

*Feasibility of Offshore Wind  
Farms Along the Atlantic Coast  
Project 5a*

Project 5a  
Team 8



Outline

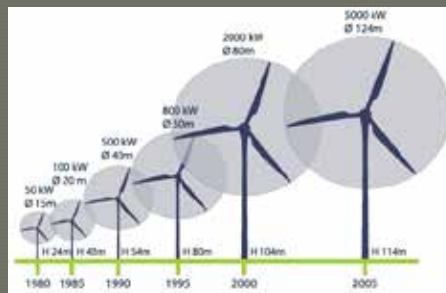
- Motivation
- Technology
- Economic Feasibility
- Environmental Impact

## Motivation

- CO<sub>2</sub> Emissions
- Renewable Energy Source
- Larger Wind Turbines
- More Energy
- Reduced Noise and Sight Line Obstruction
- Sustainable

## Technology

- Turbines are getting larger

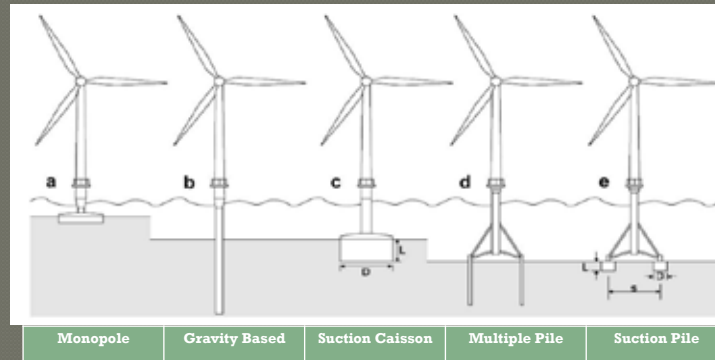


(Terra Magnetica, 2009)

- 2005 turbine generates 7 MW, rotor diameters of 125 m, & heights of 115 m

## Technology

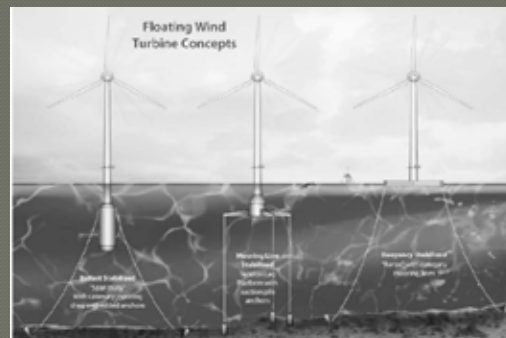
- Turbine supports
- 0m-50m depth



(Breton, Simon-Philippe ; Moe, Geir)

## Technology

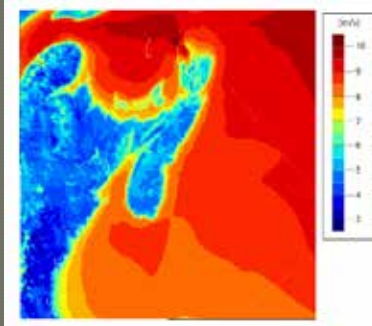
- Floating support concepts
- Over 50m depth



(Breton, Simon-Philippe ; Moe, Geir)

## Technology

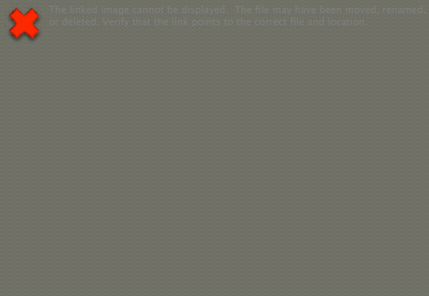
- Geographical factors
  - Atlantic Coast wind speeds



(Canadian Wind Energy Atlas, 2013)

## Technology

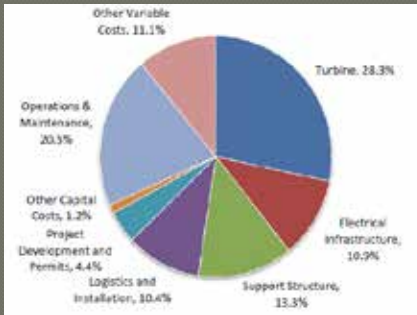
- Geographical factors (con't)
  - Atlantic Coast uses



(Fisheries and Oceans Canada, 2013)

## Economics

- Offshore wind power is the most expensive energy generating technology



Breakdown of Offshore Turbine Costs (USDOE)

## Economics

- Research
  - Ice
  - Marine Growth
  - Water Depth
  - Wind Conditions
- USDOE has spent estimated \$200M already

