

“Effects of Wind Turbines on Property Values in Rhode Island”

Tuesday, December 17, 2013

6 – 7:30PM

University of Rhode Island, Kingston Campus
Kirk Auditorium



STATE OF RHODE ISLAND

**OFFICE OF
ENERGY RESOURCES**

RI Wind Siting: Background

- **The Office of Energy Resources (OER) is the primary lead agency on energy policy and programmatic matters for the State**
- **One of OER's roles is to assist the Division of Planning Statewide Planning Program (SPP) with renewable energy siting guidance**
- **SPP is statutorily required to develop renewable energy siting guidelines, including for wind**

RI Wind Siting: Current Status

- **June 2012:** SPP released “Interim Siting Factors for Terrestrial Wind Energy Systems”
- **December 2012:** The Renewable Energy Siting Partnership (RESP) out of URI produced a land-based wind resource assessment, siting analysis, and online siting decision support-tools

RI Wind Siting: Follow Up

- **Stakeholder input during the SPP and RESP processes recommended conducting further analysis on the acoustic impacts of wind turbines and impacts on property values**
 - The OER commissioned two follow up studies by URI researchers: an acoustics study and a property values study
 - The scopes of these studies were presented at a public stakeholder meeting in January 2013
 - The outcomes of these studies will help inform any further guidance from the State regarding wind energy siting

Today

- **URI Assistant Professor Corey Lang will present the findings of his study “The Effect of Wind Turbines on Property Values in Rhode Island”**
- **The acoustics study is anticipated to be complete during Q1 2014**
- **Following the conclusion of the acoustics study, OER and SPP will propose next steps on wind guidance to stakeholders**

The Effect of Wind Turbines on Property Values in Rhode Island

(final research findings)

