

- Uses renewable organic materials such as wood, grass, agricultural wastes and crops that can be burned to produce energy or converted into a gaseous fuel.
- Jamaica's biomass to electricity potential has remain largely untapped.
- Two exceptions are the BAGGASSE cogeneration by the sugar factories and the use of FUELWOOD

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RENEWABLE ENERGY TARGETS

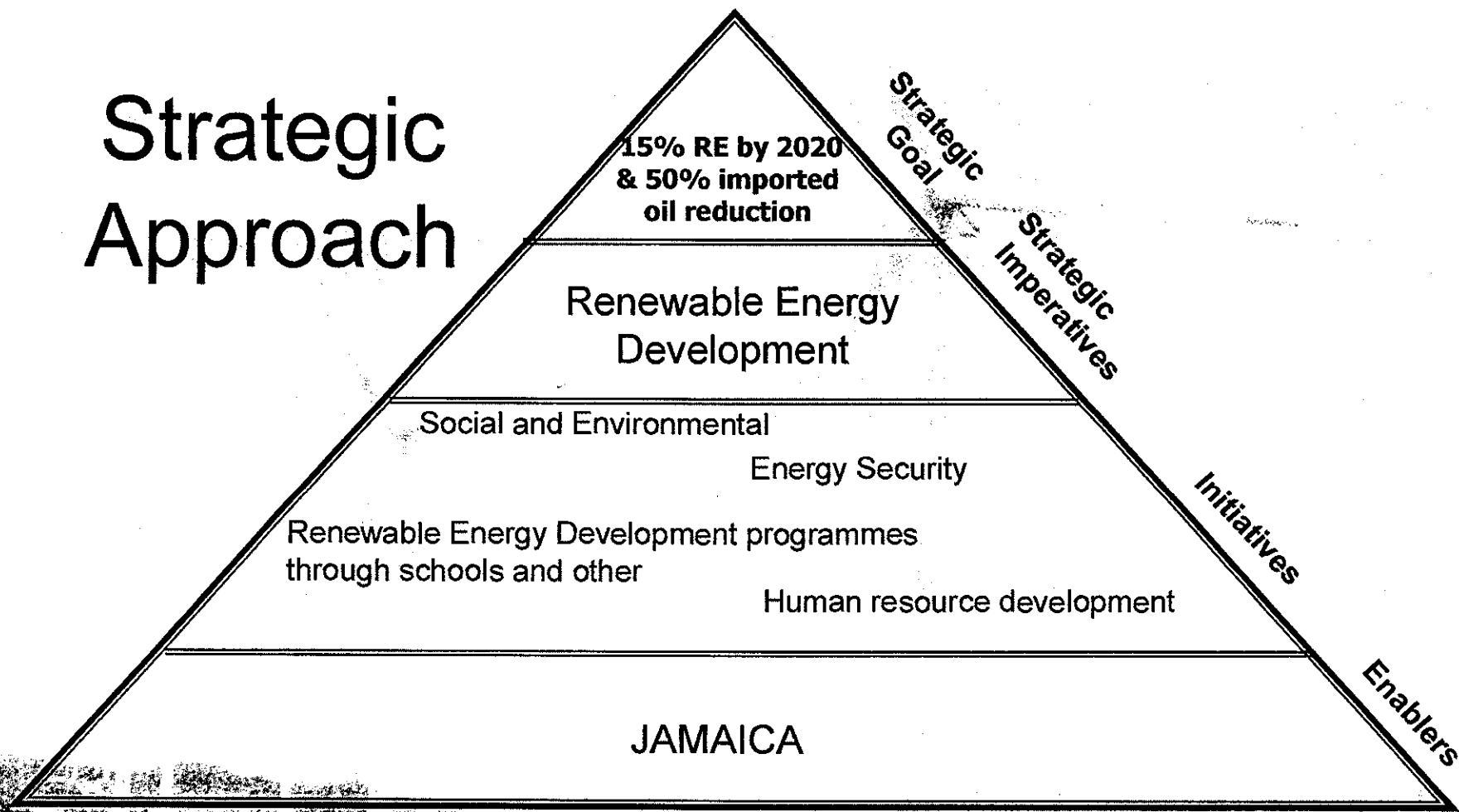
YEAR	CUMULATIVE TARGET
2010	*10%
2020	*15%
2017	**50% oil dependency reduction

Source: National Energy Policy 2006-2020;