## Economics

- Installation
  - Site Preparation
    - USDOE estimated the cost of site preparation as \$4500/Kwe
  - Turbine Construction
    - NAO estimated the cost of the building, connection and maintenance of a farm of turbines is about 8 billion pounds. (\$12.64B CAD)

## Economics

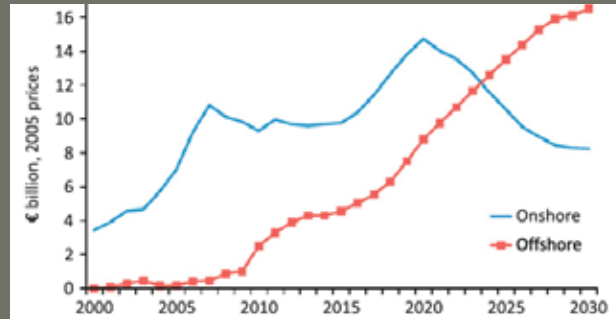
- Deep water + greater distance = Money↑
- Actual Cost = (Adj. factor) \*(Initial invest + Cost)

Water Depth (m)	Distance from shore (km)							
	0-10	10-20	20-30	30-40	40-50	50-100	100-200	>200
10-20	1	1.02	1.04	1.07	1.09	1.18	1.41	1.6
20-30	1.07	1.09	1.11	1.14	1.16	1.26	1.50	1.71
30-40	1.24	1.26	1.29	1.32	1.34	1.46	1.74	1.98

Green & Vasilakos, 2011

## Economics

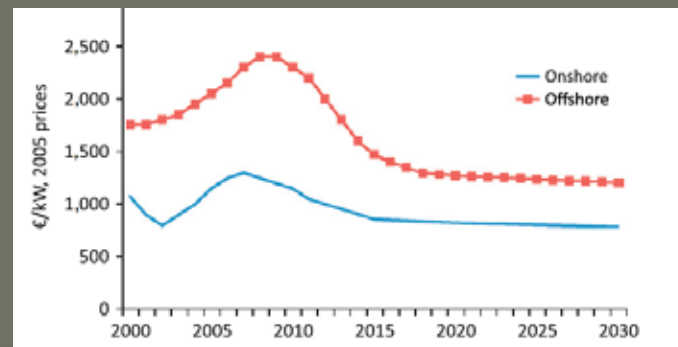
- Offshore investments



(Green & Vasilakos, 2011)

## Economics

- Predicted offshore costs



Green & Vasilakos, 2011)

## Environmental Impact

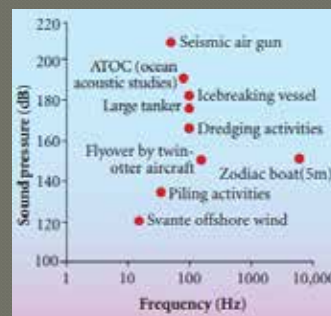
- Visual
  - Unappealing to humans
  - Dangerous to birds



(Walden, 2010)

## Environmental Impact

- Noise Impact: Operating
  - Mechanical noise
  - Affects marine life
  - Study: Svante Wind Farm

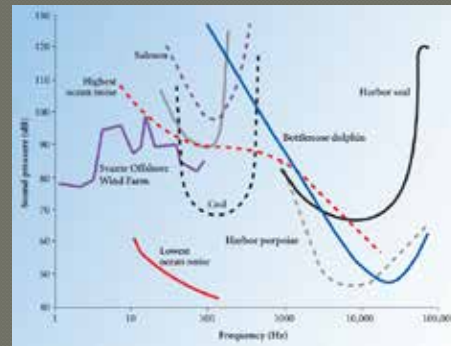


<http://offshorewind.net/>



## Environmental Impact

- **Noise Impact: Construction**
  - Cod spawning & nursery affected
  - Local fish avoid offshore
  - Fisheries important to Atlantic Canada



(Utilities Project)

## Environmental Impact

- **Wild Life Impact**
  - Birds follow windy routes when migrating
  - Dolphins, whales, & fish migration routes also affected



(Utilities Project, 2006)

## Federal Legislature

- **Government Incentives**
  - Germany Spain & UK are politically supportive of renewable energy
  - Advanced Renewable Tariffs (grid connectivity, market uncertainty)
  - Canada has no such legislation

“With the right policies, Canada can use renewable energy to satisfy its energy needs and become a world leader in sustainable technologies.”  
–David Suzuki

## Summary

- Eliminates CO<sub>2</sub> emission during operation
- Turbines getting bigger / harder to install
- No existing technology for deeper waters
- Currently, not economically feasible
- Visually not appealing
- Noise affects marine organisms
- Birds endangered
- Whales and dolphins effected

**NOT a feasible option for the Atlantic Coast of Canada at this time!**

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## Questions?