Corey Lang

Wind Turbine Siting Public Stakeholder Meeting
December 17, 2013

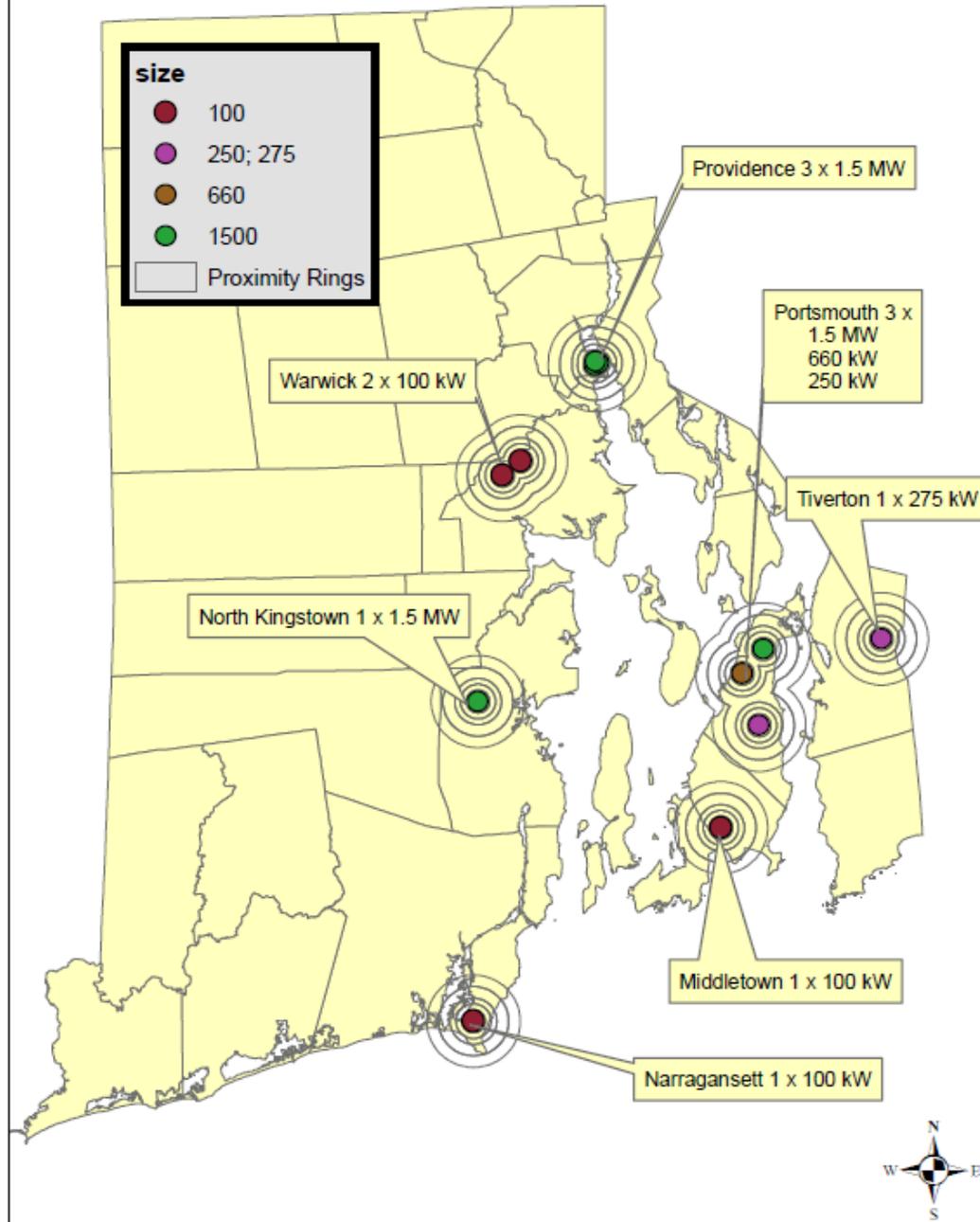
Plan for the talk

- Motivation
- Methodology
 - build intuition of methodology by looking at ocean proximity
- Results for Wind Turbine Analysis
 - Basic results, plus extensions
- Conclude

Motivation

- Onshore wind turbines erected in Rhode Island beginning in 2006
- Contentious issue
- Common concern is property values
- Property values act as an indicator of preferences for a given location
- Existing work typically looks at impact of wind farms – perhaps doesn't fit Rhode Island

Rhode Island Wind Turbines



Methodology

Design model to examine how house prices change when turbine is sited/constructed.

Null hypothesis: Turbines have no impact on property values

Alternative hypothesis: Turbines have a negative impact on property values.

Methodology

Develop a model that analyzes how house prices vary with respect to:

- Three time periods:
 - Pre-announcement (PA) vs. post-announcement/pre-construction (PAPC) vs. post-construction (PC)
- Five distance bands
 - 0-0.5 miles, 0.5-1 miles, 1-2 miles, 2-3 miles, 3-5 miles
- Additional heterogeneity
 - Characteristics of the turbine and site (capacity, industrial v. residential area)
 - Viewshed

Methodology

Develop a model that controls for:

- Housing unit characteristics (bedrooms, bathrooms, living area, lot size, fireplace, age, view of the water, distance from the ocean)
- Unobserved factors at the neighborhood (census tract) level
- Price fluctuations by city

Methodology

Treatment and Control

- Treatment: close proximity during post-announcement/pre-construction and post-construction phase
- Control: 1) pre-announcement and 2) non-proximate houses
 - Important due to housing market bust

Housing Data

- Arms-length transactions between January 2000 and February 2013
- Owner-occupied, single family homes
- Within 5 miles of a turbine
- Results in a sample of 48,554 observations

Transaction counts and proportions by distance and time period

Distance Interval (miles)	PA	PAPC	PC	TOTAL
0 - 0.5	435	75	74	584
	1.2%	1.0%	1.4%	1.2%
0.5 - 1	1979	353	338	2670
	5.5%	4.9%	6.4%	5.5%
1 - 2	6120	1180	942	8242
	17.0%	16.3%	17.8%	17.0%
2 - 3	10116	1877	1599	13592
	28.1%	25.9%	30.3%	28.0%
3 - 5	17375	3765	2326	23466
	48.2%	51.9%	44.1%	48.3%
TOTAL	36025	7250	5279	48554
	100%	100%	100%	100%

Methodology – Narragansett example

- Examine ocean proximity in Narragansett
- Build a model that includes proximity to ocean, housing characteristics, and time variables to control for price fluctuations
- Natural log of sales price is the dependent variable
 - Interpretation of model coefficients is in percent

Housing Market Analysis for Narragansett, RI

Variable	Coef (s.e.)
within 1/4 mile of coast	0.212 (0.014)***
lotsize (acres)	0.293 (0.025)***
lotsize squared	-0.015 (0.002)***
living area (000s square feet)	0.393 (0.027)***
living area squared	-0.034 (0.004)***
number of bedrooms	0.007 (0.009)
number of bathrooms	0.068 (0.013)***
number of half bathrooms	0.063 (0.015)***
central AC	0.082 (0.015)***
R-squared	0.612
Observations	2969

Houses within 1/4 mile of the coast are worth 21% more than those not within 1/4 mile, all else equal. With 90% confidence, the premium is between 18.9% and 23.5%.