Prime Minister's Speech

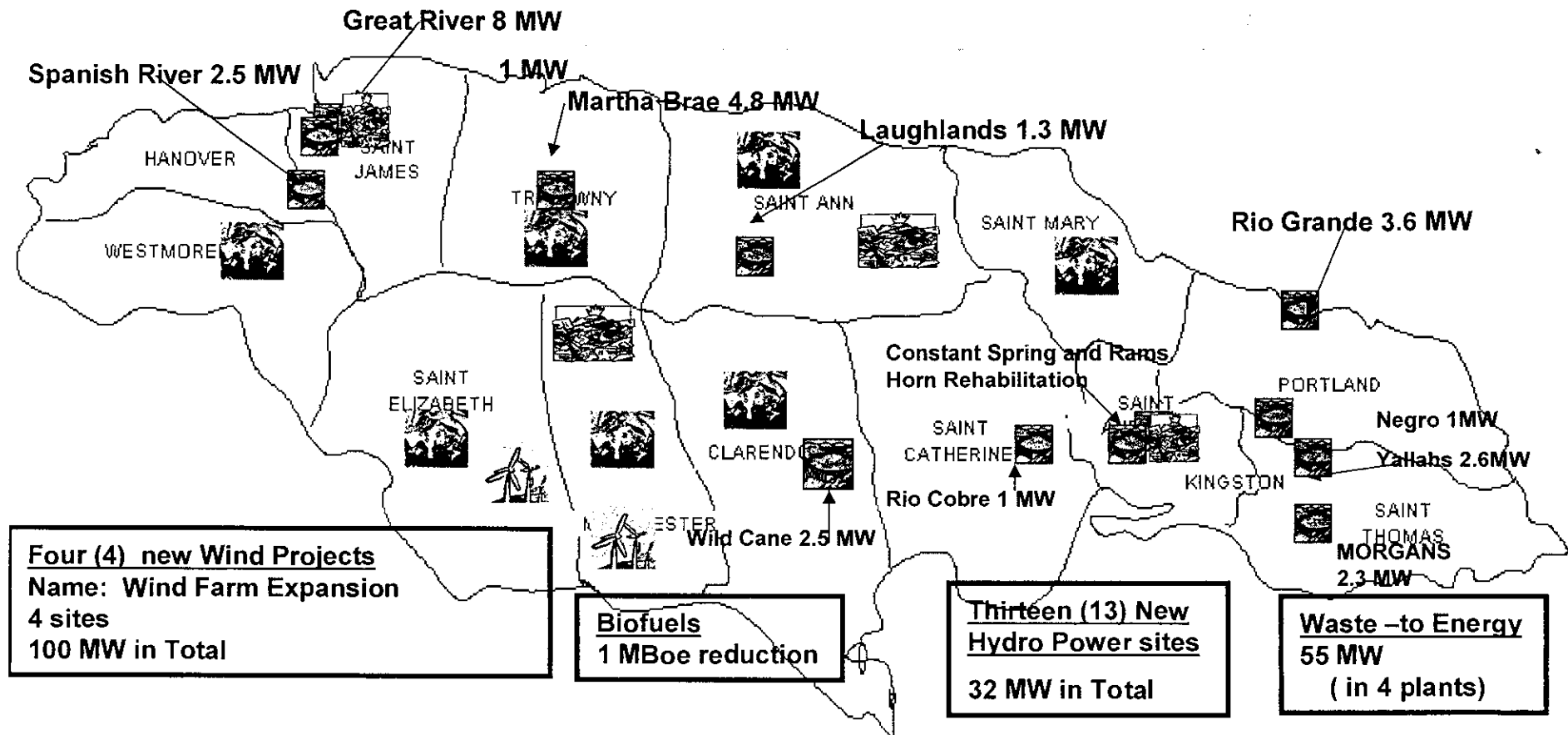
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Strategic Approach



