

Energy 101 - KidWind & the SHS Chevy Volt Project

Dan Whisler
Env. Science Teacher
Sterling High School
Sterling, Kansas

KidWind Wind Senator



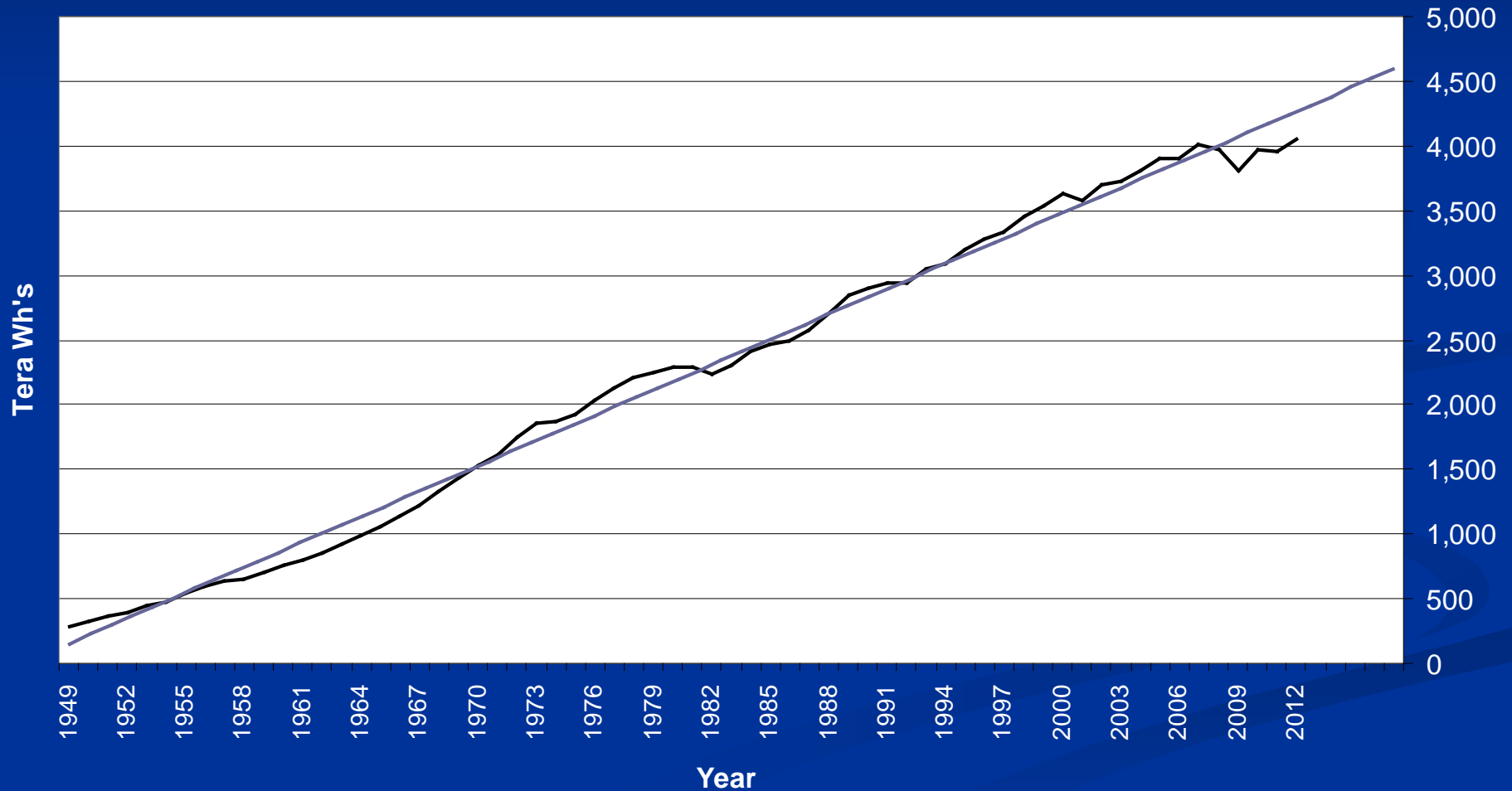
Creating Energy Awareness in the Next Generation!