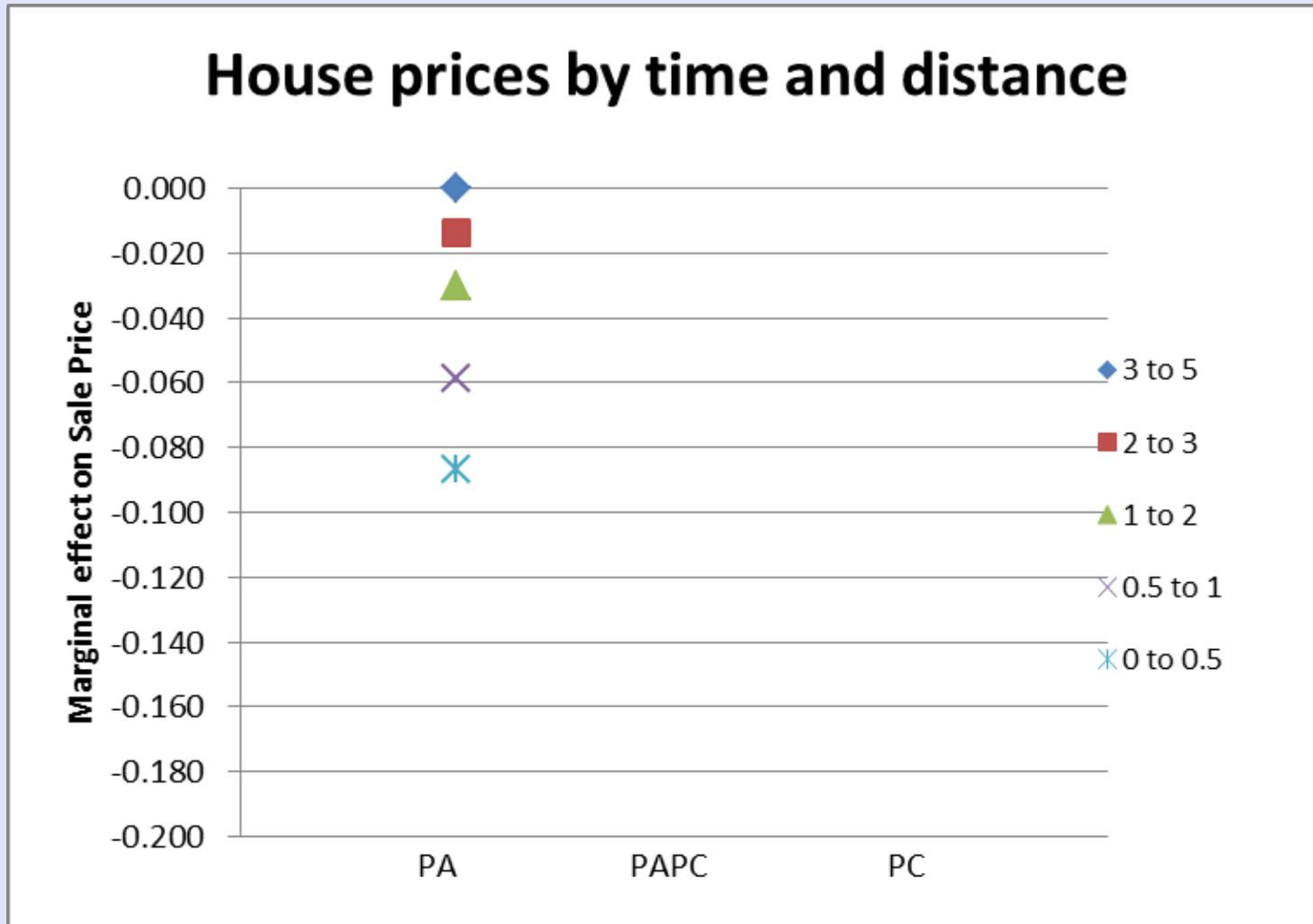
Houses with larger lots are worth more than those with smaller lots, but price increase diminishes with size, all else equal.

