

# Opportunities and Threats to Offshore Wind Development in The Caribbean



Nestor Hernandez  
South East Eolic, LLC

Dr. Andy Danylchuk  
Dept. Environmental Conservation  
UMass Amherst



Overall Area: 1 mill sq mi

Land Area: 92,000 sq mi

13 sovereign states

17 dependent territories

# History

Pre-European: Ciboney, Tanio/  
Arawak, and Carib

Columbus 1492 (Spanish conquest)

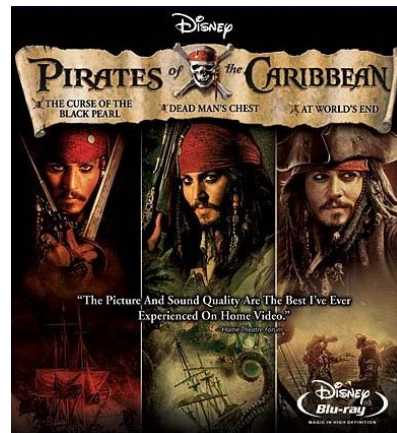
Dutch, French, British

Slave trade (3.5 mil +)

Gold, sugar cane, sunshine









# Small Island Developing States

Tourism, financial services, shipping

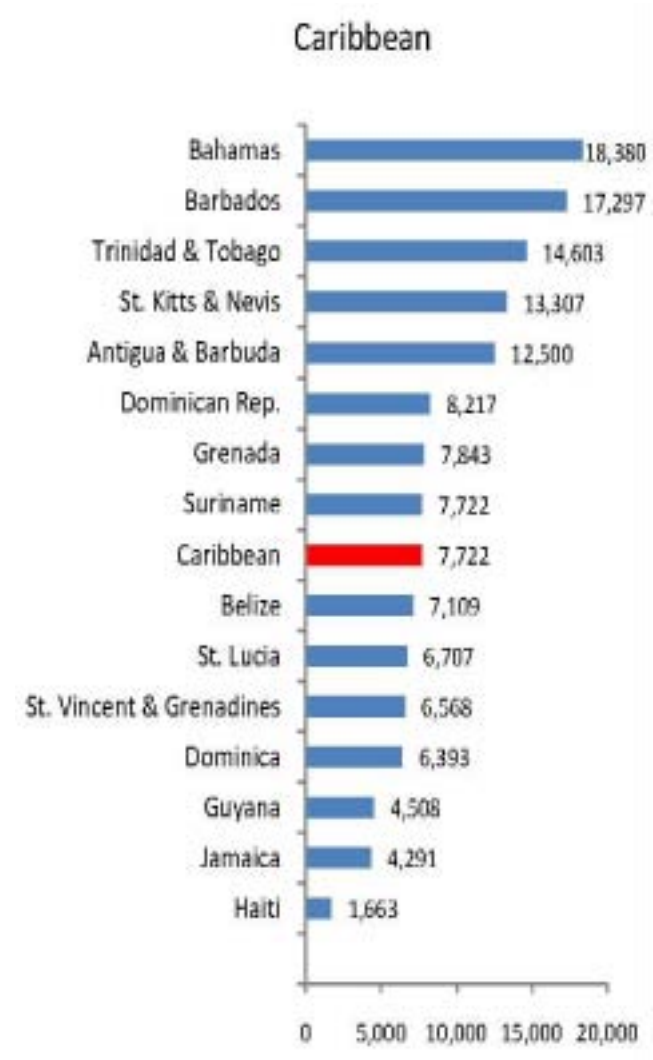
Tourism alone, 16-31% of GDP

Moderate unemployment

Dependent on imports

Caribbean Common Market and  
Community (CARICOM)

US, EU, and Venezuela





# Energy

Net energy importers  
(except T&T)

Oil refineries  
(local/regional markets)



Electricity via oil-fired power  
plants  
Largest producer/consumer  
Puerto Rico

Average cost, US\$0.22 per KWH,  
max US\$0.43-0.59 per KWH



# Electricity

Antiquated plants & grids  
(poor distribution)

Poor distribution = unreliable

Impacts on residential and  
commercial/industrial sectors

Local, regional, global  
environmental impacts





Date: Sunday, 20 January, 2013

# THE NASSAU Guardian



News

Business

National Review

The only  
**Christmas**  
card you need!

