

### AFCEC:

- Manages the Installation Restoration Program at the MMR.
- Constructed nine pump and treat plants to remediate groundwater contamination
- Has implemented a robust optimization program to reduce the carbon footprint and utility cost associated with the treatment systems

### FOR MORE INFORMATION:

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### ACRONYMS

ft - feet

M - million

MW - Megawatt

MWhr - Megawatt-hour



### WHAT IS WIND I AND WHERE IS IT?

Wind I is a Fuhrlaender 1.5 MW wind turbine. It is located in the southwestern area of the MMR, 1140 feet (ft) from the nearest base housing unit. It started operating on 02 Dec 2009.

The wind turbine has an 80 m (262 ft) hub height, a 77 m (253 ft) rotor diameter, and is approximately 119 m (390 ft) tall.

The project is jointly funded by the Air Force and the Army.

Refer to the Oct 2011 Fact Sheet for additional information.

### HOW MUCH DOES AFCEC SPEND IN ELECTRICITY?

Electrical costs for the AFCEE program ranged from \$2 million in 2009 to \$1.6 million in 2012. The 1.5 MW wind turbine was projected to generate 3810 MWhr annually (29% capacity factor) and offset the utility costs by 25%-30%. In addition, the wind turbine was expected to reduce the air emissions associated with the fossil fuel power supply for the treatment systems by the same range of 25%-30%.

### HOW MUCH ENERGY AND CREDIT HAS BEEN GENERATED BY WIND I TO DATE?

Since startup in December 2009 through November 2012, the wind turbine has generated 8040 MWhrs, resulting in a credit of \$1,059,058. In addition, AFCEC received \$54,394 from an availability guarantee on the wind turbine performance during the first year of operation.

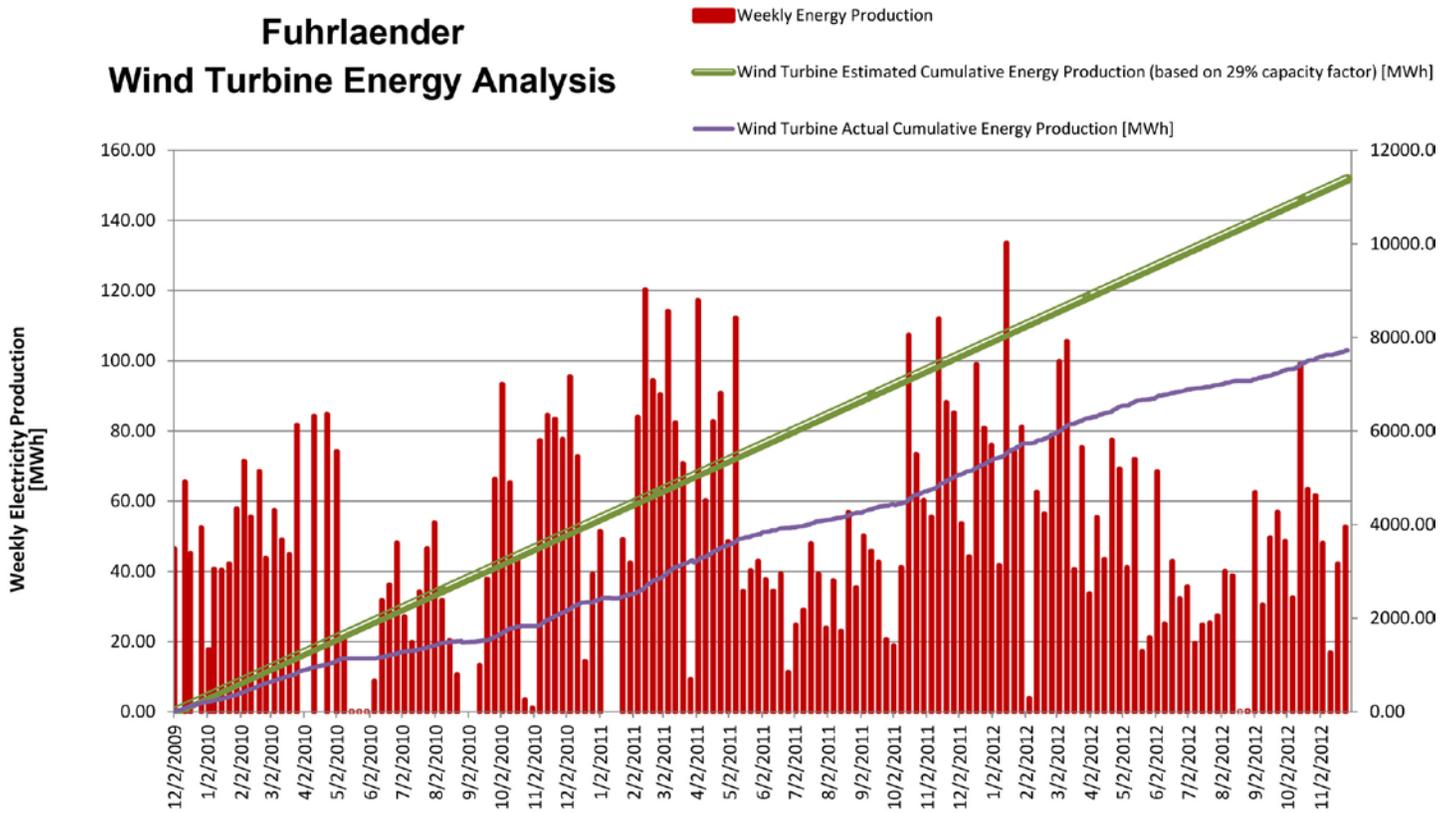
### HOW DOES THE PERFORMANCE COMPARE WITH EXPECTATIONS?