Houses with central AC are worth 8.2% more than houses without, all else equal.

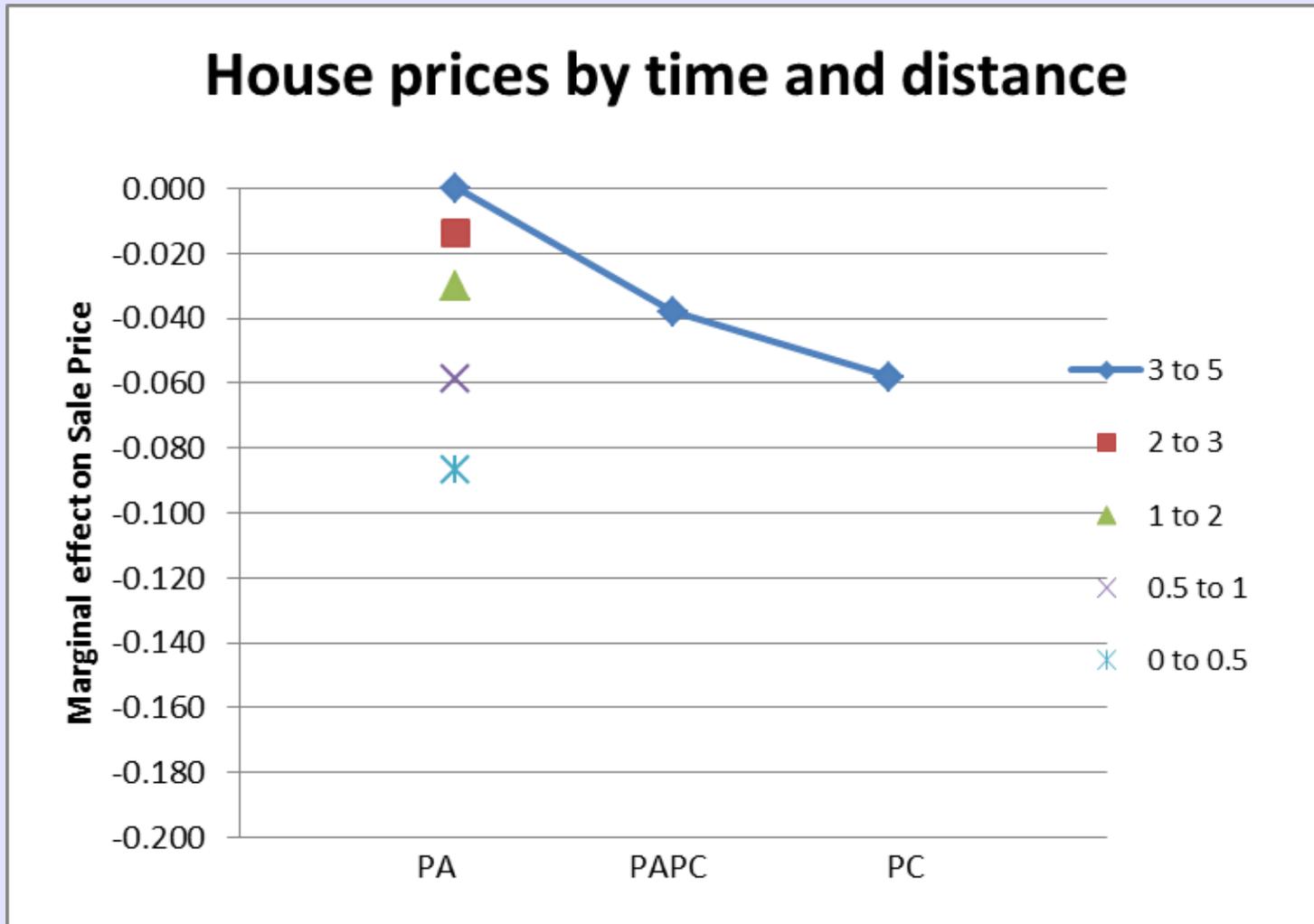
Narragansett Price Index Resulting from the Model



