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**Disclosure: Paul Gipe has worked with Aerovironment, ANZSES, APROMA, ASES, AusWEA, AWEA, BWEA, BWE, CanWEA, CAW, CEERT, DGW, DSF, EECA, ES&T, GEO, GPI Atlantic, IREQ, KWEA, MADE, Microsoft, ManSEA, MSU, NRCan, NRG Systems, NASA, NREL, NZWEA, ORWWG, OSEA, PG&E, SeaWest, SEI, TREC, USDOE, WAWWG, WE Energies, the Folkecenter, the Izaak Walton League, the Minnesota Project, the Sierra Club, and Zond Systems, and written for magazines in the USA, Canada, France, Denmark, and Germany.**



Skystream, Alexandria, Indiana

# Feed-in Tariffs for Small Wind Turbines Becoming a Reality

by Paul Gipe

Paul Gipe, [wind-works.org](http://wind-works.org)

# Advanced Renewable Tariffs

- **What Are They?**

**Feed-in Tariffs or Minimum Price Systems**

**Political Price, Not Political Quota**

- **How Do They Work?**

**Price Differentiation**

- **Where?**

**Germany, France,**

**Spain . . .**



# Renewable Tariff Design

- Simple, Comprehensible, & Transparent
- Priority Access & Purchase
- Prices Sufficient for Development
- Lengths Sufficient for Profitability
- Fair But Not Undue Profit
- Price Differentiation

Paul Gipe, [wind-works.org](http://wind-works.org)

Altamont Pass, California

# Myths to Dispel

- Renewables are Free or Cheap
- Net Metering Works Outside California

Paul Gipe, [wind-works.org](http://wind-works.org)

Husum, Germany



# Renewable Tariffs in North America .. Unthinkable?

- Yes--Just 4 years ago
- Today? No
- Now Possible

Paul Gipe, [wind-works.org](http://wind-works.org)

WindShare, Toronto



# The Mood Has Changed

- Ontario Moved First with RESOP
- Ontario Again Moving First with GEA
- Growing Trend in both USA & Canada



# Michigan's Proposed Renewable Energy Sources Act

**All Renewables**

**Term: 20 Years**

**Differentiated Tariffs for Wind**

**Small Wind Tariff**

**Differentiated Tariffs for PV**

**Tariffs Reduced with Federal  
Subsidies**

Paul Gipe, [wind-works.org](http://wind-works.org)



Machinac City, Michigan



# Proposed Small Wind Tariffs

- **MI: \$0.25/kWh**  
    <15 m diameter (2,000 ft<sup>2</sup>)
- **MN: \$0.25/kWh**  
    <10 m diameter (1,000 ft<sup>2</sup>)
- **Payments Go to Consumer**  
    Not to Manufacturer or Dealer  
    Payment Only for Performance  
    Necessary Step for Small Wind



# Skystream Cost of Energy Assumptions

- **\$13,500 Installed**
- **Yield from SWP Estimates\***
- **Annual Reoccurring Expenses: 4%**
- **6 m/s**

