

# *Fairhaven Wind LLC: Presentation to the Board of Selectmen*

August 8, 2016

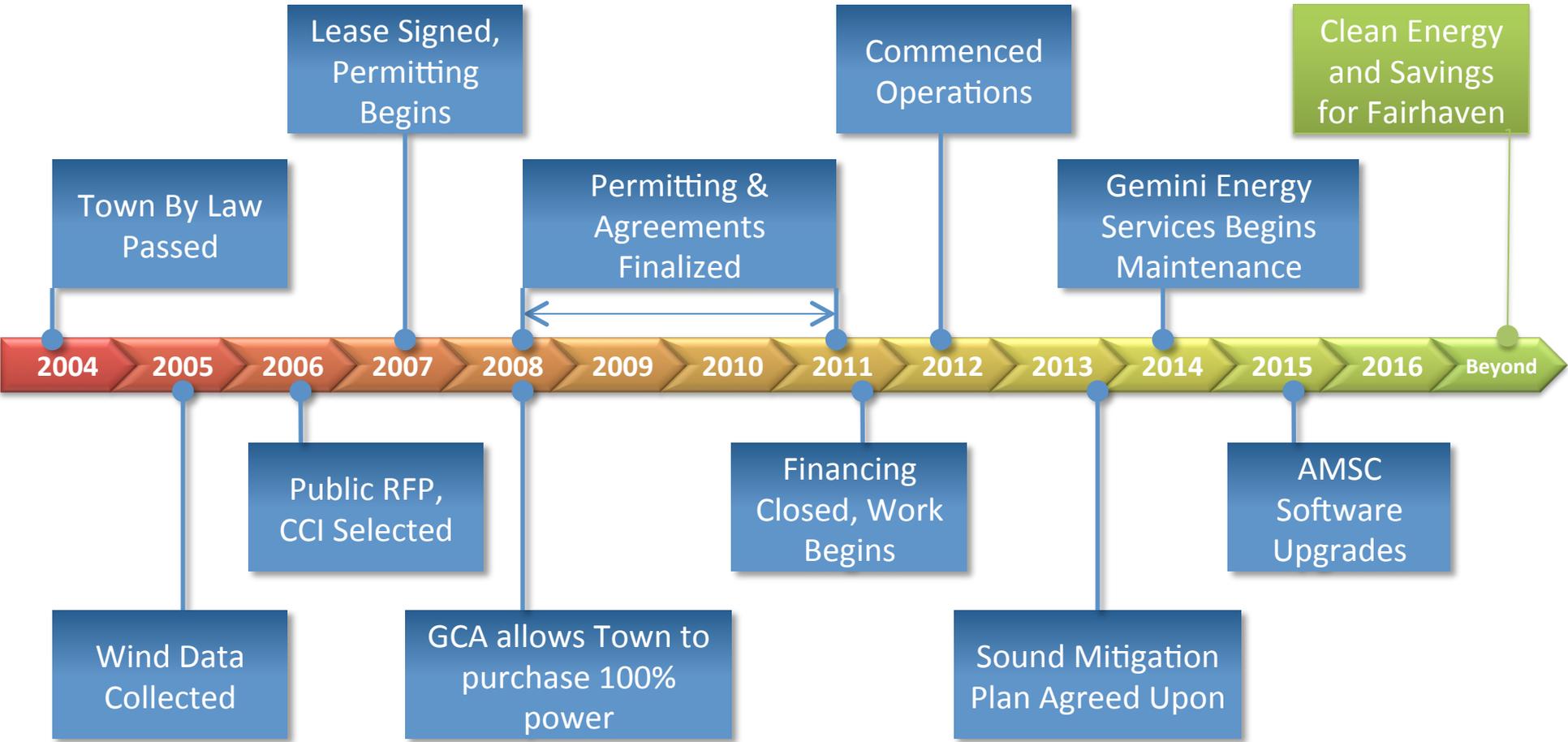


# Fairhaven Wind Benefits to Date

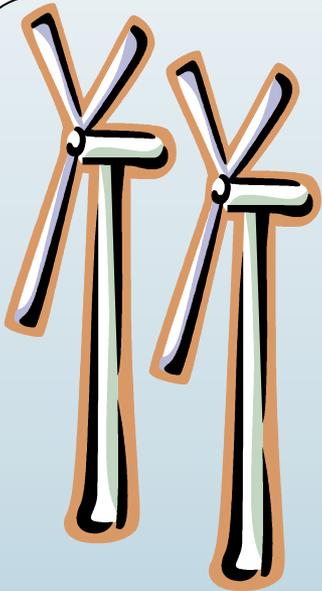
## Summary

- **23 million** kilowatt hours of Electricity
- **17,817 Tons** of Carbon Dioxide Eliminated
- Over **\$1.066 Million** in Net Income for the Town of Fairhaven
- Equals average annual salaries for **16 Teachers**

# History of Fairhaven Wind



# Fairhaven Environmental Benefits



23 million  
kWh

of Electricity  
produced by these  
turbines to date



35,635,185 lbs  
of Carbon Dioxide  
(CO<sub>2</sub>)