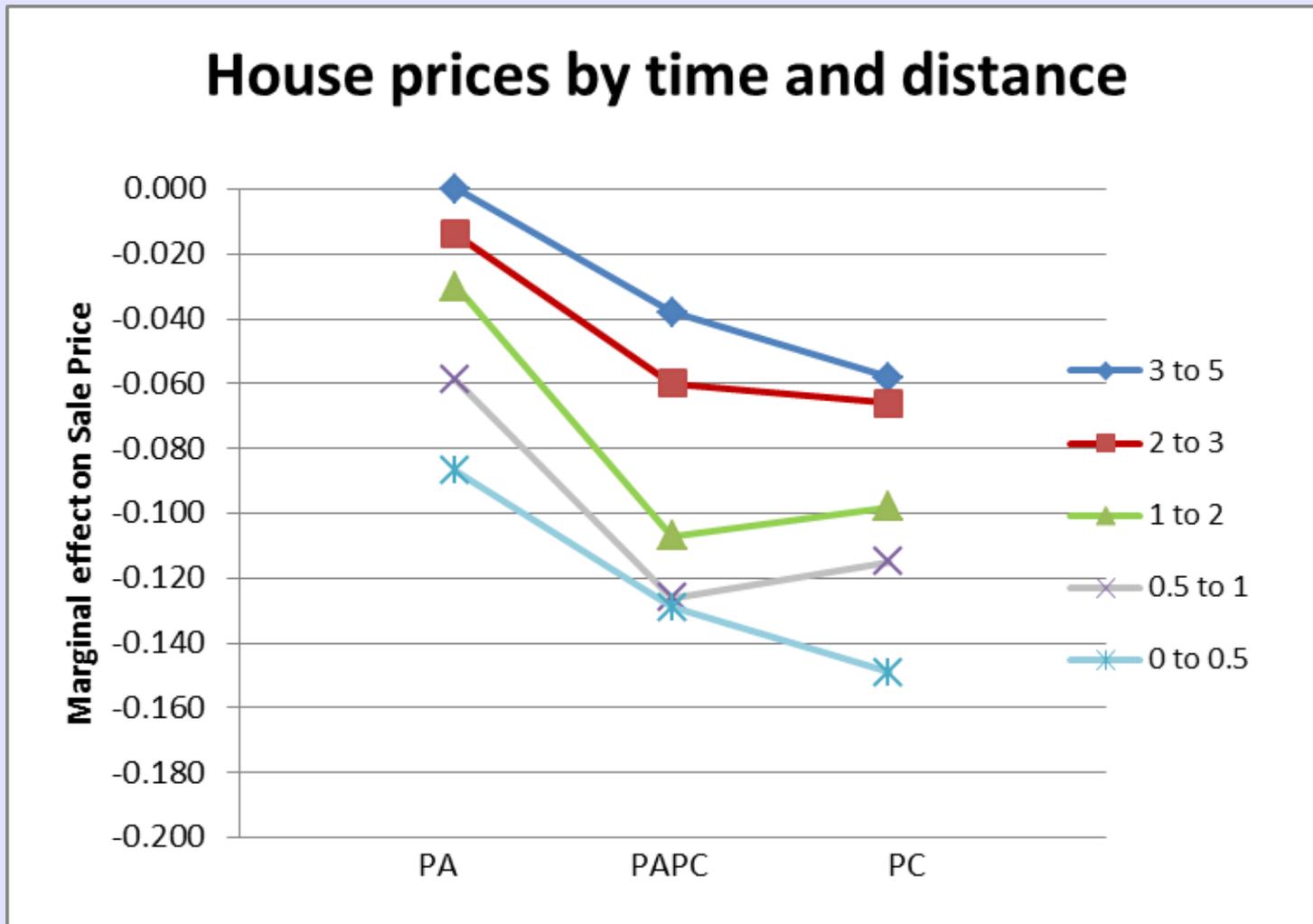
Results – Proximity to turbines



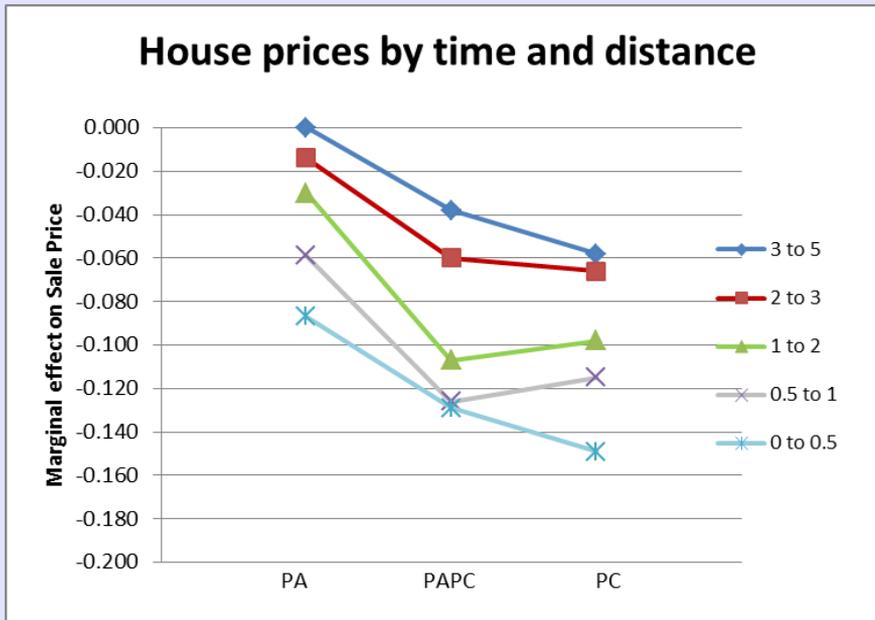
Results – Proximity to turbines



Results – Proximity to turbines



Results – Proximity to turbines



The price trends for houses in close proximity are similar to houses further away.

Price differentials between distance bands are similar for PA and PC

Impact of Turbines by Proximity

2 - 3 miles	PAPC	-0.008 (0.018)
	PC	0.006 (0.015)
1 - 2 miles	PAPC	-0.039 (0.036)
	PC	-0.010 (0.018)
0.5 - 1 miles	PAPC	-0.029 (0.028)
	PC	0.002 (0.030)
0 - 0.5 miles	PAPC	-0.004 (0.054)
	PC	-0.004 (0.038)
Observations		48554
R-squared		0.760

No treatment effect for 2-3 miles (expected)

Treatment effect for 0.5 to 1 mile indicates price drop of 2.9% pre construction and 0.2% increase post construction – both are statistically indistinguishable from zero.

Treatment effect for 0 to 0.5 mile indicates price decrease of 0.4% post construction, but is statistically indistinguishable from zero.

Results – Proximity to turbines

Bounding effects

- What magnitude of negative effects can we rule out?

proximity band	time period	point estimate	lower bound (with 90% confidence)
0.5 to 1 mile	post construction	0.2%	-3.6%
0 to 0.5 mile	post construction	-0.4%	-5.2%

- Effect of proximity to turbines is statistically unlikely to be worse than -5.2%.
- Claims of 50% drop in home value are statistically inconsistent with the observed data.

Results – Heterogeneity

- Is the price impact different for industrial sized turbines versus smaller turbines? Or for turbines in rural/residential areas versus urban/industrial areas?