KSDE Conference 2013

US Electric Generation

Source: US Energy Information Administration



Growing up with technology...



...and here's the next generation!

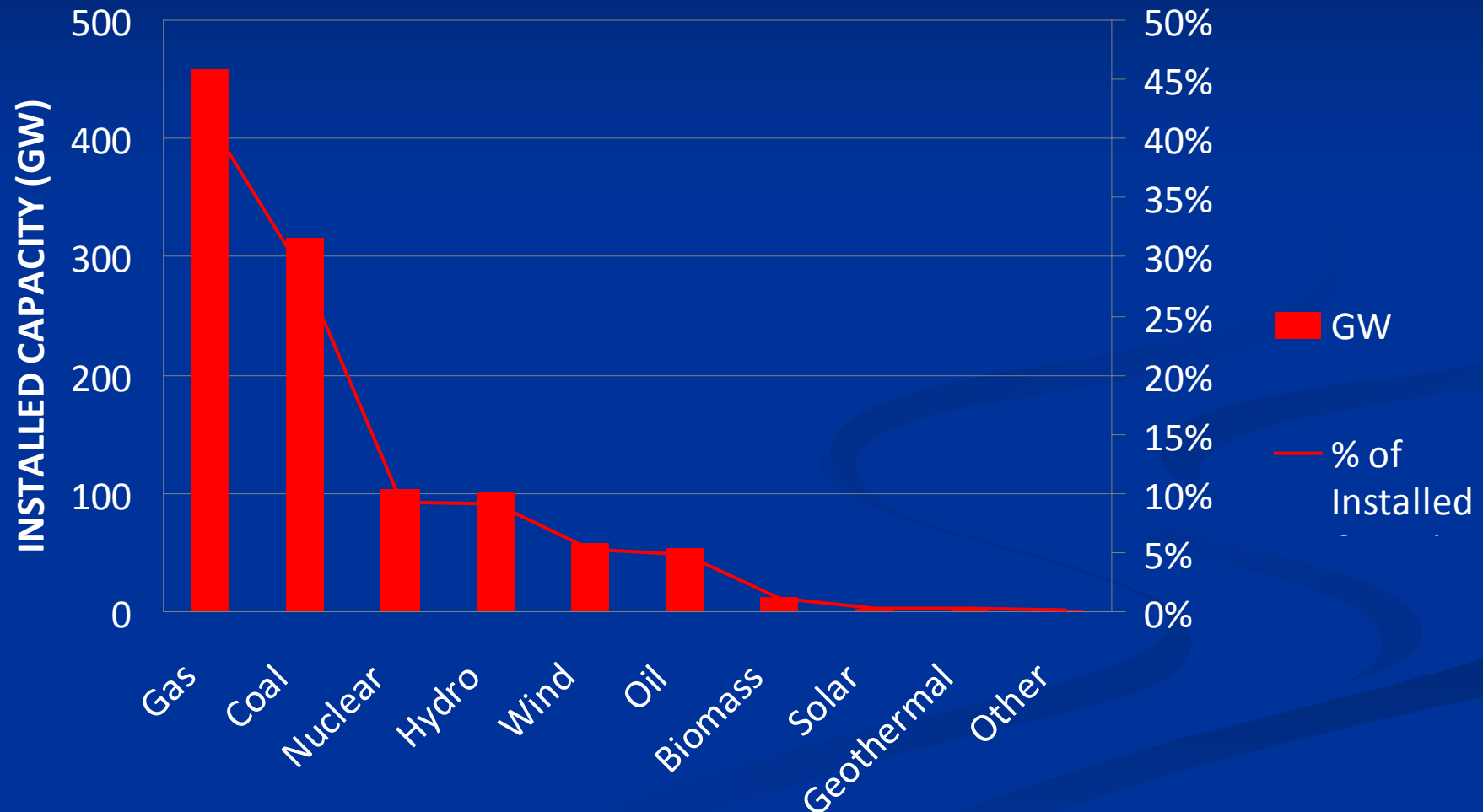


More electricity **WILL** be needed!