3,414  
Cars removed from  
the road for a year



1,571,766 gal  
of oil consumed per  
year



1707  
Homes powered by  
these turbines

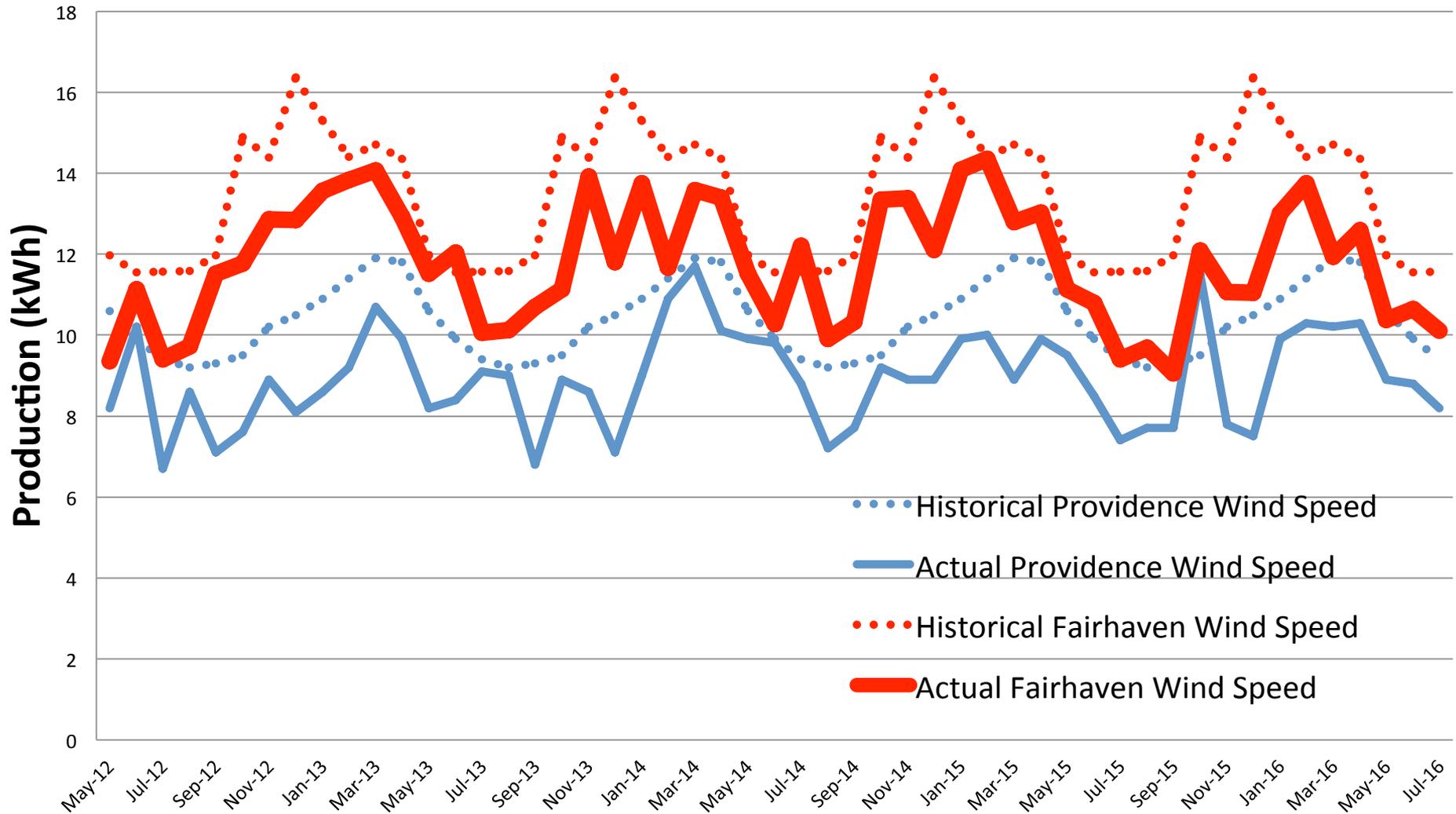


86.1  
Railroad cars of coal  
consumed

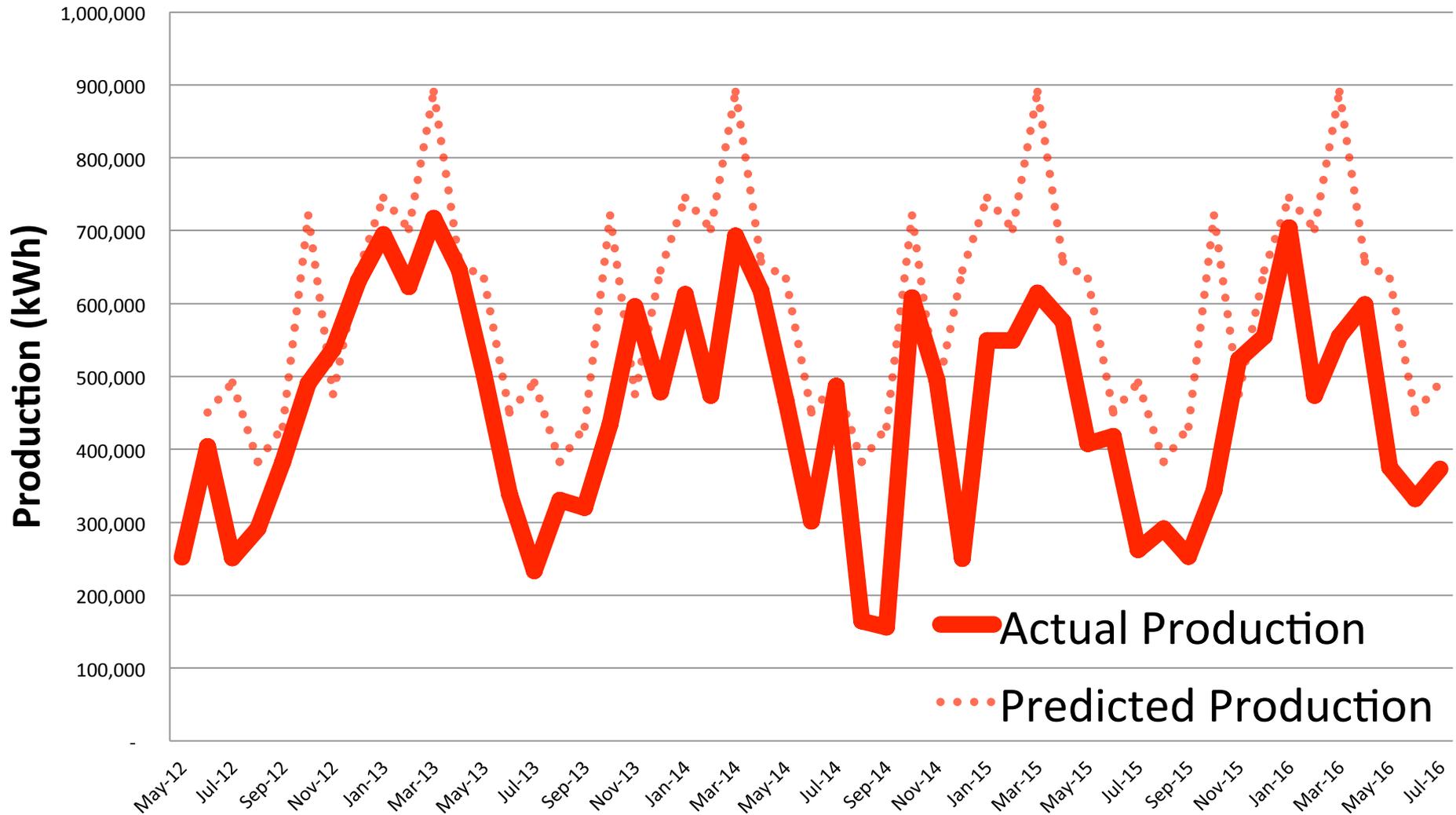


15,301 acres  
of pine or fir forests  
carbon offset

# Wind Speed Comparison By Month



# Production by Month



# Production by Year

Year	2012	2013	2014	2015	2016
Months Operational	8	12	12	12	7
Actual kWh	3,202,710	5,860,820	5,107,830	5,328,190	3,382,042
Actual kWh Cumulative	3,202,710	9,063,530	14,171,360	19,499,550	22,881,592
Expected kWh	3,850,160	7,227,000	7,227,000	7,227,000	5,377,986
Expected Cumulative	3,850,160	11,077,160	18,304,160	25,531,160	30,102,024

# Capacity Factor by Year

Year	2012	2013	2014	2015	2016
Months	8	12	12	12	6
Calculated Capacity Factor	18%	22%	19%	20%	23%
Expected Capacity Factor	24%	28%	28%	28%	31%

- The calculated capacity factor is taken by dividing the annual output by the rated capacity times the number of hours per year.
- The calculated capacity factor is impacted by curtailment and lower wind speeds.

