



Offshore Wind Development in Rhode Island

Cost-Benefit Analysis of Proposed Project

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Honors Environmental Studies Thesis

Presentation

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UEL, Brown University



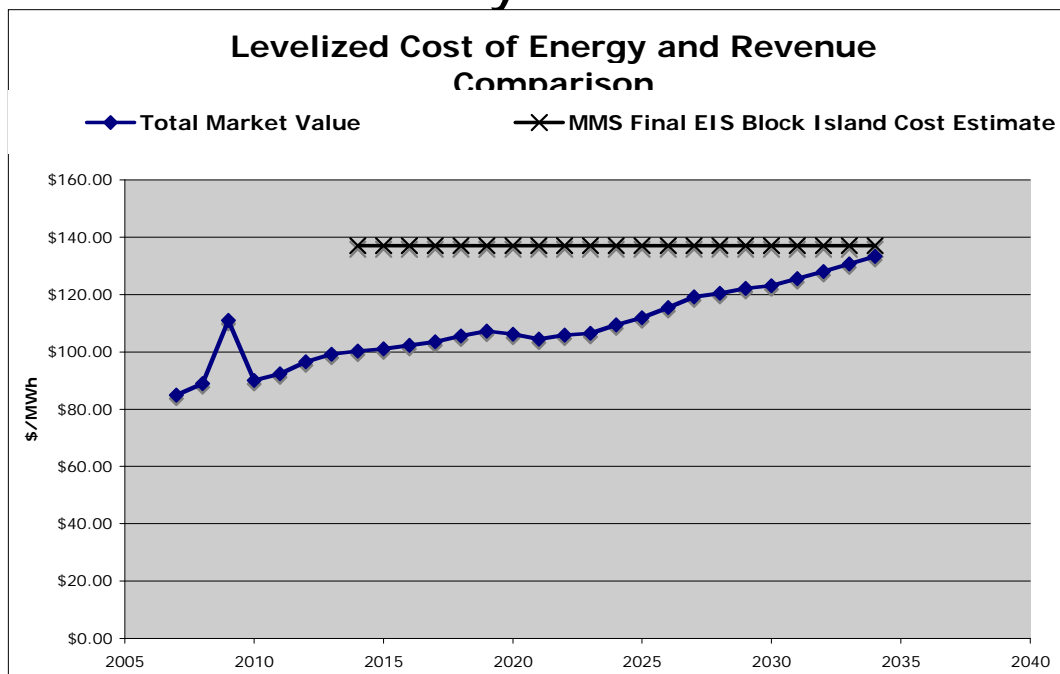
Outline of Presentation

- **Findings**
- **Purpose & Background**
- **Cost-benefit Analysis**
- **Synthesis & Recommendations**



Findings

Market Value of energy from proposed offshore wind farm below cost by 25% to 3% for life of project



Externality inclusion could make up the difference



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Why Renewables Now?

Global Warming & Regulatory Trends

Carbon markets & Renewable Portfolio Standards

Energy Independence

Hedge against fossil fuel markets

Economic Development

Jobs!

