



## Wahl Residence Lawler, IA



### Project History

In October 2002, Roger and Emma Wahl installed Uni-Solar photovoltaic shingles, with a total capacity of 3075 Watts, on the south-facing roof of their two-stall garage. They added a 10kW Bergey Excel-R wind turbine in November 2003. In August 2005, they installed Uni-Solar® thin-film solar modules, affixed to Galvalume standing-seam panels, to the roof of their 16x80-foot mobile home for another 5632 Watts of capacity.

The Wahls own 10 acres near Lawler, midway between Charles City and Decorah. Roger says he became intrigued by alternative energy in the 1970's, and three decades later the Iowa Energy Center's Alternate Energy Revolving Loan Program piqued his interest.

"I figured that a no-interest loan would make it feasible for us to move away from the grid and be self-sufficient," he says.

The Wahl's system components were all purchased from and installed by a local contractor, and they say that all installations went fairly smoothly. The installation of the solar shingles was simplified by having open rafters in the garage, which made wiring easier. The only notable difficulty involved making a connection to the grid in a tight location beneath the Wahl's mobile home during their turbine installation.

When they installed the turbine, the Wahls also added a 360 Amp-hour bank of lead-acid batteries and a switch to disconnect the system from the grid, if they chose. To house the batteries, they added an 11-foot extension onto their garage.

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### System Performance

#### Technical Specifications

##### PV Shingles

180 17-Watt UniSolar SHR-17  
Solar Shingles

2500-Watt SMA Sunny Boy  
Inverter

**Project Cost:** \$25,597

**AERLP:** \$11,743

**Loan Term:** 10 yrs.

**Lender:** Decorah Bank & Trust  
Decorah, IA

**Lender Share:** \$13,257

**Annual Ave. O & M Cost:** \$0

**Installation Date:** October 2002

##### Wind Turbine

10-kW Bergey Excel-R Wind  
Turbine, 100 ft tilt-up tower

2 5500-Watt Trace 5548 inverters  
24 Interstate 6V batteries

**Project Cost:** \$55,661

**AERLP:** \$28,083

**Loan Term:** 10 yrs.

**Lender:** Decorah Bank & Trust  
Decorah, IA

**Lender Share:** \$28,083

**Annual Ave. O & M Cost:** \$0

**Installation Date:** November 2003

##### Thin-film solar modules

33 128-watt Uni-Solar SSR-128  
solar thin-film modules

22 64-Watt Uni-Solar SSR-64 solar  
thin-film modules

6000-Watt SMA Sunny Boy Inverter

**Project Cost:** \$47,864

**AERLP:** \$23,932

**Loan Term:** 10 yrs.

**Lender:** Decorah Bank & Trust  
Decorah, IA

**Lender Share:** \$24,860

**Annual Ave. O & M Cost:** \$0

**Installation Date:** August 2005

The Wahls have been generally pleased with the performance of their system, though they have found self-sufficiency elusive. In the first five years of operation, their PV shingles produced a total of 19,922 kWh for an average of 332 kWh per month. Their thin-film installation generated 12,656 in the first 26 months, an average of 487 kWh per month. The Wahl's are unable to accurately record the output of the wind turbine, nor are they able to track their total electricity consumption.

The Wahl's system frequently sends excess power onto the grid, for which their rural electric cooperative (REC) pays them an avoided cost rate of \$0.021 per kWh. But the Wahls also continue to use a considerable amount of electricity from the grid for which they pay full retail rates. In the first eleven months of 2006, for example, they sold 8342 kWh to for \$175, but were billed \$1028 for 10,536 kWh, resulting in total charges of \$853 for the period, not including a \$20 per month basic service charge.

In May 2008 the Wahl's struck a true net-metering agreement with their utility, so excess production is allowed to offset the amount they take from the grid.

The Wahl's home uses electricity for heating, central air, and all appliances. Emma notes that they purchased their mobile home new and have made no significant investments in energy conservation or efficiency.

Roger says that he's disconnected their home from the grid on a few occasions as an experiment. On one occasion, several days of heavy fog and no wind set in, and the batteries lasted for three and a half days. They later doubled their battery bank in hopes of achieving five to six days of storage capacity, but have

still not successfully operated in standalone mode.

### **Operation and Maintenance**

The Wahls say their system is virtually maintenance free except for checking water levels on their batteries. Roger notes that he's blown fuses several times while disconnecting their home from the grid, and they occasionally have electronics issues that require phone or on-site support from the local contractor who installed the system.

The most significant repair issue came when the thin-film sheets began to slide downward in hot weather during 2006 because a set of anchor screws had been overlooked during installation. A section of the units shorted out and were down for three months before being replaced by Uni-Solar and reinstalled by the same local contractor at no charge.

### **Overall Satisfaction**

Roger says that "as long as I could afford it" he would make the same investments again. Their biggest frustration has been their inability to achieve a more profitable net-metering or net-billing agreement. They've argued to their REC that their excess production in any given month should at least be allowed to offset the amount they take from the grid, and in 2007 they began paying REC only the amount they felt they owed at risk of having their service disconnected.

Roger also has an on-going experiment with generating hydropower from a 20-foot drop on his lake. All this with their original goal in mind: to achieve energy independence.

"We haven't reached that point, but in time I think we will," says Roger, who turned 92 in 2008.

The Iowa Energy Center's Alternate Energy Revolving Loan Program (AERLP) plays a supporting role in stimulating renewable energy development within the state. Since its inception in 1996, the AERLP has supported numerous wind, biomass, solar, hydro, and hybrid projects.

Successful applicants receive a low-interest loan from a combination of Energy Center and lender funds. The Energy Center provides loan funds equal to 50% of the projects financed cost (up to \$1 million) at zero percent interest. Matching financing must be obtained from a lender of the applicant's choice. The maximum loan term for the Energy Center's funds is 20 years.

The lending institutions are responsible for financially qualifying the borrower, while

the Energy Center assists in technically qualifying the borrower. By partnering with expertise from lending institutions the Energy Center is able to cost-effectively process the loans in a timely manner and maximize the impact of the loan program.

### **Eligibility**

The AERLP is open to all individuals and groups who want to build renewable energy production facilities in Iowa. Utilities that are not required to be rate-regulated are not eligible. AERLP loan funds may not be used to refinance an existing loan or be applied to existing alternate energy facilities.

### **Application Deadlines**

January 31, April 30,  
July 31, October 31

### **For more information**

Contact the Iowa Energy Center,  
(515) 294-8819  
[www.energy.iastate.edu](http://www.energy.iastate.edu)

The Iowa Energy Center is dedicated to improving Iowa's energy efficiency and use of renewable energy through research, demonstration, and education.