# Production Summary

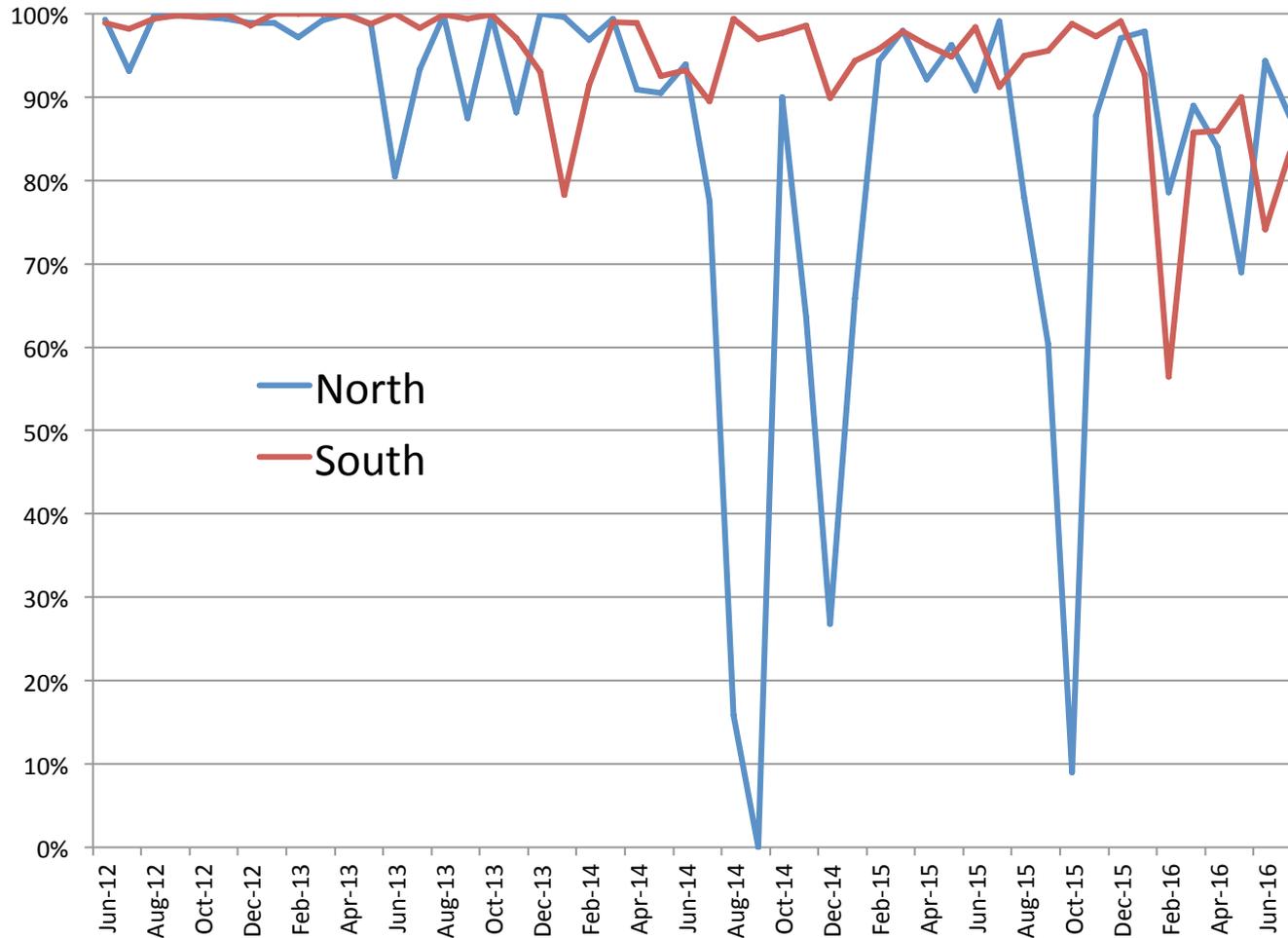
- Wind Speed has been 87% of the expected historical average – consistent with Providence
- Production has been 77% of the predicted values
  - There is a cubic relationship between wind speed and power output
    - Doubling wind speed means **eight** times more power.
    - Small changes in wind speed averages have significant impacts on power production.
  - Major reason for difference is the wind speed variance which means production occurs lower on the power curve
  - Sound curtailments and maintenance have also been factors for production

# Curtailment by Year

Year	2012	2013	2014	2015	2016
Months	8	12	12	12	6
Days when Curtailment Occurred	5	46	31	31	35
Cumulative	5	51	82	113	148

- Includes downtime for sound testing in 2012-2013 and BoH abatement order in 2013.
- Mitigation plan is in effect 167 days of the year.

# Turbine Availability By Month



# Maintenance Summary

- There has been no failure of any major component to date
  - In 2014 and 2015, the North Turbine experienced problems with the power converter.
- There is ongoing maintenance
  - Over the past 3 years, maintenance has been performed by Gemini Energy Services
  - Regularly scheduled service, minor maintenance items, preventative maintenance, etc.
- Fairhaven Wind purchased software and hardware upgrades from AMSC in 2015 and 2016, along with ongoing remote tech support.
  - Allows for greater access to data, improving the troubleshooting and diagnostics process