Avoided Pollution

Positive health & environmental impacts

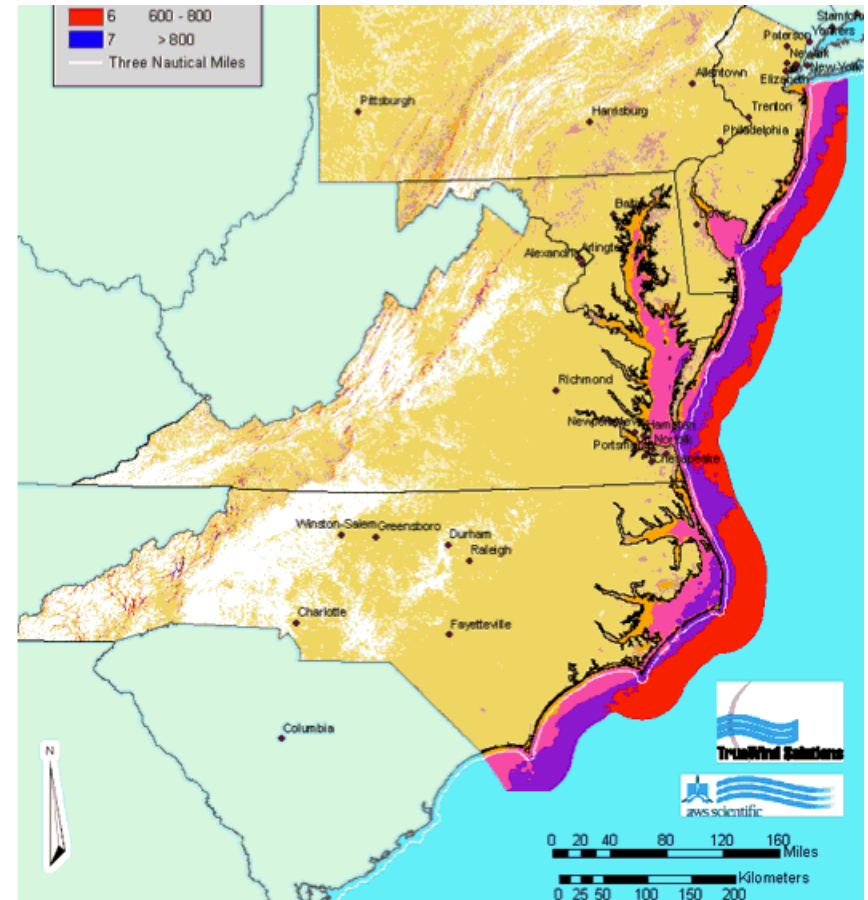


Why Offshore Wind?

Mid-Atlantic Bight

Capacity to meet 150% of
electricity needs,
Massachusetts to DC

Limited renewable resources
on land





Offshore Wind in Rhode Island

Governor's Goal: 15% wind

98% of opportunity offshore

Progress:

- Deepwater Wind

- Special Area Management Plan

- Joint Development Agreement



Project Assumptions

Block Island site

~370 MW

Operates for 20 yrs beginning
in 2014



Global Warming

RI Greenhouse Gas Action Plan: 80% reduction target by 2050

Net benefit to state of \$400M

Renewable energy development is biggest strategy

Offshore wind farm would meet it in cost range



Cost-benefit Analysis

- **Levelized cost of energy**
- **Market value of energy**



Levelized Cost of Energy

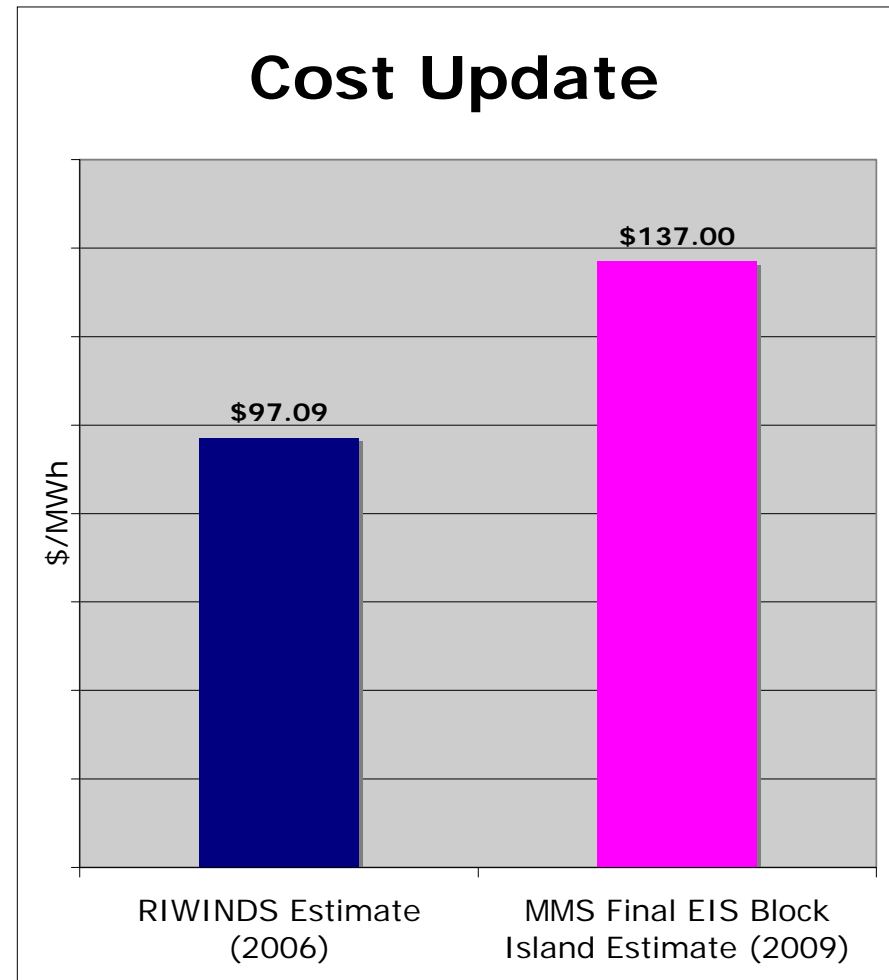
The present value of the total cost of a power plant over its economic life, converted to equal payments per MWh