US Installed Generation

Source: US Energy Information Administration



Combining Science & Economics

Science is... "knowledge attained through study or practice,"

Instead of asking kids to study science, let them learn by
DOING science!

First Law of Thermodynamics:

**Energy can be changed from one form to another,
but it cannot be created or destroyed.**

Commoner's Laws of Ecology:

(three apply specifically to this project)

Everything is connected to everything else.

Everything must go somewhere. (NIMBY & BANANA)

There's no such thing as a free lunch.

(both environmental & economic costs)

S'Mores fixed using the First Law of Thermodynamics!



Not the same as using a
campfire, but it works!

The Guide to Economic Thinking



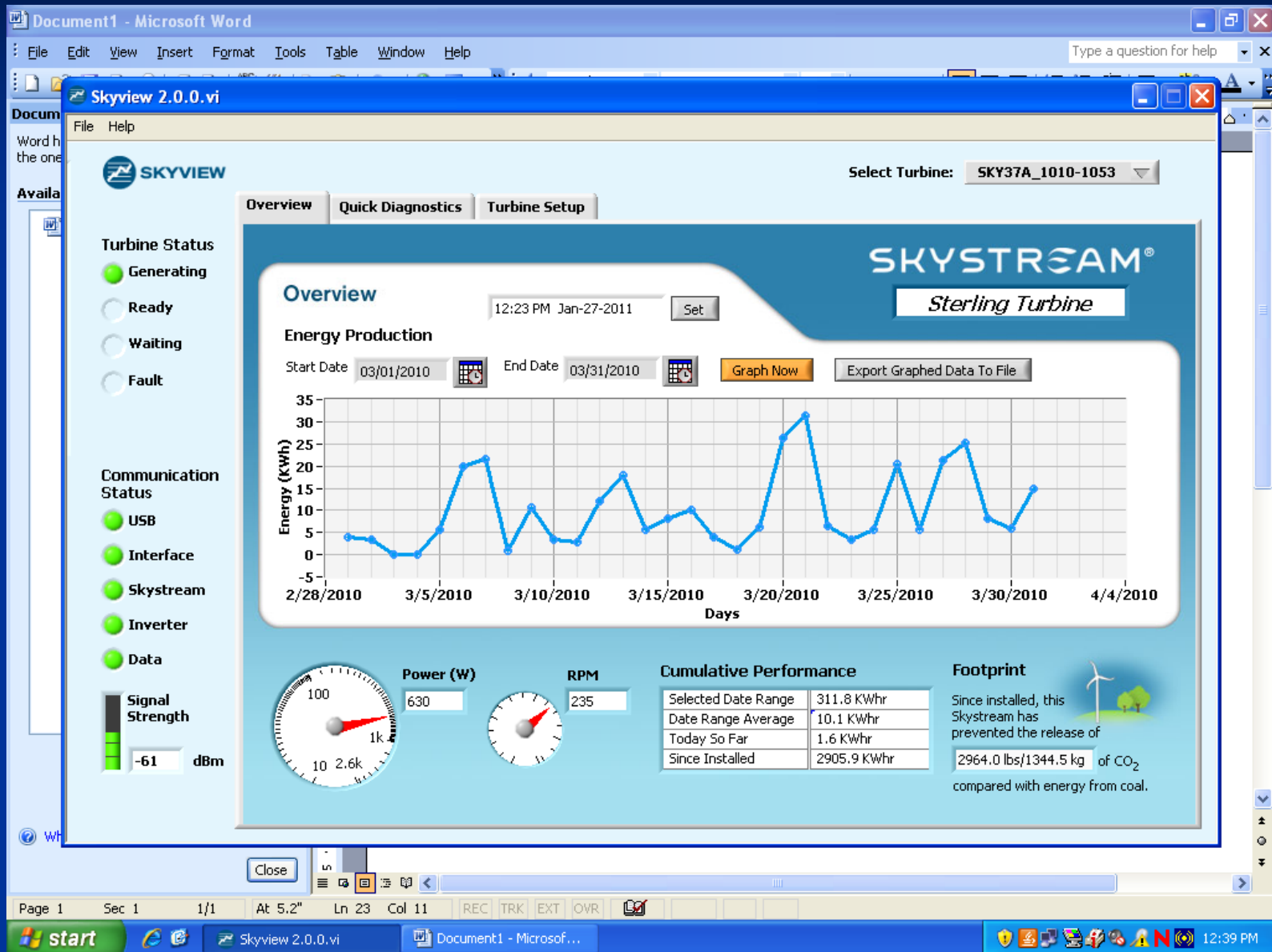
- 1. People *choose*.
- 2. People's choices involve *costs*.
- 3. People respond to *incentives* in predictable ways. (**Companies do, too. ex. - PTC**)
- 4. People create *economic systems* that influence individual choices and incentives.
- 5. People gain when they *trade* voluntarily.
- 6. People's choices have consequences that lie in the *future*.