Shop. Earn. Enjoy!  
CIBC FirstCaribbean  
Visa Credit Cards...  
[Learn more](#)



## 70,000 gallons of BEC fuel spills

*Teams dispatched to Eleuthera*

Travis Cartwright-Carroll  
Guardian Staff Reporter  
[travis@nassguard.com](mailto:travis@nassguard.com)

Published: Dec 07, 2012

An estimated 70,000 gallons of fuel has spilled into the ground from a Bahamas Electricity Corporation (BEC) fuel storage facility for the Rock Sound, Eleuthera, power station, BEC confirmed last night.

The fuel spill was discovered around 9 a.m. Tuesday, officials said, but it was not made public before yesterday.

"Although the storage tanks in this area, located in the

# NEW FUEL LEAK OF 70,000 GALLONS

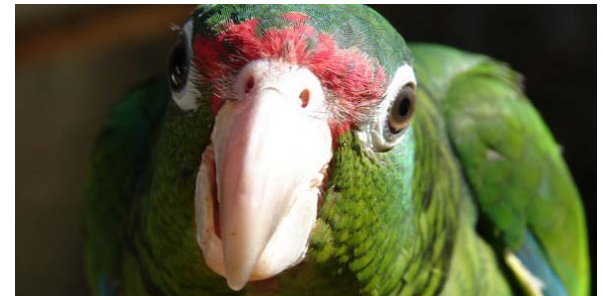


# Tropical Ecosystems

High biodiversity



Endemism



Fragile and  
important



Research paper

## The significance of coral reefs as global carbon sinks— response to Greenhouse

D.W. Kinsey<sup>a</sup>, D. Hopley<sup>b</sup>

# Offshore Wind Energy Production



Reduce per KWH costs  
Reduce imports  
Increase reliability ?  
Reduce impacts ?  
Risks?



# Hurricanes & Earthquakes

June 1 – Nov 30

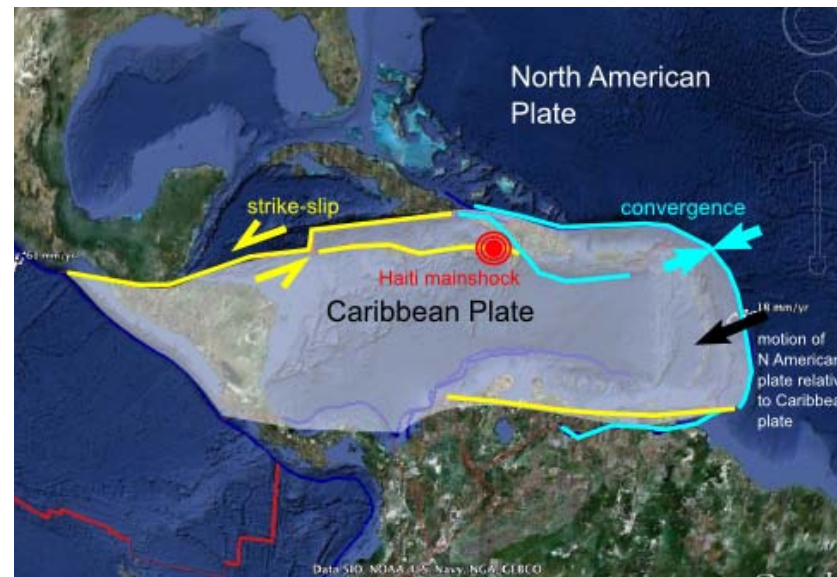
Cat 1 74-95 mph

Cat 5 > 155 mph

Eastern Caribbean Graveyard

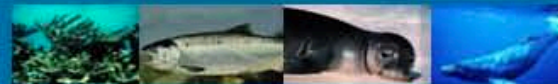


Dominican Republic	Jan 20 06:58 AM	3.2
Virgin Islands Region	Jan 19 13:07 PM	2.8
Puerto Rico Region	Jan 19 08:29 AM	3.4
Puerto Rico Region	Jan 19 05:00 AM	3.2
Haiti	Jan 12 2010	7.0