Includes all predicted costs:

construction, engineering, land leasing, financing, maintenance, etc.

Reasons for increase

Turbine, copper & steel price, financing cost increases



*\$10/MWh=1c/kWh



Market Value of Energy

Electricity



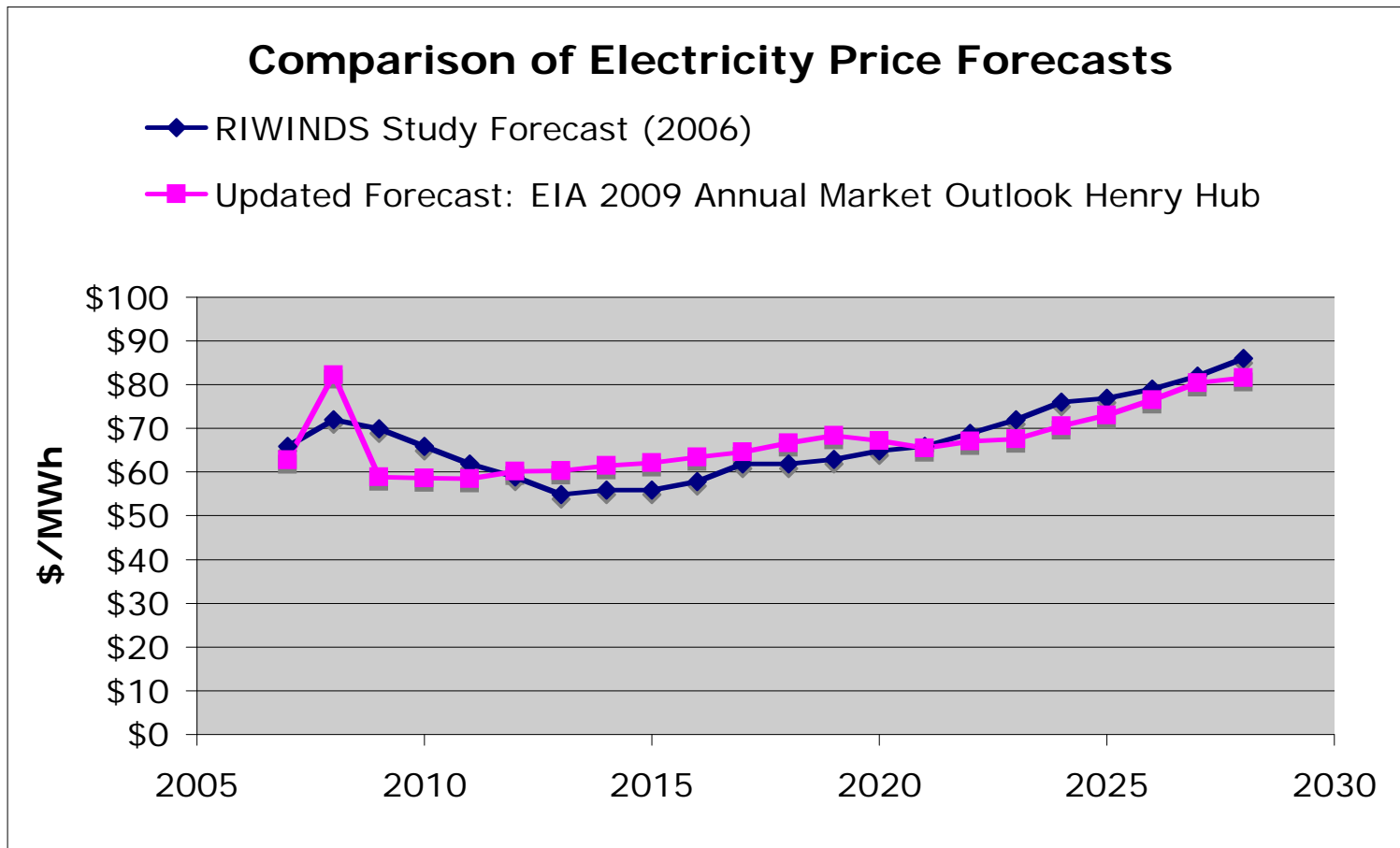
Renewable
Energy
Credits
(RECs)

