Wind Turbines

Building Wind Turbines Since 1979

Worldwide Leader in Installed Capacity

Thomas Mills, Aeronautical Engineer

Susan Innis, Senior Manager Government Relations

Wind Turbines

V-82 1.65 MW Technology

Proven Design, Workhorse of Fleet

Storage and Upgrades Prior to Service

Wind Turbines

Operational Safety

Emergency Planning Consideration

Falmouth WWTF Wind 1&2 Operation and Emergency Response Planning

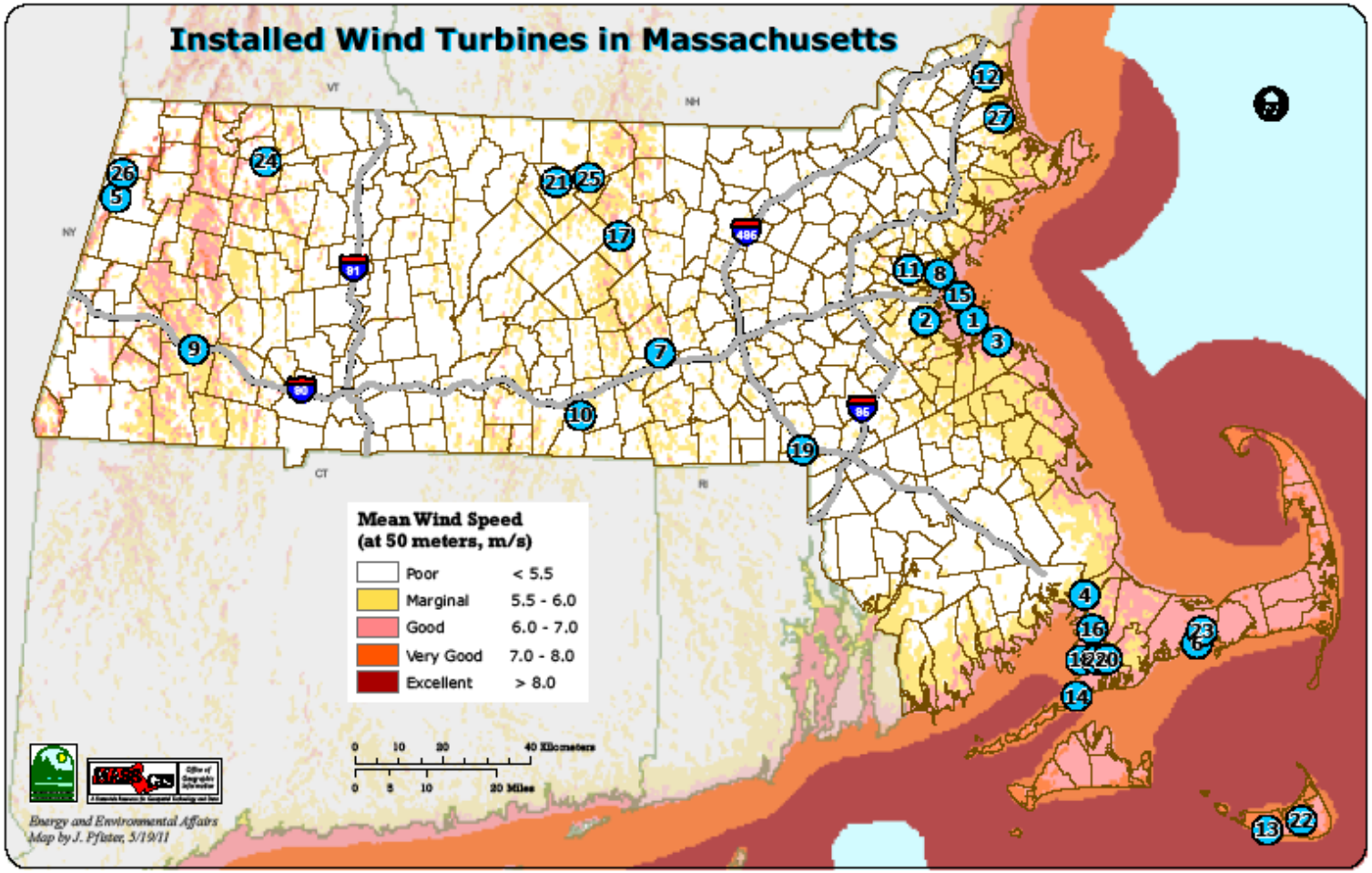
MA Wind Turbines

40 Large Scale Wind Turbines totaling 39.6 MW at 27 locations are now operating in MA with no safety related turbine incidents reported