# Net Income to Fairhaven

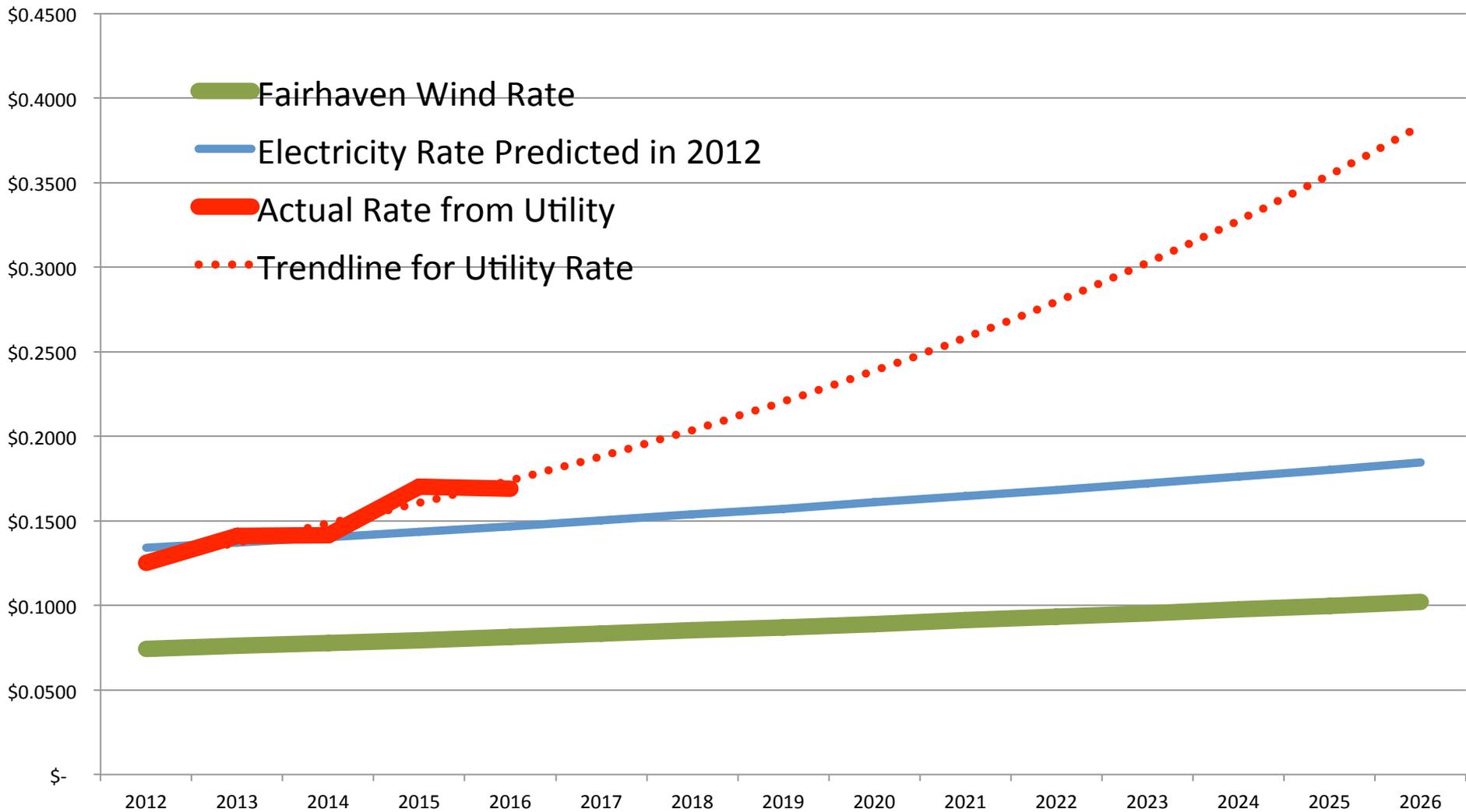
Year	2012	2013	2014	2015	2016
Months	8	12	12	12	6*
Net \$ to Town	\$108,232	\$179,484	\$218,502	\$402,291	\$157,793
Cumulative	\$108,232	\$287,717	\$506,219	\$908,510	<b>\$1,066,303</b>

- Annual net income has averaged over \$250,000 per year, exceeding expectations.
- Annual Income is predicted to increase if energy prices follow current trend and with greater availability.

\* Town not yet billed for July



# Income to Fairhaven





# Thank You