Carbon
Market

Capacity



Electricity



Forecast using current natural gas forecast (EIA AEO 2009), & 2006 Market Heat Rate (ISO New England)

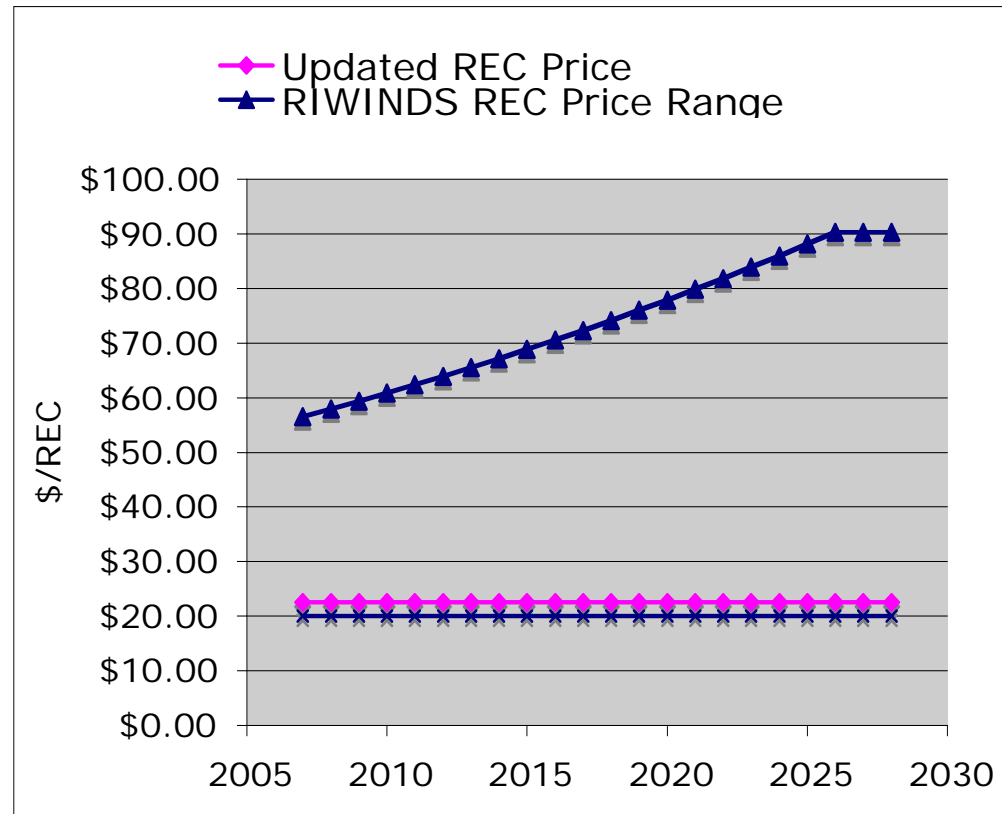


Renewable Energy Credits

Definition: A commodity that represents the benefits of 1 MWh of renewably generated electricity