Turbines have been operating in MA now for 10 years

These include turbines which are ~500 feet from residential homes (Hull); next to schools (Bourne and Hull) and at a ski area (Jiminy Peak) where snow is present all winter

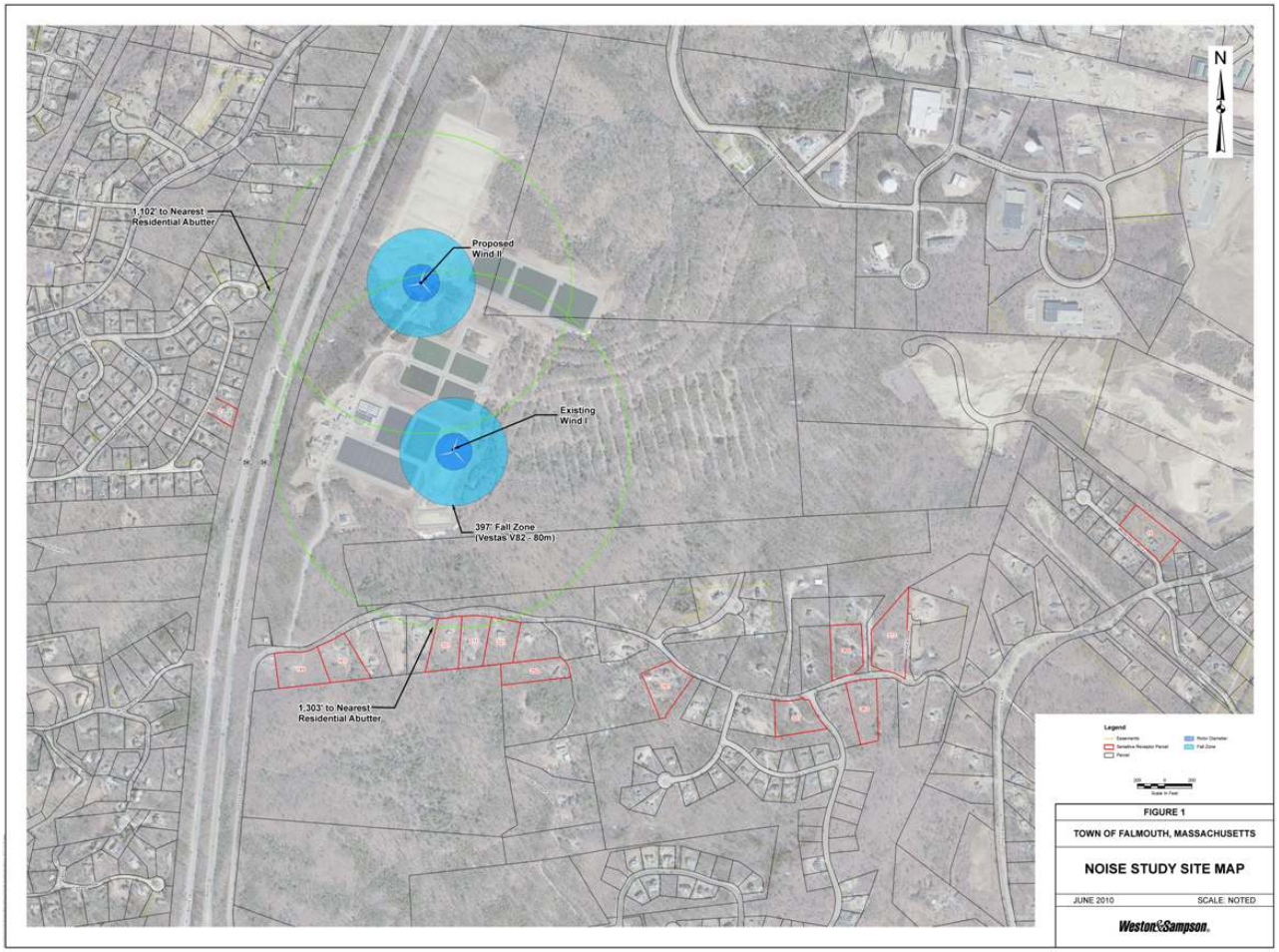
MA Wind Turbines



MA Wind Turbines

About 35 Cities and Towns in MA have passed wind turbine siting ordinances which range from 1.0 to 1.5 x structure height as appropriate safety set back