- copied from **The Council for Economic Education**

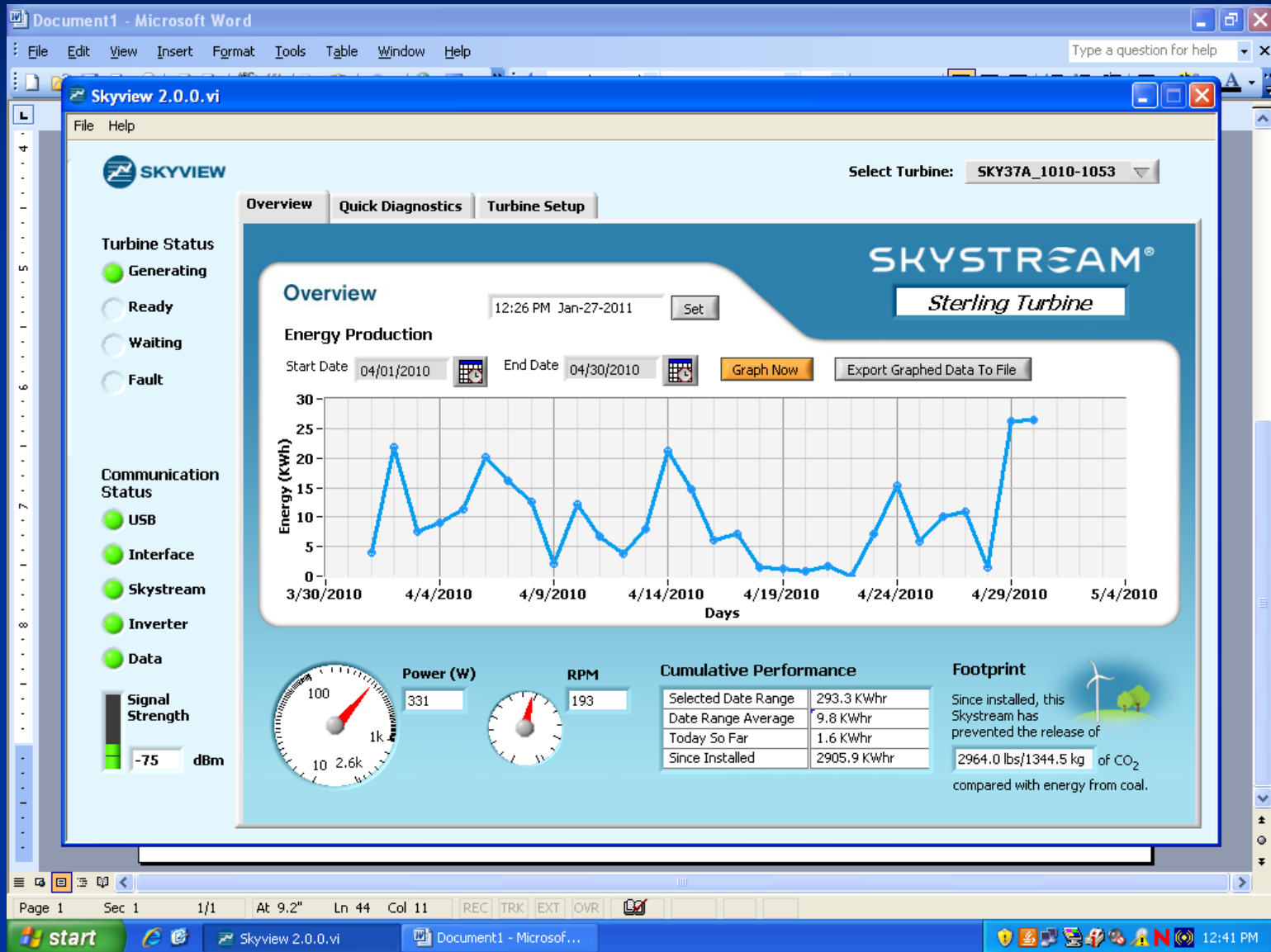
Thanks to the City of Sterling!