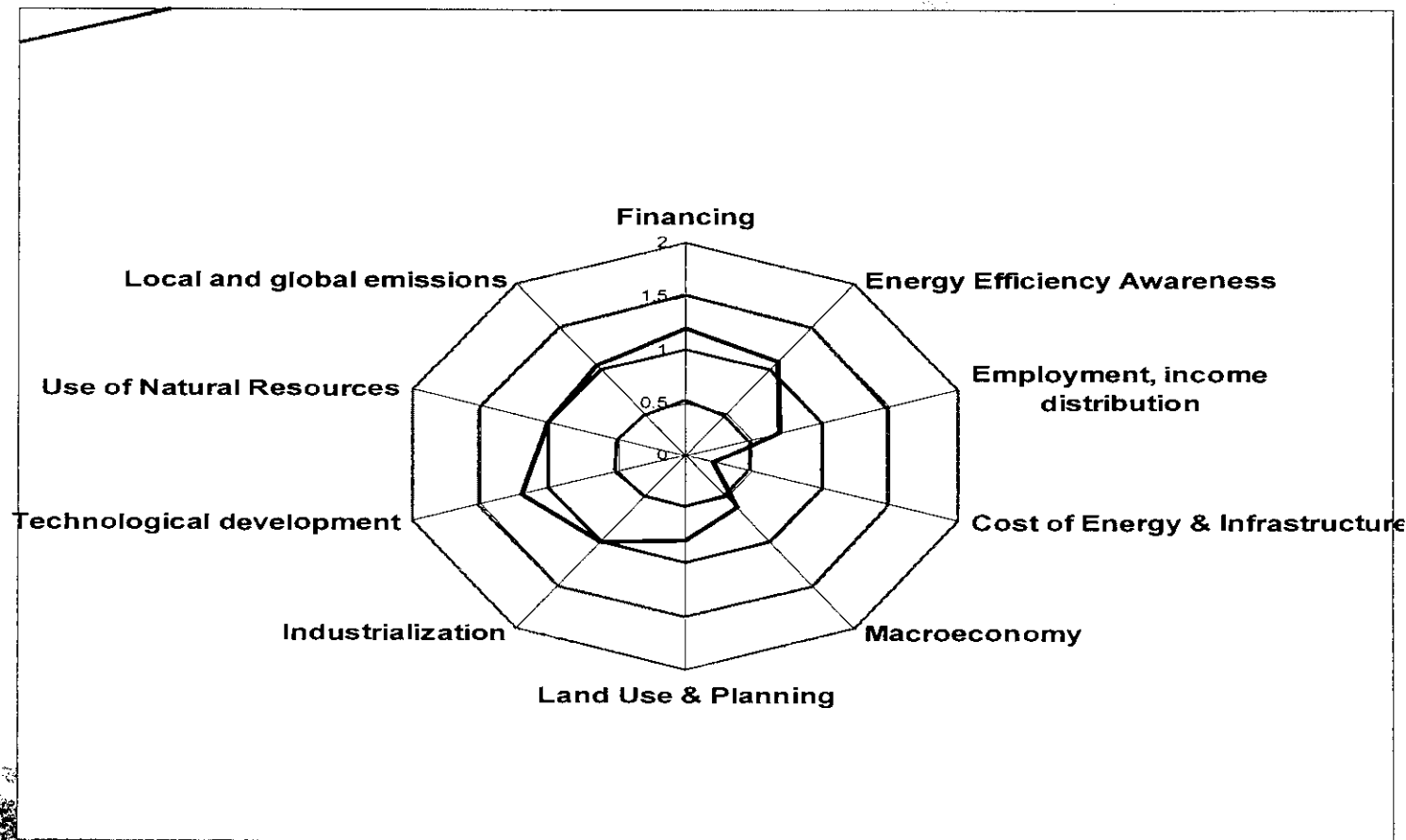
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POSSIBLE ENERGY PROJECTS FOR INTERVENTION



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Creating an Integrated Renewable Energy Industry



Source: UNE/CAC Regional Biofuels Workshop, in Trinidad & Tobago, Nov 2007.

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RE Cost Benefit

Technology	Capital Cost (USD) per MW	Earnings (USD)	Payback Period (years)	Avoided Carbon Emissions (tonnes) per KWh
Wind	2,713,900	304,154	9	2,484
Solar	5,700,000	279,554	20	1,023
Hydro	2,500,000	661,983	4	5,406
WTE	2,363,636	548,993	4	3,799

Technology	Capital cost (USD) per Million Gallons (MG)	Earnings (USD) per MG	Payback Period (months)	Avoided Carbon Emissions (tonnes) per MG
Biodiesel	723,871	5,677,500	1.5	33,757

- 1 MW (wind) can supply the energy needs of 831 households.

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Stakeholders Support

- PCJ/Ministry of Energy/Private Sector
- Cabinet Office
- MoFPS
- OUR
- JPSCo
- NEPA
- Tertiary Institution
- International Community
- The Jamaican people