Prices recently
dropped from
~\$50/REC to
~\$25/REC

Uncertain Market



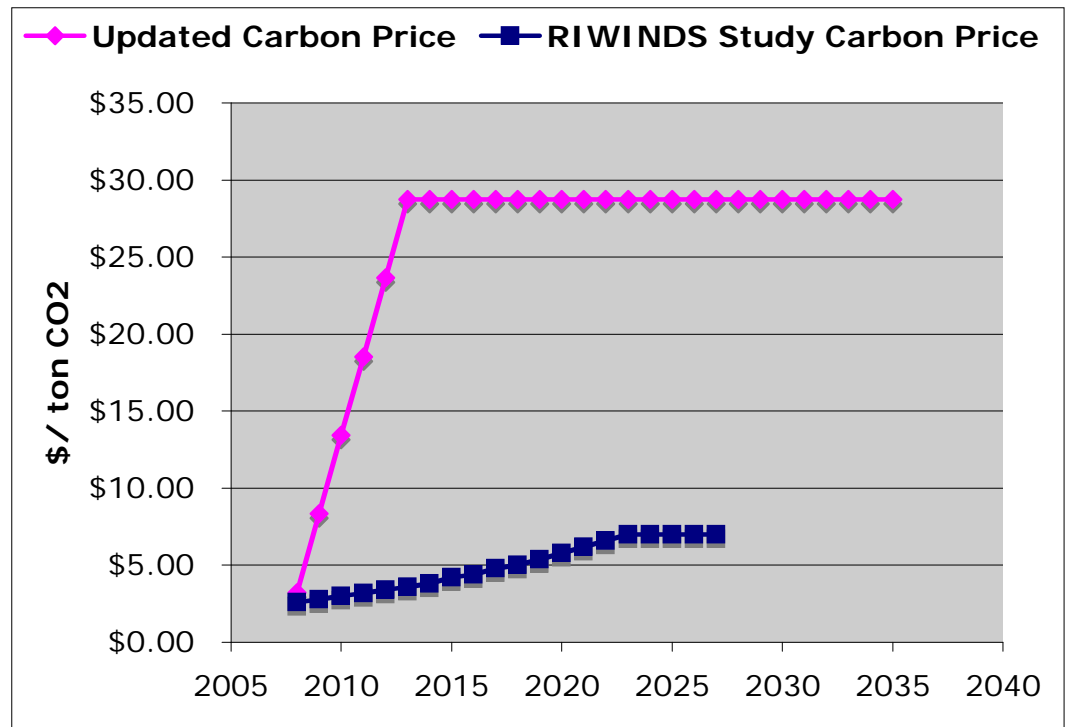


Carbon Market