Data for March 2010 - Sterling



Data for April 2010 - Sterling



Energy Savings from our Turbine

- Total kWh Produced: 2899.69

Approx. Cost per kWh: \$0.12

Value of the electricity produced: \$347.96

Value of the educational opportunity created:

PRICELESS!

(data recorded by KSU as of January 25, 2011)

<http://www.usd376.com/windproject/index.html>

Home Energy Audit – Blower Test



Understanding Your Electric Bill



Customer Service Inquiries:
PO Box 208
Wichita, KS 67201-0208

For service located at:
7407 N MADISON CT
HUTCHINSON, KS 67502-8911

Customer Action Line
1-800-383-1183

Statement Date Aug 2, 2012

Electric Outages
1-800-LIGHT-KS
(1-800-544-4857)

5-DIGIT 67502

00019562 01 AV 0.347 22 19
|||||

Online Information
www.WestarEnergy.com

DAN WHISLER
7407 N MADISON CT
HUTCHINSON, KS 67502-8911

Deposit: NONE

SVC TYP	SERVICE PERIOD FROM - TO	NBR DAYS	METER READINGS PREVIOUS - PRESENT	ENERGY USE KWH			
ELE	06-28-12 07-27-12	29	62342 64050	1708			

SVC TYP	CUSTOMER CHARGE	ENERGY CHARGE	FUEL CHARGE	PROP TAX SURCHARGE	TRANSMN CHARGE	ENVRMNTL CHARGE	ENERGY EFF CHARGE	CURRENT CHARGES
ELE	9.00	121.46	35.54	.57	17.22	2.23	.92	186.94

Simple Savings, an Efficiency Kansas Program

Sales Tax

Total Current Charges

Previous Balance 162.70
Payments Received ** THANK YOU 162.70CR
Balance Forward .00

To change your e-mail, use My Account profile or Update
Your Info or e-mail us at customerinquiry@westarenergy.com.

COMPARATIVE USE INFORMATION					AMOUNT DUE	
PERIOD	DAYS	KWH	KWH/DAY		By Aug 28, 2012	\$ 212.66
CURRENT	29	1708	58.9		AMOUNT DUE	
LAST YEAR	31	2403	77.5		With Late Charge	\$ 216.44

EXPLANATION OF TERMS AND PAYMENT OPTIONS

CUSTOMER CHARGE

The customer charge partially recovers fixed costs associated with providing electricity to customers. These fixed costs include bill processing, mailing expenses, meter reading, meter equipment, maintenance on equipment used to provide electric service such as meters, service lines, etc., and customer service personnel available to answer customer inquiries.

ENERGY CHARGE

The energy charge recovers variable operating costs, as well as any additional non-variable costs not recovered in other charges which may be applicable.

DEMAND CHARGE

The demand charge partially recovers operating costs incurred in providing electric capacity capable of supplying a customer's maximum usage at any time. These costs include, but are not limited to, buildings, generating facilities, distribution circuits and other electric equipment.

FUEL CHARGE

The fuel charge reflects the fuel (such as coal, uranium, & natural gas) utilized in generating electricity at our energy centers and purchased power costs reduced by gains from wholesale electric sales. This charge adjusts quarterly.

PROPERTY TAX SURCHARGE (PROP TAX SURCHARGE)

The property tax surcharge reflects changes in the amount of property tax since Westar Energy's most recent rate review. This charge adjusts annually.