Results – Heterogeneity

		Capacity ≥ 660 kW	Primarily residential
0 - 0.5 miles	PAPC	0.084 (0.044)*	-0.034 (0.126)
	PC	0.043 (0.101)	0.078 (0.115)
Observations		23776	8206

- Point estimates are positive, but standard errors are large.

Results – Viewshed

- Are there different property value impacts based on what you can see from the property?



Results – Viewshed

The impact of viewshed on property values

Variables		(1)	(2)
0 - 0.5 miles	PAPC	-0.004 (0.054)	-
	PC	0.003 (0.059)	-
View of turbine	None (omitted)	-	-
	Minor	0.021 (0.072)	0.020 (0.066)
	Moderate	0.080 (0.125)	0.082 (0.124)
	High	-0.044 (0.172)	-0.042 (0.144)
	Extreme	-0.016 (0.069)	-0.012 (0.050)

Neither model shows statistical evidence that viewshed affects price.

Results

Additional results

- Examined shadow flicker
 - Too few observations
- Repeat Sales
 - Similar to main results

Conclusions

- Results are consistent with the null hypothesis (no impact on property values)
- Results are consistent with recent LBNL report
 - Ben Hoen et al. (2013)
- However, there is a degree of statistical uncertainty
 - Small time window post construction
- As time goes on, if OER and stakeholders think it has value, we can update these estimates with more sales

Next Steps

- The property values study will be available on OER's website this week: www.energy.ri.gov
- The acoustics study is anticipated to be complete during Q1 2014
- A public meeting will be scheduled to present the results of that study
- Following the conclusion of the acoustics study, OER and SPP will propose next steps on wind guidance to stakeholders
- Questions? Email danny.musher@energy.ri.gov