## NOAA Fisheries Office of Protected Resources



[OPR Home](#) | [About OPR](#) | [Species](#) | [Permits](#) | [Laws & Policies](#) | [Programs](#) | [Education](#) | [Publications](#)

### Species

- ▢ **Marine Mammals**
  - ▢ Cetaceans
  - ▢ Pinnipeds
- ▢ **Marine Turtles**
- ▢ **Marine & Anadromous Fish**
- ▢ **Marine Invertebrates & Plants**
- ▢ **Species of Concern**
- ▢ **Threatened & Endangered Species**
  - ▢ Critical Habitat Maps

[Contact OPR](#)  
[Glossary](#)  
[OPR Site Map](#)

### Corals Proposed for Listing under the ESA

#### NOAA Proposes Listing 66 Reef-building Coral Species under the Endangered Species Act

NOAA Fisheries is proposing Endangered Species Act (ESA) listings for 66 coral species:

- 59 in the Pacific
  - 7 would be listed as endangered
  - 52 would be listed as threatened
- 7 in the Caribbean
  - 5 would be listed as endangered
  - 2 would be listed as threatened

In addition, we are proposing that 2 Caribbean species--elkhorn and staghorn corals--already listed under the ESA be reclassified from threatened to endangered.

#### Proposed Endangered

##### Atlantic/ Caribbean

1. Boulder star coral (*Montastraea annularis*)
2. [Elkhorn coral \(\*Acropora palmata\*\)](#) \*
3. Mountainous star coral (*Montastraea faveolata*)
4. Pillar coral (*Dendrogyra cylindrus*)
5. Rough Cactus Coral (*Mycetophyllia ferox*)
6. [Staghorn coral \(\*Acropora cervicornis\*\)](#) \*
7. Star coral (*Montastraea franksi*)

\* proposed to be reclassified from threatened to endangered

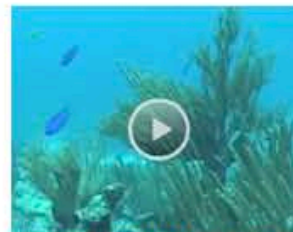
#### Proposed Threatened Species

##### Atlantic

15. Lamarck's Sheet Coral (*Agaricia lamarcki*)
16. Elliptical Star Coral (*Dichocoenia stokesii*)

##### Pacific

17. *Acanthastrea brevis*
18. *Acanthastrea hemprichii*



Video: [Protecting Coral Reefs](#)  
Credit: NOAA, Coral Reef Task Force, and National Park Service

#### More Information

- [Comment on the proposed coral listing, through 03/07/2013](#)
- [More on the proposed coral listings](#)
- [How are species listed under the ESA?](#)
- [Other species proposed for ESA-listing](#)
- [Federal Register Notice of Proposed Listings \(Dec 2012\)](#)



**Staghorn Coral**  
(*Acropora cervicornis*)  
Photo: NOAA

# Puerto Rico



Population: 3.6 million, US citizenship (1917)