TRANSMISSION DELIVERY CHARGE (TRANSMN CHARGE)

The transmission delivery charge reflects costs associated with building and maintaining Westar Energy's transmission system. This charge adjusts annually.

ENVIRONMENTAL CHARGE (ENVRMNTL CHARGE)

The environmental charge recovers Westar Energy's investment in equipment installed to meet environmental standards. Only equipment installed since Westar Energy's most recent rate review is included. This charge adjusts annually.

ENERGY EFFICIENCY CHARGE (ENERGY EFF CHARGE)

The energy efficiency charge recovers Westar Energy's investment in energy efficiency programs including consumer education, Building Operator Certification, the WattSaver programmable thermostat demand response program and other energy efficiency demand response initiatives.

PRIVATE AREA LIGHT (PAL)

The PAL line item appears for customers who have a private area light.

RATE INFORMATION

Rate information is available online at
WestarEnergy.com or upon request.

Project DESERVE

Project DESERVE can provide customers who are older, severely disabled or income eligible with financial assistance to pay their Westar Energy electric bills. Contributions are given to a participating Kansas American Red Cross chapter or social service agency for distribution to Kansans in need. Any even dollar amount paid in excess of your bill up to \$5 will automatically be contributed to Project DESERVE. You may also request to have an even dollar amount added to your bill every month.

FOR YOUR SAFETY

Before digging, excavating, planting trees or setting fence posts, simply call 811, Kansas One Call, the underground utility notification center. Please call at least two days in advance and underground lines will be marked at no charge. To report a broken or downed power line, call 1-800-383-1183. Assume any broken or downed power line is live. Do not attempt to touch or move it. Report it immediately.

REPORT AN ELECTRIC OUTAGE

To report an electric outage, call
1-800-LIGHT-KS (1-800-544-4857).

NGSS – Using “Energy” to make connections & DO science!

SMART Ink

http://www.nextgenscience.org/4ps3-energy

4-PS3 Energy | Next Generat...

File Edit View Favorites Tools Help

Page Safety Tools

Related Content »

Views: Disable Popups / Black and white / Practices and Core Ideas / Practices and Crosscutting Concepts / PDF

Students who demonstrate understanding can:

- 4-PS3-1.** Use evidence to construct an explanation relating the speed of an object to the energy of that object. *[Assessment Boundary: Assessment does not include quantitative measures of changes in the speed of an object or on any precise or quantitative definition of energy.]*
- 4-PS3-2.** Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents. *[Assessment Boundary: Assessment does not include quantitative measurements of energy.]*
- 4-PS3-3.** Ask questions and predict outcomes about the changes in energy that occur when objects collide. *[Clarification Statement: Emphasis is on the change in the energy due to the change in speed, not on the forces, as objects interact.] [Assessment Boundary: Assessment does not include quantitative measurements of energy.]*
- 4-PS3-4.** Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.* *[Clarification Statement: Examples of devices could include electric circuits that convert electrical energy into motion energy of a vehicle, light, or sound; and, a passive solar heater that converts light into heat. Examples of constraints could include the materials, cost, or time to design the device.] [Assessment Boundary: Devices should be limited to those that convert motion energy to electric energy or use stored energy to cause motion or produce light or sound.]*

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Asking Questions and Defining Problems Asking questions and defining problems in grades 3–5 builds on grades K–2 experiences and progresses to specifying qualitative relationships. <ul style="list-style-type: none">Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships. (4-PS3-3) Planning and Carrying Out Investigations Planning and carrying out investigations to answer	PS3.A: Definitions of Energy <ul style="list-style-type: none">The faster a given object is moving, the more energy it possesses. (4-PS3-1)Energy can be moved from place to place by moving objects or through sound, light, or electric currents. (4-PS3-2),(4-PS3-3) PS3.B: Conservation of Energy and Energy Transfer <ul style="list-style-type: none">Energy is present whenever there are moving	Energy and Matter <ul style="list-style-type: none">Energy can be transferred in various ways and between objects. (4-PS3-1),(4-PS3-2),(4-PS3-3), (4-PS3-4) <hr/> Connections to Engineering, Technology, and Applications of Science