Emerging Market: RGGI & National Policy

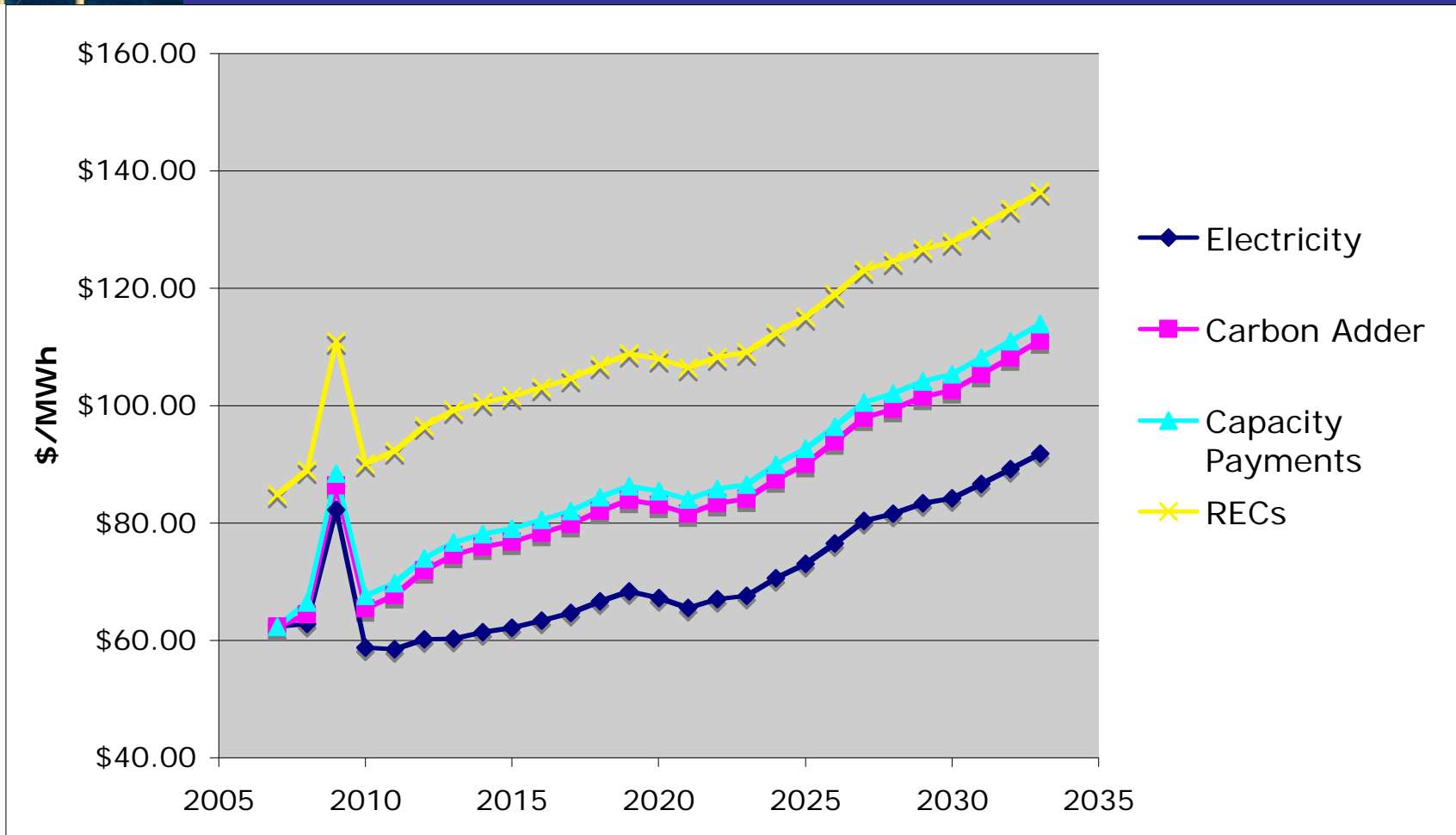
2009 PJM Study Average: \$28.75/ton CO₂ in 2013