Town of Falmouth Turbines



Town of Falmouth Turbines

Public has no access to be close to turbines

Wind I is set back 1,303 feet from nearest resident and Wind II is set back 1,138 feet to nearest resident

Town has an Emergency Management Plan for the facility and local Police, Fire Rescue were included in training on hazards associated with the wind turbines

Wind I has not resulted in sound impacts greater than 10 dBA above background at any receptors

Project Economics

Project Costs

Wind I $4.98M – GOB, Loan with P&I payments

Wind II $4.89M – ARRA, Grant funded through SRF

Project Economics

Wind Project Costs (Estimated FY 2012*)

Bond Repayments	$360,000 per year
Service, O&M, other	$ 85,000 per year
Total Cost	$445,000 per year

REC Contract with Cape Light Compact Years 1-5
REC Contracts with MassCEC for Years 6-20
REC Contracts have penalties for failure to deliver
* Excludes Capital and Operation Reserves

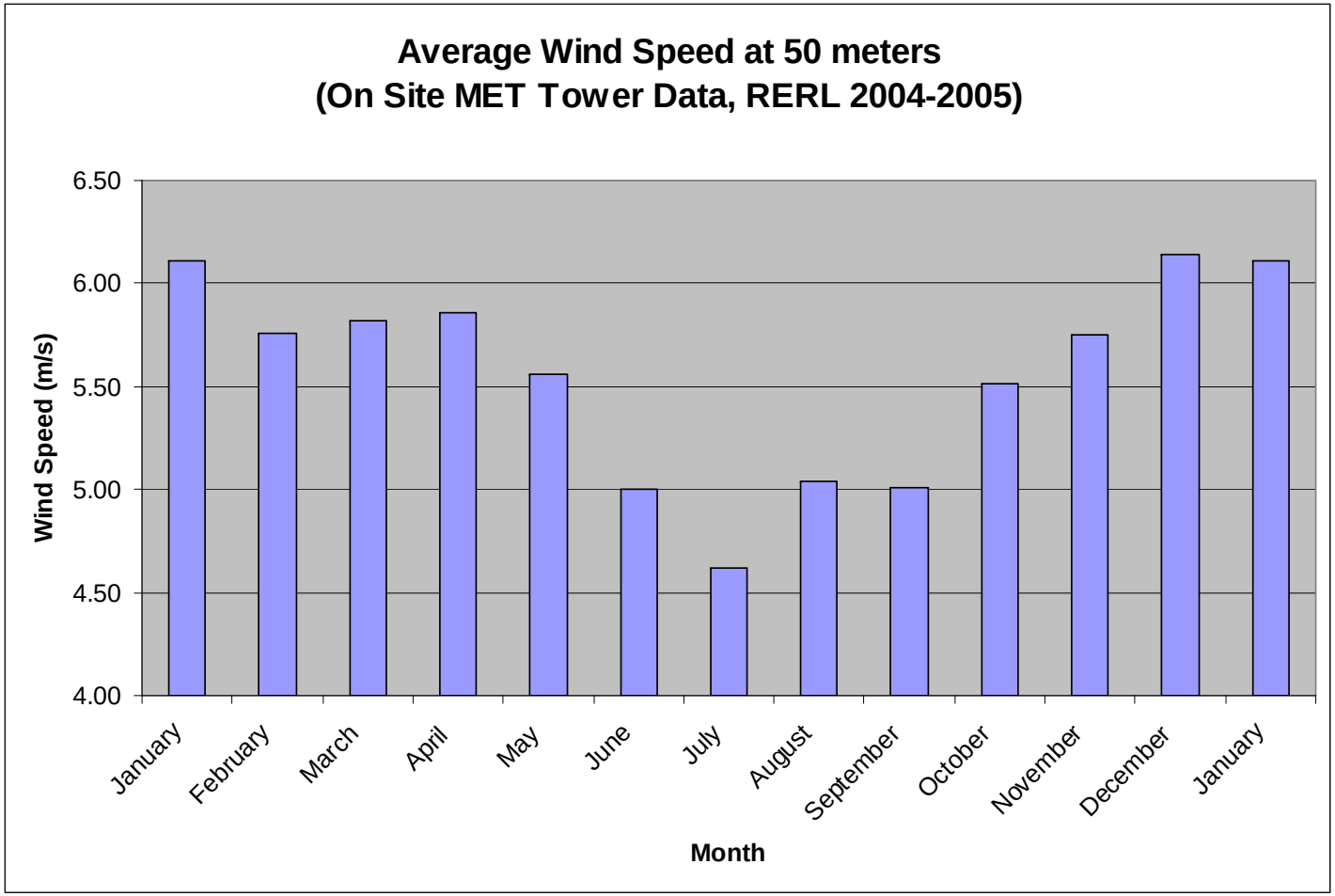
Project Economics

Energy Production Based on Wind Speed

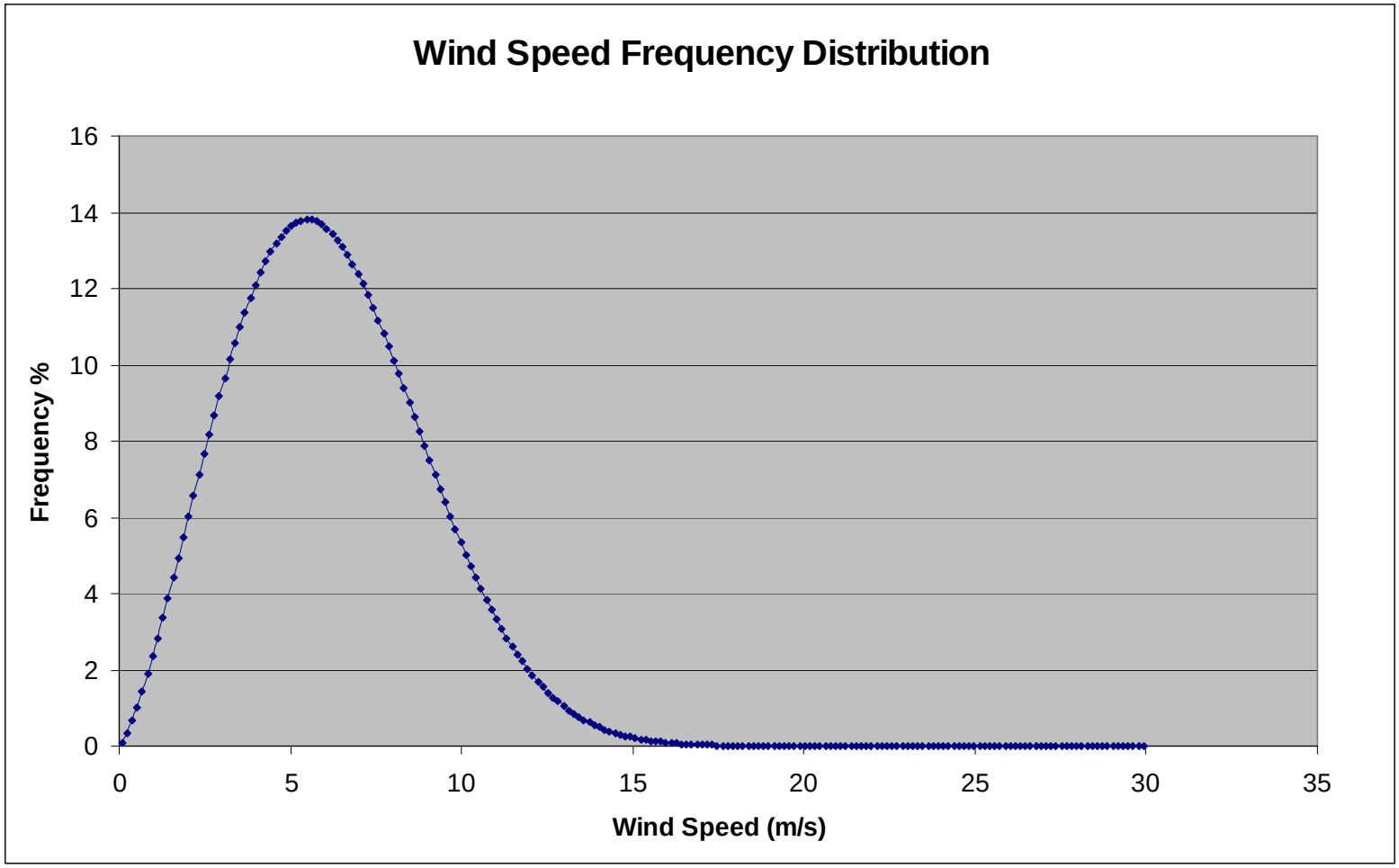