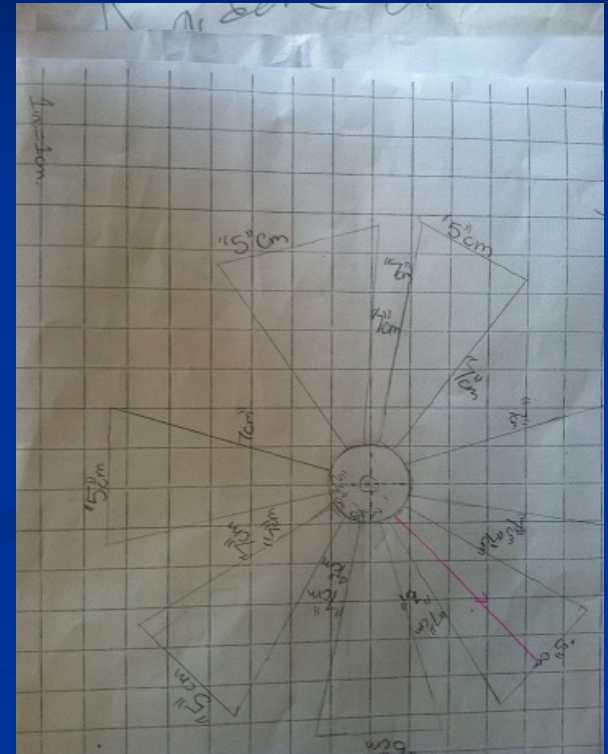
3:11 PM 11/5/2013

Think kids like hands-on learning?
Watch this!



Connecting the Dots – KidWind & PBL

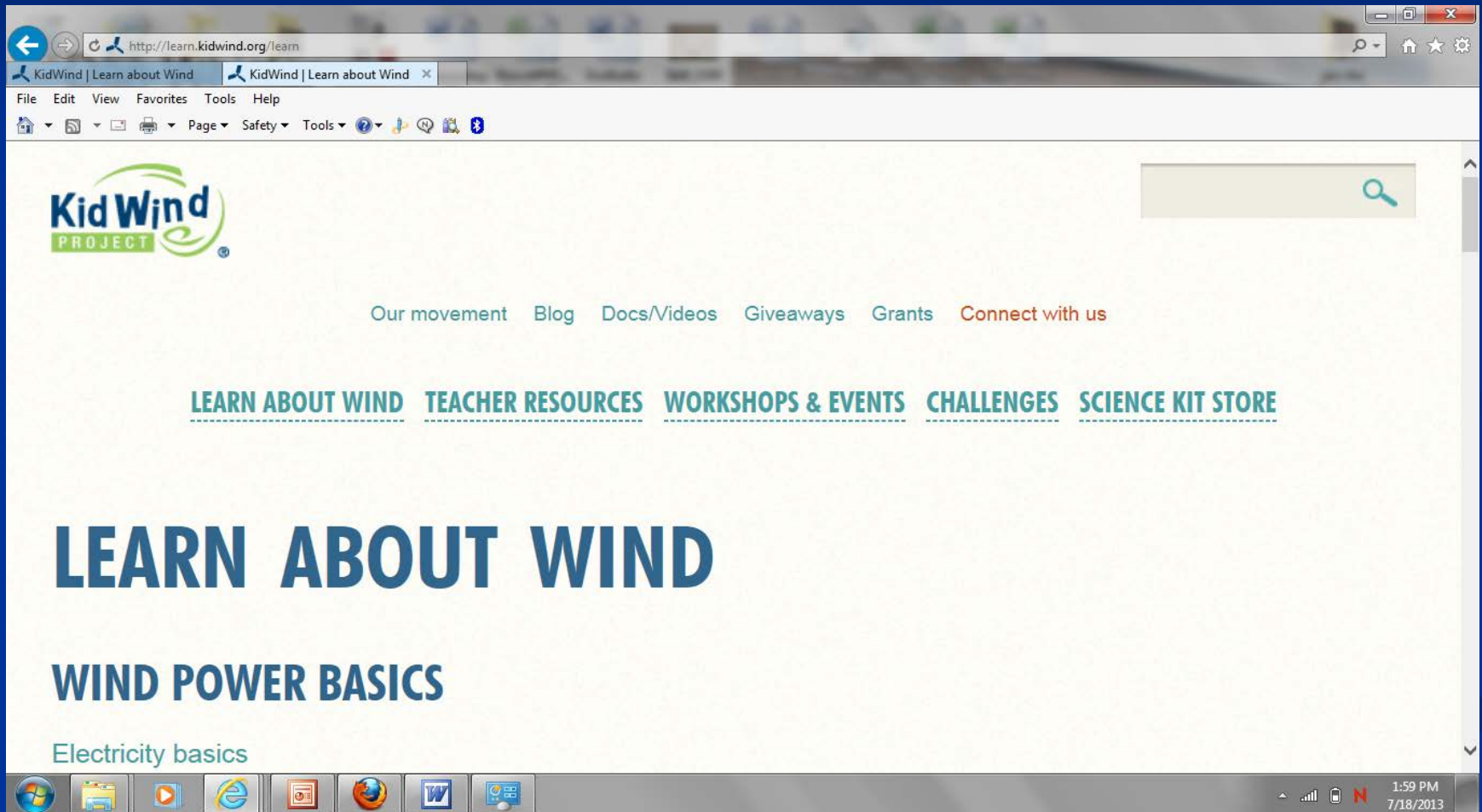
- Podcast with Kim Herron –
6th Grade Teacher
Inman Elementary School