The Fuhrlaender turbine has not performed as well as expected. Based on a 29% capacity factor, the wind turbine was expected to produce 3810 MWhrs annually. From startup on 02 Dec 2009 through 30 Nov 2012, the turbine should have produced 11,430 MWhrs. Actual production for the period of 02 Dec 2009 through 30 Nov 2012 was 8040 MWhrs. The operation of the wind turbine offset carbon dioxide emissions by 5266 tons.

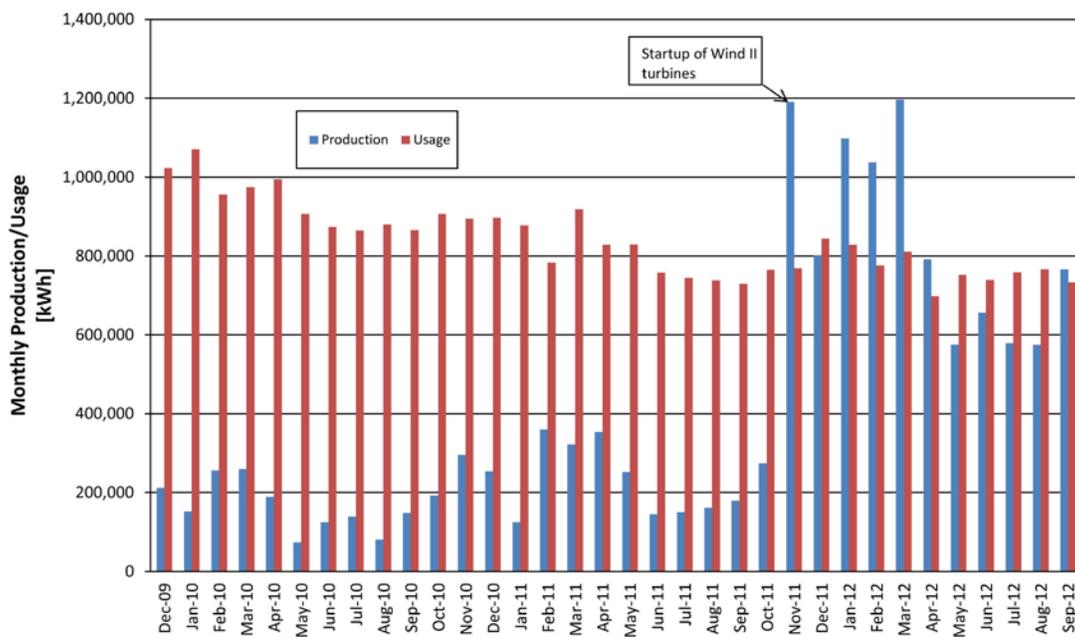
Performance has been impacted by lower than average wind speeds, a number of mechanical problems, and poor service by the manufacturer. Mechanical problems included an improper encoder model, worn generator brushes, loss of charging capacity in backup batteries, and a yaw converter error that lasted for over a year. All of these issues have been repaired but delays by the manufacturer in responding to the problems have impacted the performance of the wind turbine. In addition, diagnostic evidence suggests the gearbox may be failing due to a bad bearing and possibly poor design. AFCEC is currently working with contractors to develop a cost estimate for replacing the gearbox.

The first figure below reports the monthly energy production and compares the actual cumulative energy production against expectations. The second figure compares the energy used in the AFCEC remediation program against the energy produced by the Wind I and Wind II wind turbines.

### Fuhrlaender Wind Turbine Energy Analysis



### MMR Wind Turbine Production vs. Remediation Project Usage Since Wind I Startup



kWh = kilowatt-hours