Wind Speeds Measured On Site RERL

Forecast Based on Wind and Power Curve

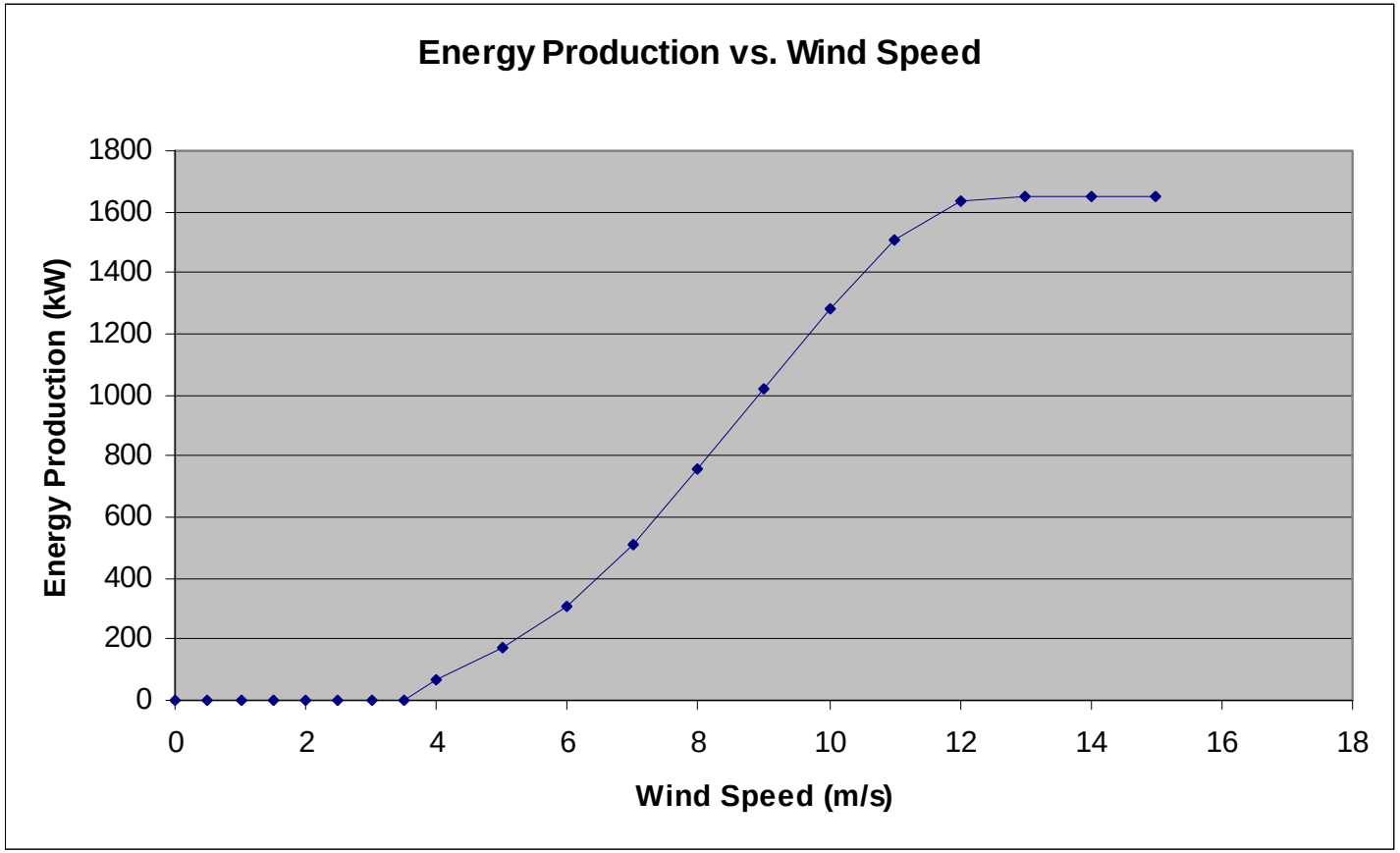
Site Wind Speed



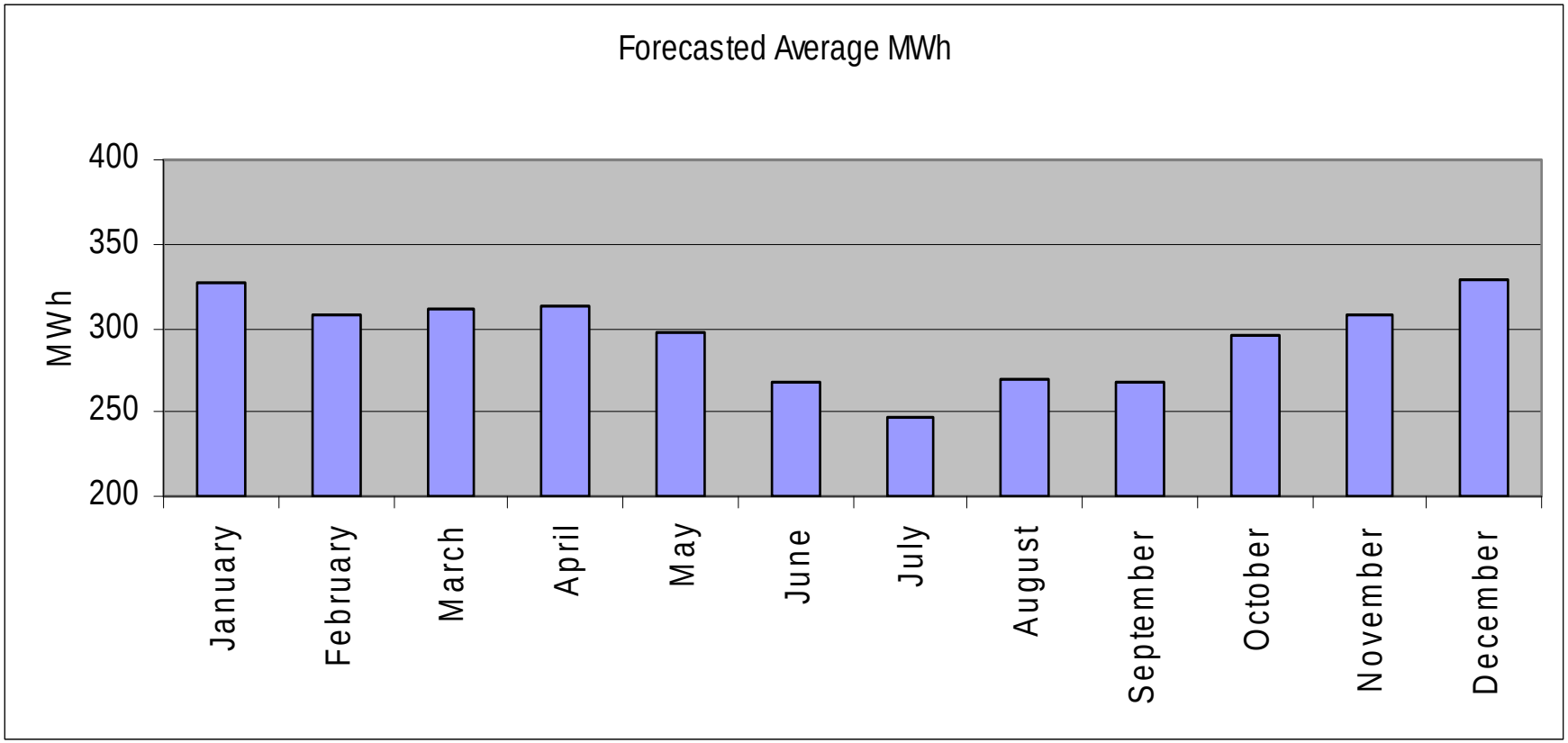
Frequency Distribution



Turbine Power Curve



Production Forecast



3,542 MWh Annually

Value of Wind I Production

Kilowatt hours (kWh) – output over time

Renewable Energy Certificates (REC)