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SWOT

Resource	Strengths	Weaknesses	Opportunities	Threats
Wind	<ul style="list-style-type: none"> • Considerable Experience - 20.7 MW plant existing. 	<ul style="list-style-type: none"> • Electricity structure 	<ul style="list-style-type: none"> • High cost of imported Fuel. • Carbon Credit earning potential 	<ul style="list-style-type: none"> • Low Avoided cost declared by the OUR. • Land issues.
Hydro	<ul style="list-style-type: none"> • Considerable Experience 	<ul style="list-style-type: none"> • Electricity structure 		<ul style="list-style-type: none"> • Low Avoided cost declared by the OUR.
Waste	<ul style="list-style-type: none"> • Quantity and quality of waste 	<ul style="list-style-type: none"> • Limited technical expertise on waste conversion processes • Electricity structure 		
Biofuels	<ul style="list-style-type: none"> • Plant Production experience PEL • Brazilian expertise Available • By products can provide fertilizers and/or animal feed. 	<ul style="list-style-type: none"> • Limited local expertise in biodiesel production. • No legislation mandating biodiesel use. 		<ul style="list-style-type: none"> • Competing interests for land. • Destruction of crops by natural disasters.
Biomass	<ul style="list-style-type: none"> • High yielding crop 	<ul style="list-style-type: none"> • Possible threat to biodiversity due to invasiveness of crop 		<ul style="list-style-type: none"> • Low Avoided cost declared by the OUR.
Solar	<ul style="list-style-type: none"> • Abundant resource 	<ul style="list-style-type: none"> • Capital Intensive • Electricity structure 	<ul style="list-style-type: none"> • High cost of imported Fuel. • Loans available 	<ul style="list-style-type: none"> • Net metering not implemented.

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PEST

Resource	Political	Environmental	Social	Technological
Wind	<ul style="list-style-type: none"> • Changing country focus. • Political will for RE • Competing national interest for land use. • Lack of clear policy for RE implementation 	<ul style="list-style-type: none"> • No approvals due to biodiversity issues • Destruction of crops by natural disasters. 	<ul style="list-style-type: none"> • Disruption in earning potential of informal sorters. • Food vs. Fuel debate. • Squatting issues. • Lack of public knowledge 	<ul style="list-style-type: none"> • Unfamiliar Technology. • Performance issues based on geographic location. • High capital costs.
Hydro				
Waste				
Biofuels				
Biomass				
Solar				
Human				

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RISK PROFILE

Business risks:

1. Inadequate legal support

2. Natural disasters

3. Inadequate land identification and resource mapping

4. OUR's Avoided cost, feed-in tariffs, PPA/PIA and Net Metering. "The Deal"

5. Procurement requirements.

6. Project Implementation.

7. Legislation and regulation

8. Financing strategy

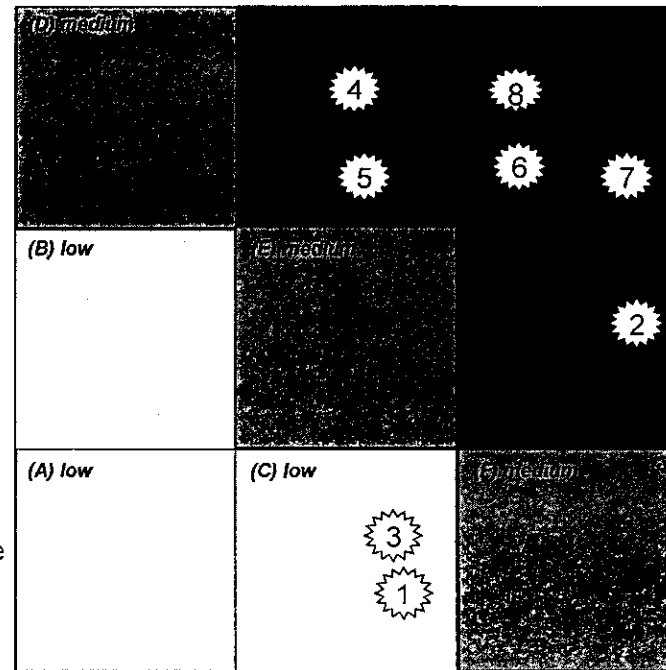
Business Risk and Opportunity Profile

IMPACT/BENEFIT

3) critical

2) major

1) manageable



1) remote
(< 10%)

2) possible
(10 - 50%)

3) likely
(> 50%)

LIKELIHOOD

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RE BENEFITS

- Potential avoided fuel for 1 MW - 588 BLS
 - Equates to (US\$ 58.8 K @ US\$100/Bbl)
- Potential avoided carbon dioxide equivalent emissions (2484 t of CO_{2e})
 - Equates to (US\$77K @ US\$31/ tonnes)
- Increase energy security supply
- Capacity building

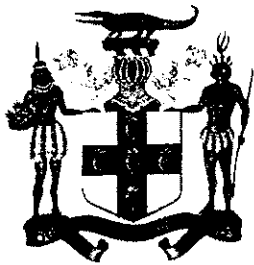


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Critical Factors for Success

- Site ID, Selection and acquisition
- Financing
- Procurement
- PPA/PIA
- Stakeholder cooperation
- Stimulation of RE Market
- Engage skilled professionals
- Continuous capacity building
- Effective communication

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THANK YOU



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