**\* Not Independently Verified.**



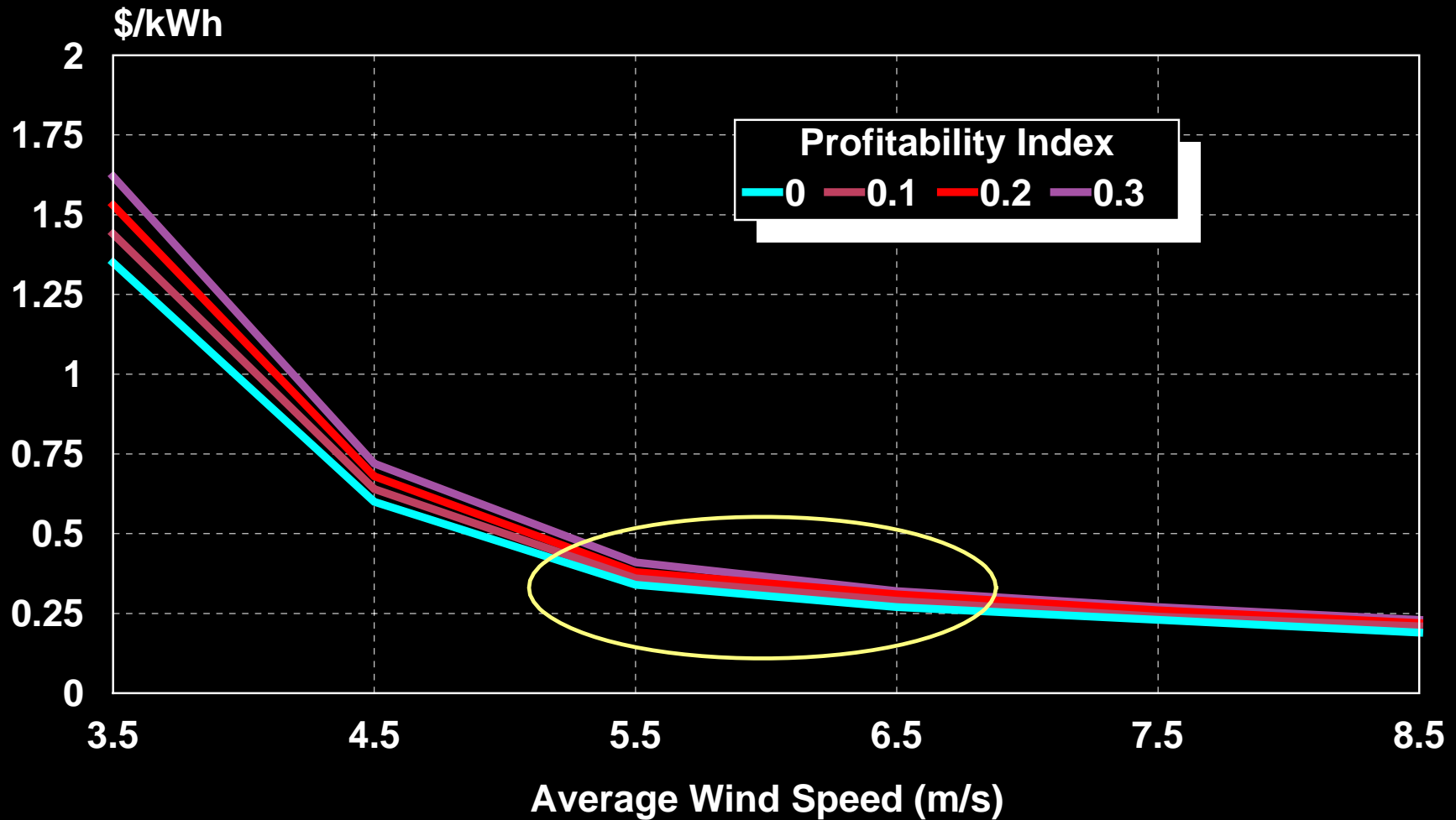
# Skystream Cost of Energy Chabot Profitability Index Method

<b>Average Weighted Cost of Capital <u>Before Tax</u></b>			
Equity			20%
Return on Equity	ROE		13.0%
Debt			80%
Interest on Debt			6.94%
Nominal AWCC			0.0815
Inflation			3.0%
AWCC real	t		5.0%

# Skystream Cost of Energy Chabot Profitability Index Method

Rotor Diameter	3.7	11	m2
Installed Cost	I	\$13,500	
Specific Installed Cost	Ius	\$1,256	\$/m2
Annual Expenses	Kom	4.0%	
Term	n	20	years
Discount Rate (AWCC)	t	5.0%	real
Specific Yield	Eas	446	kWh/m2/y
Capital Recovery Factor (n,t)	Kd	0.0802	
Profitability Index Target	PI	0.3	NPV/I
Cost of Energy	T1	\$0.406	\$/kWh
Simple Payback	SPBT	9.6	years