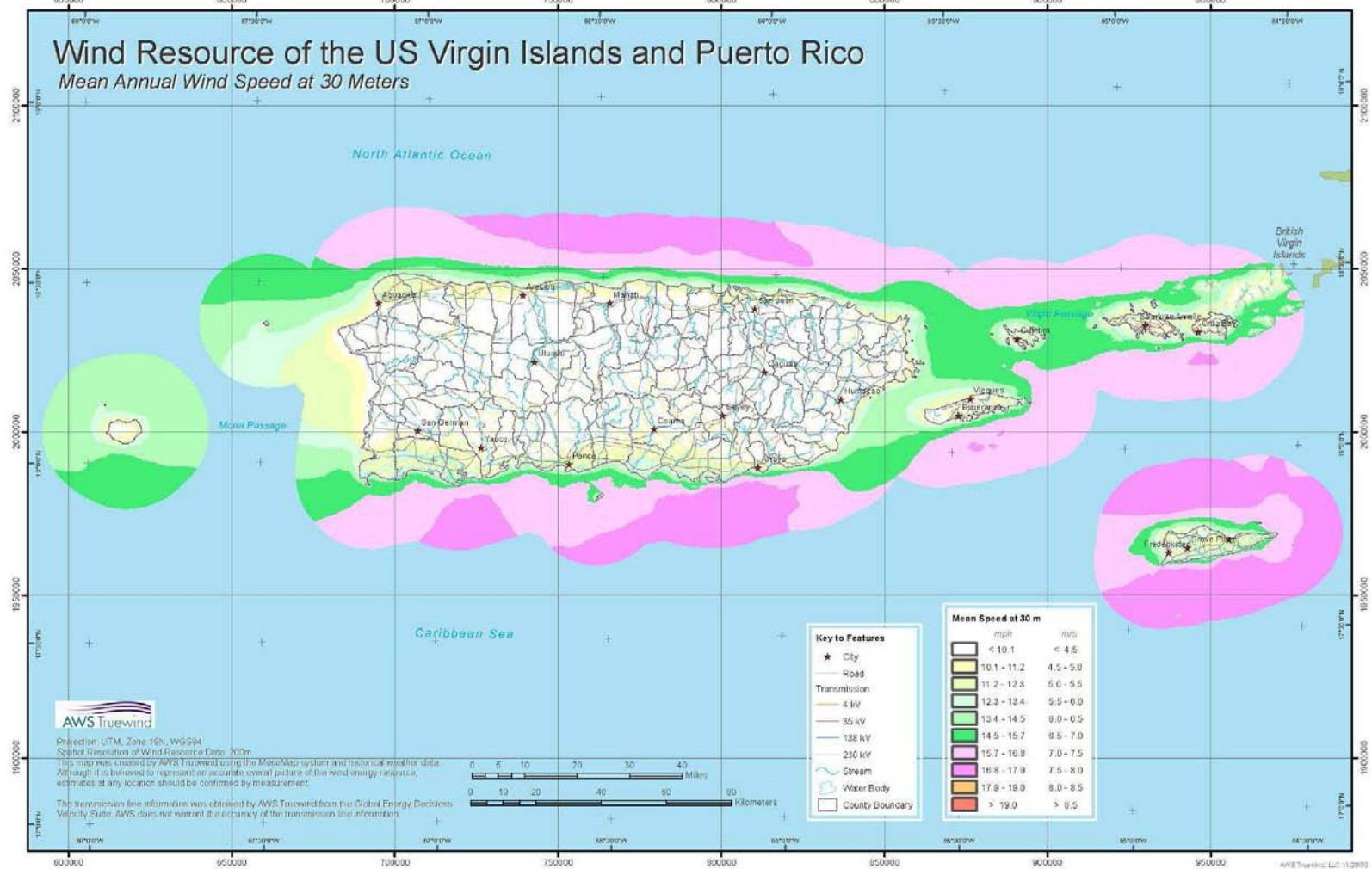
GDP – US \$26,588

Petrochemicals, pharmaceuticals, tech, tourism

Electricity - US\$0.26-0.29 per KWH



*Truewind Wind Map for Puerto Rico – 30 m (in public domain)*



# Why are the conditions favorable for an offshore wind installation on the east coast of Puerto Rico?

Macroeconomic model of the economy of PR has collapsed

Labor participation is 40% of the population

More than 50% of the population is receiving food assistance from the federal government

# Why are the conditions favorable for an offshore wind installation on the east coast of Puerto Rico?

PR (along with Hawaii) has the highest electricity costs in the nation

Production of clean energy could be the basis of future job creation – promote industrial development

“Report by the President’s Task Force on Puerto Rico’s Status” (March 2011) indicates that PR is well positioned to become a model for implementing green energy



# Why are the conditions favorable for an offshore wind installation on the east coast of Puerto Rico?

Waters between PR and Culebra belong to the Commonwealth of PR. PR government can sell or lease.

Close proximity to the USVI can increase benefits

Roosevelt Roads naval base (closed) has a deep water port already available for wind turbine construction