1,000 kWh = 1 MWh = 1 REC

3,542,000 kWh = 3,542 MWh = 3,542 REC

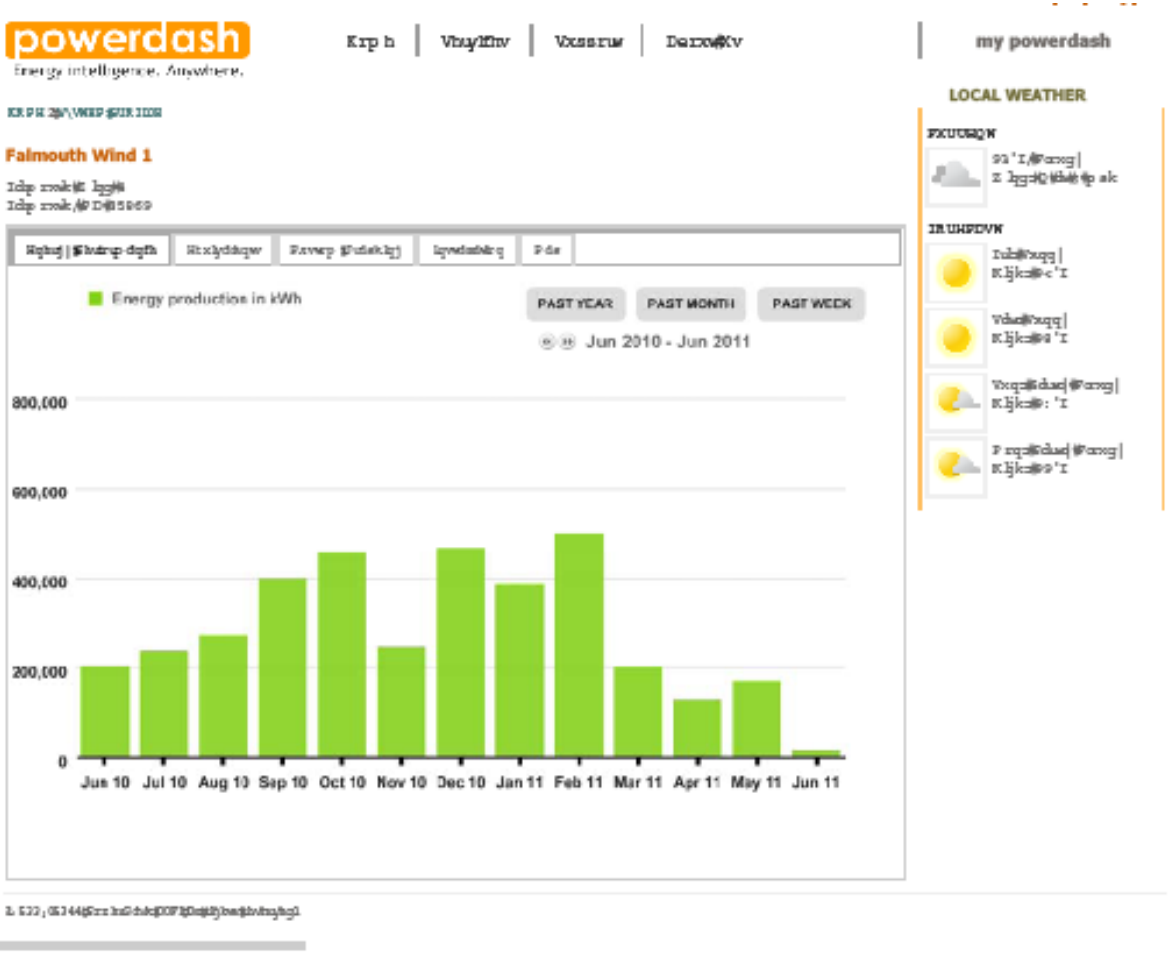
Value of Wind I Production

REC		$ 45 MWh (0.045kWh)
MWh		$105 MWh (0.105 kWh)
Total		$150 MWh (0.150 kWh)
	x	3,542 MWh
	=	$531,300 year