Directly impact
electricity prices



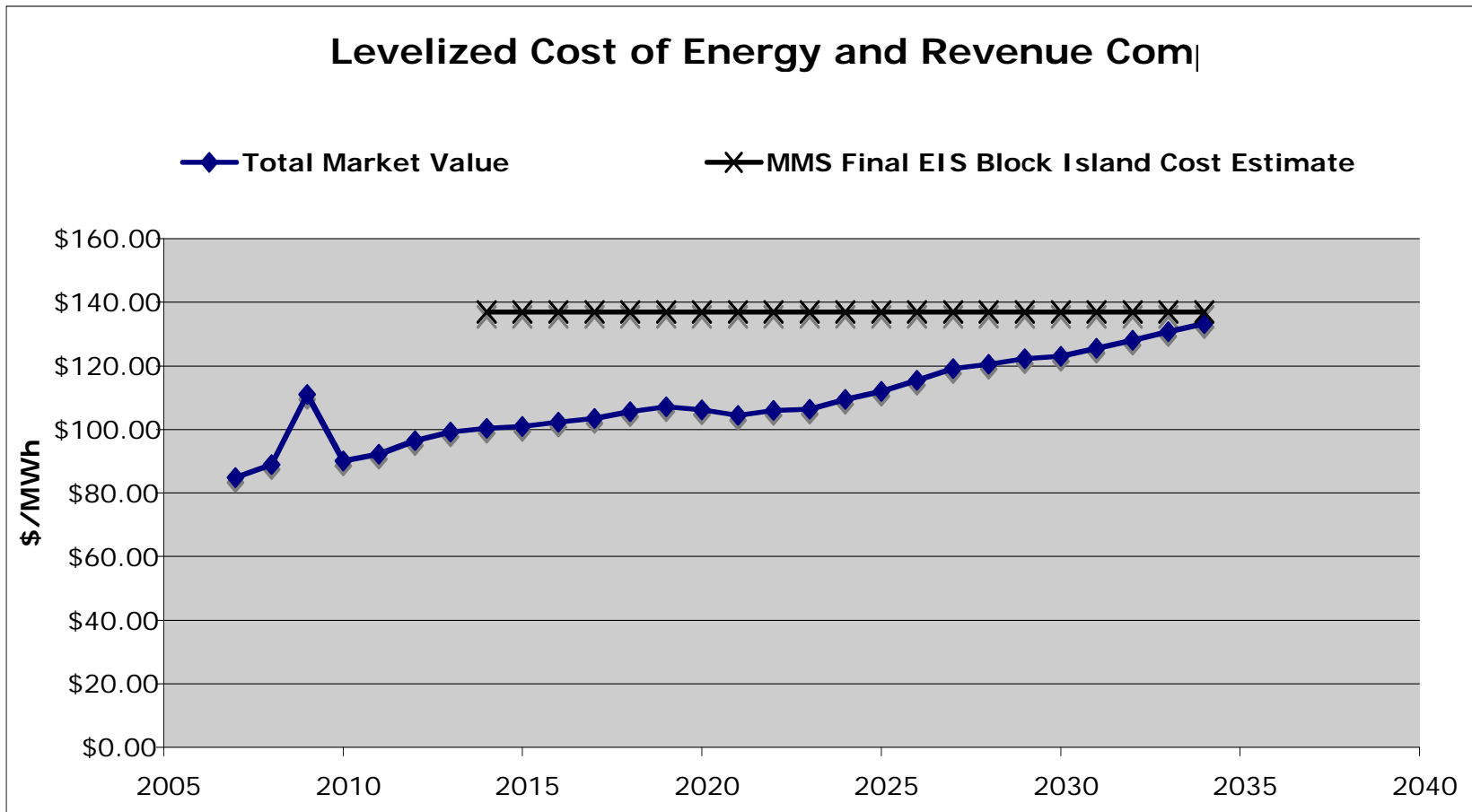


Cumulative Market Value





Cost/Market Value of Energy Comparison



Net Present Value of project: **-\$200M**

Rate-Payers: **25%-3%** premium over life of project



Is it worth it? Externalities of Offshore Energy

- Health Care
- Hedge against Price Volatility
- Others



Health Care

Displaces pollution: SO_2 , NO_x , others

➔ Reduces premature mortality & health costs

Adopted Cape Wind study:

Health Care Savings per year: \$3M

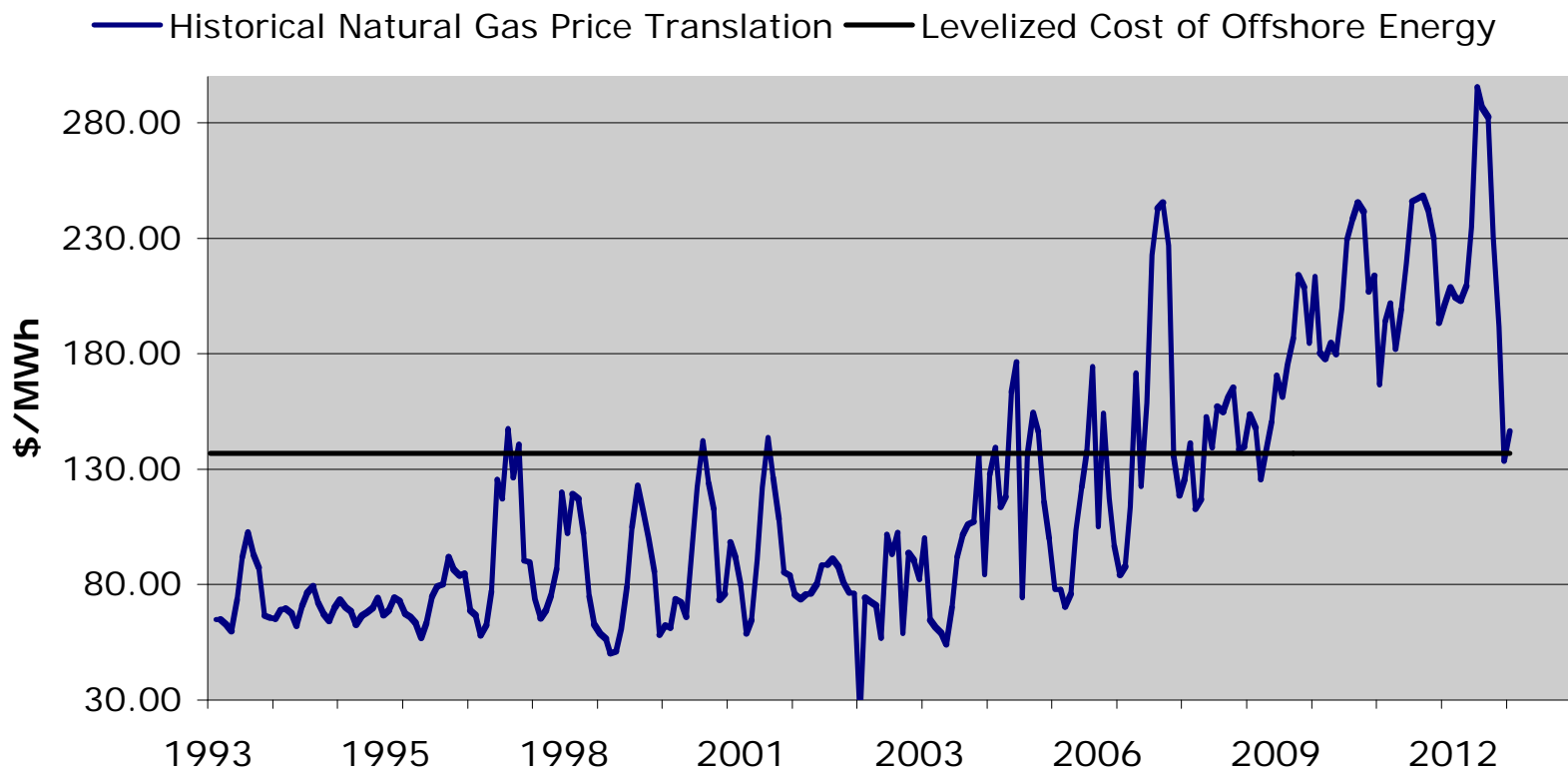
**not \$43M/yr as CW methods suggest*

Raises NPV by \$16M when taken into account



Hedge Against Volatility

Historical Rhode Island Electricity Trends Compared to Cost





Other Benefits

Global Warming

Economic Development

Business Certainty

Others?

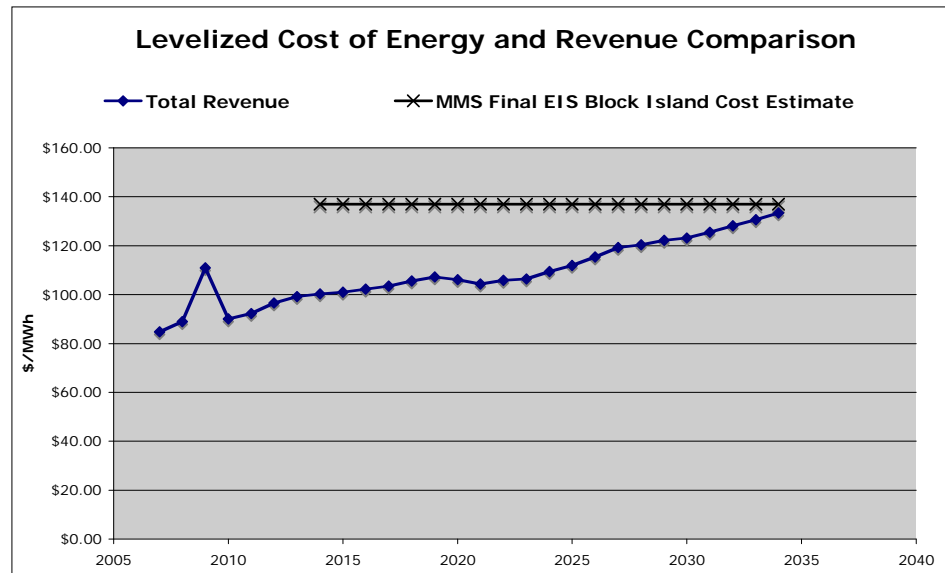


Conclusions

Externalities may compensate for premium cost of energy

Health savings, Volatility hedge, Economic development

Further study needed to quantify externalities



If further study is favorable, RI policy & regulations should enable development of the project



**Thanks again to those who
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