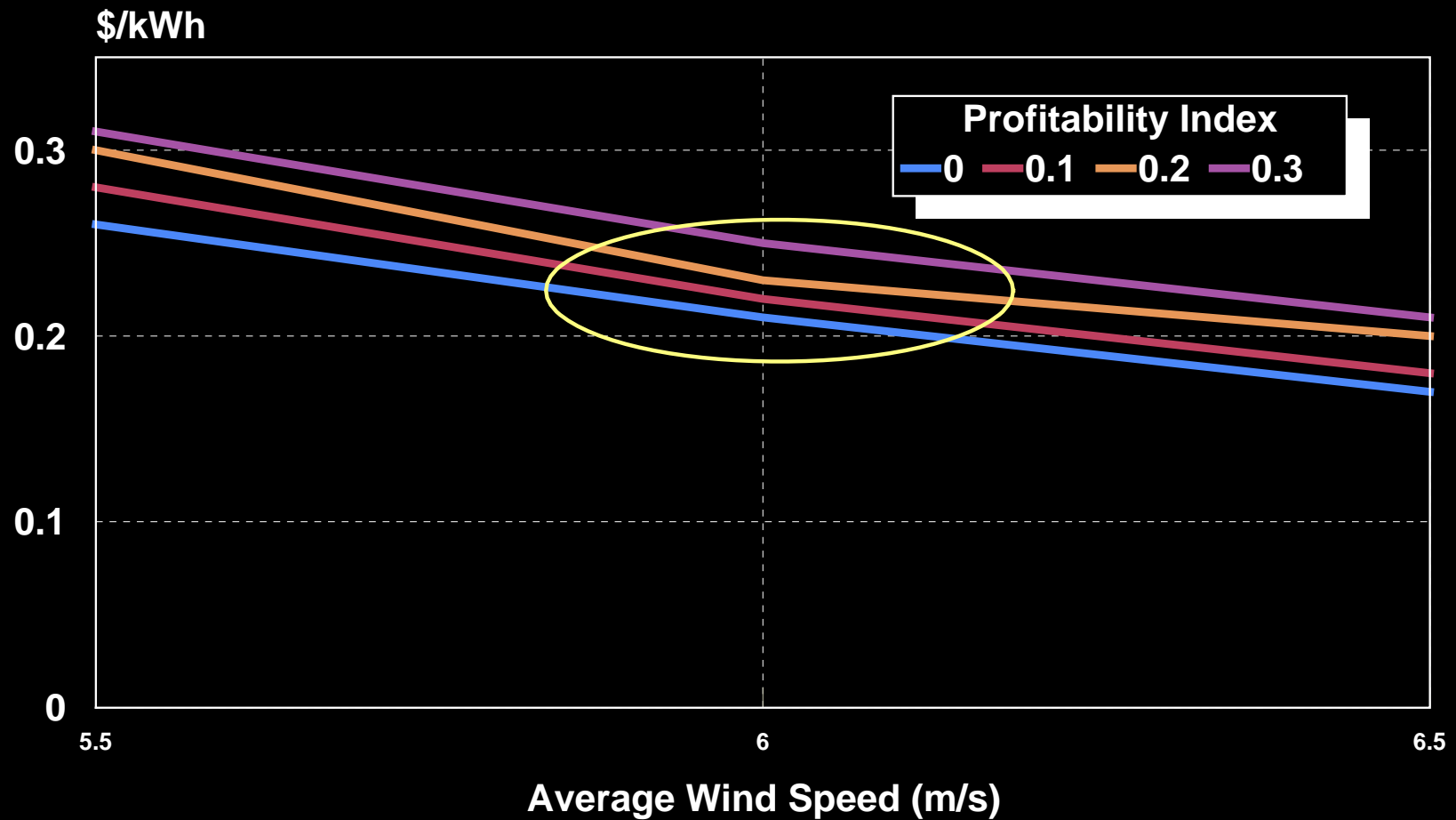
# Skystream Cost of Energy



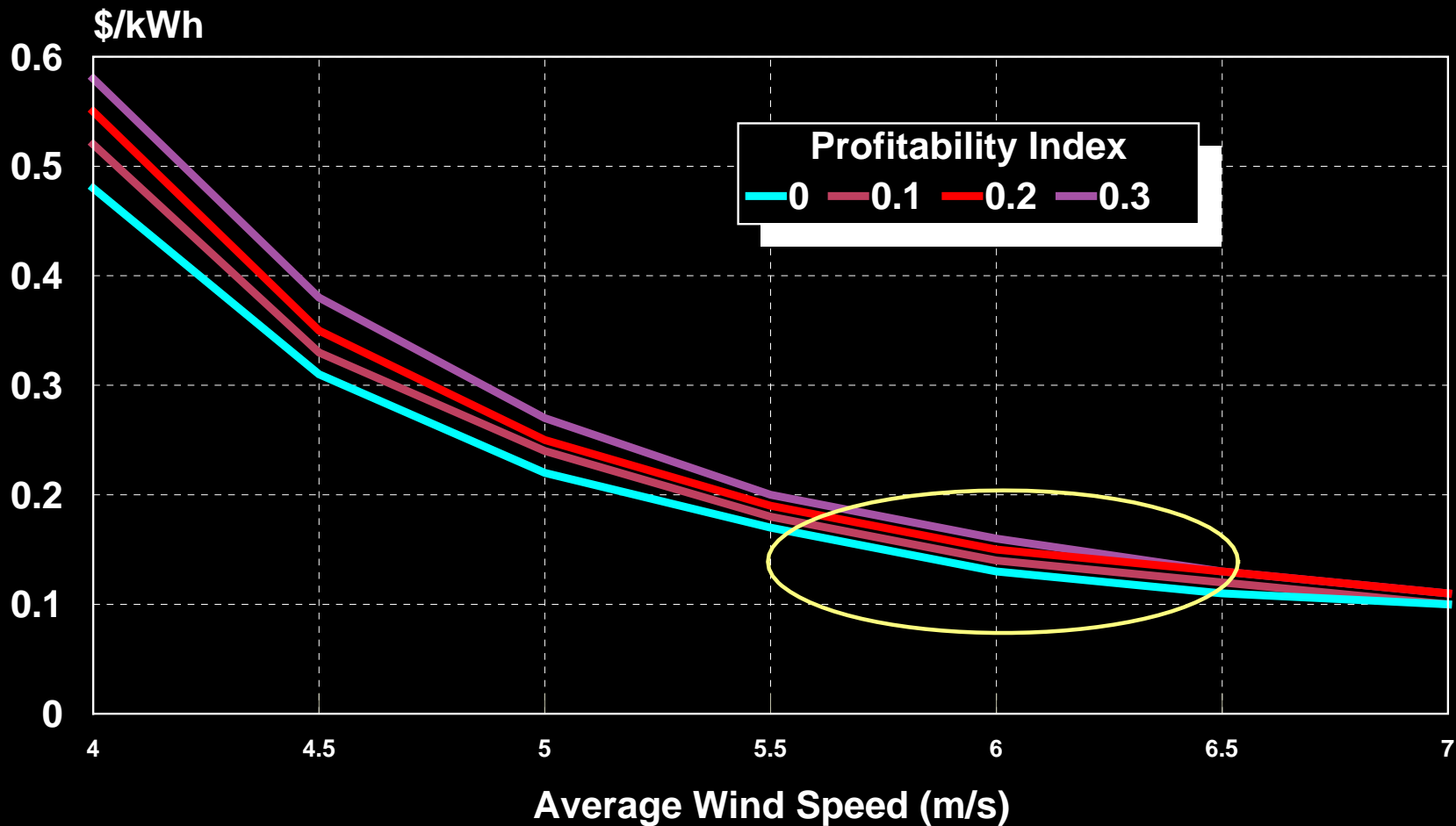
# Entegrity Cost of Energy Assumptions

- **\$205,000 Installed**
- **Yield from Entegrity Estimates**
- **Annual Reoccurring Expenses: 4%**

# Entegrity Cost of Energy \$0.25/kWh



# Used 17 m Cost of Energy \$750/m<sup>2</sup>, \$0.16/kWh





# Proposed Small Wind Tariff

- **Cost of Generation Plus Profit**  
\$0.25/kWh Reasonable Compromise
- **Limitation on “Excessive” Profit**  
Size Cap:  $<10\text{ m (1,000 ft}^2\text{)}$   
Availability of 15m Used Turbines  
Entegrity Only New 15 m Product

# Existing World Small Wind Tariffs

	Years	€/kWh	CAD/kWh	USD/kWh
Italy <200 kW	15	0.300	0.489	0.399
Israel <15 kW	20	0.297	0.485	0.395
Israel <50 kW	20	0.232	0.379	0.309
Switzerland <10 kW	20	0.131	0.214	0.174

# Existing North American Small Wind Tariffs

	Years	€/kWh	CAD/kWh	USD/kWh
Washington Out State	6	0.090	0.147	0.120
Washington in State	6	0.309	0.503	0.410
Wisconsin, Xcel	10	0.050	0.081	0.066
Wisconsin, MG&E	10	0.046	0.075	0.061

# Proposed Small Wind Tariffs

	Years	€/kWh	CAD/kWh	USD/kWh
Michigan <2,000 ft <sup>2</sup>	20	0.188	0.307	0.250
Minnesota <1,000 ft <sup>2</sup>	20	0.188	0.307	0.250
Vermont <15 kW	20	0.151	0.246	0.200
IP&L >50 kW <100 kW	10	0.105	0.172	0.140

# Ontario Small Wind Tariffs

- **Minister of Energy Announcement**  
April 24, 2009 Press Release
- **Probably Begin Discussions**  
Late This Year or Early 2010
- **Little Organizational Support**
  - CanWEA?**  
Not a Priority
  - NGOs?**  
Not Likely to Invest Time
  - Dealers?**  
Few and Far Between

Gaspé Peninsula, Quebec

# No Time for Half-Measures

## No Time to Lose

Paul Gipe, [wind-works.org](http://wind-works.org)



# Renewable Tariffs-- New Policy Option for North America

[www.wind-works.org](http://www.wind-works.org)

Manawatu Gorge, New Zealand

Paul Gipe, [wind-works.org](http://wind-works.org)

Skystream, Alexandria, Indiana



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