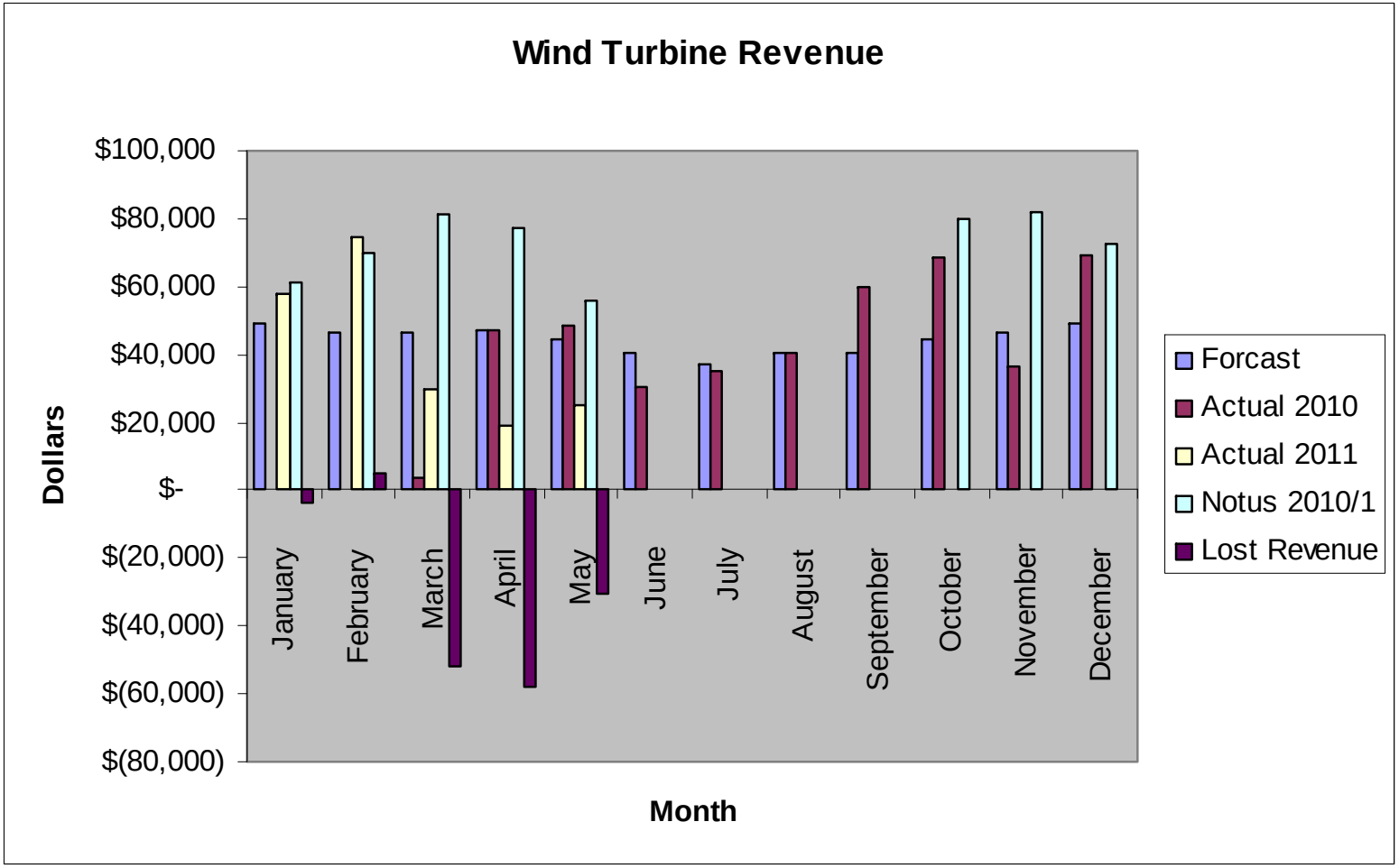
Value of Wind II Production

REC		$TBD MWh (0.015 kWh)
MWh		$105 MWh (0.105 kWh)
Total		$120 MWh ~(0.120 kWh)
	x	3,542 MWh
	=	$425,040 year

Actual Production



Actual Production



Impact of Wind I Curtailment

Month	Forecasted Average MWh	Falmouth 2011 MWh	Notus 2011 MWh	"Lost" Production MWh
January	327	384	408	
February	308	498	466	
March	311	199	543	344
April	314	128	515	387
May	298	168	373	205
YTD Total	1,558	1,376	2,305	929

Impact of Wind I Curtailment

Forecast Jan-May	1,558 MWh	x $150	=	$233,700
Actual Jan-May	1,376 MWh	x $150	=	$206,400
YTD Of Forecast	- 182 MWh	x $150	=	($ 27,300)
Lost Revenue Jan-May	- 929 MWh	x $150	=	($139,350)
Full Year Impact	- 1,083 MWh	x $150	=	($162,450)

Recommendations

Increase Cut-In Speed of one turbine to 8 meters per second between the hours of 12 midnight and 3 am.

Control strategy expected to keep project within noise standards; will results in loss of ~ 174 MWh = $26,100

Increasing number of hours from 11 pm to 5 am results in forecasted loss of ~ 825 MWh = $123,750

Other mitigation strategies can be evaluated case by case