Hosted by Steve Wyckoff @ ESSDACK –
Hutchinson, KS

http://www.remarkablechatter.org/kimherron/?fb_source=pubv1

www.learn.kidwind.org



The screenshot shows a web browser window with the address bar displaying <http://learn.kidwind.org/learn>. The browser's menu bar includes File, Edit, View, Favorites, Tools, and Help. The toolbar contains icons for home, back, forward, print, and other functions. The website's header features the Kid Wind Project logo on the left and a search bar on the right. Below the header, a navigation menu lists links: Our movement, Blog, Docs/Videos, Giveaways, Grants, and Connect with us. A secondary menu lists categories: LEARN ABOUT WIND, TEACHER RESOURCES, WORKSHOPS & EVENTS, CHALLENGES, and SCIENCE KIT STORE. The main content area displays the heading "LEARN ABOUT WIND" in large blue letters, followed by "WIND POWER BASICS" in a slightly smaller blue font. Below this, the text "Electricity basics" is visible. The Windows taskbar at the bottom shows several open applications, including Internet Explorer, and the system clock indicates 1:59 PM on 7/18/2013.

Kid Wind PROJECT

[Our movement](#) [Blog](#) [Docs/Videos](#) [Giveaways](#) [Grants](#) [Connect with us](#)

[LEARN ABOUT WIND](#) [TEACHER RESOURCES](#) [WORKSHOPS & EVENTS](#) [CHALLENGES](#) [SCIENCE KIT STORE](#)

LEARN ABOUT WIND

WIND POWER BASICS

Electricity basics

Advanced Wind Experiment Kit


http://store.kidwind.org/wind-energy-kits/complete-kits/advanced-wind-experiment-kit

KidWind | Learn about Wind KidWind | Advanced Wind E...

File Edit View Favorites Tools Help

Page Safety Tools

Home > Wind Energy Kits > Complete Kits > Advanced Wind Experiment Kit



Click to enlarge

ADVANCED WIND EXPERIMENT KIT

Availability: **In stock**


Product Name	Price	Qty
Advanced Wind Experiment Kit SKU: A0012	\$129.00	<input type="text" value="0"/>
Advanced Wind Experiment Kit - Classroom Pack SKU: A0015	\$349.00	<input type="text" value="0"/>

Add to Wishlist


MY CART

You have no items in your shopping cart.

RELATED PRODUCTS



[Basic Wind Experiment Kit](#)
Starting at: \$89.00



[Science Fair Wind Project](#)
Startina at: \$62.00

2:01 PM 7/18/2013

Checking pitch...



Election signs make great blades!



Data collection - More fun than reading a textbook!



**Testing & Data Collection –
Not just studying, but USING the
scientific method!**



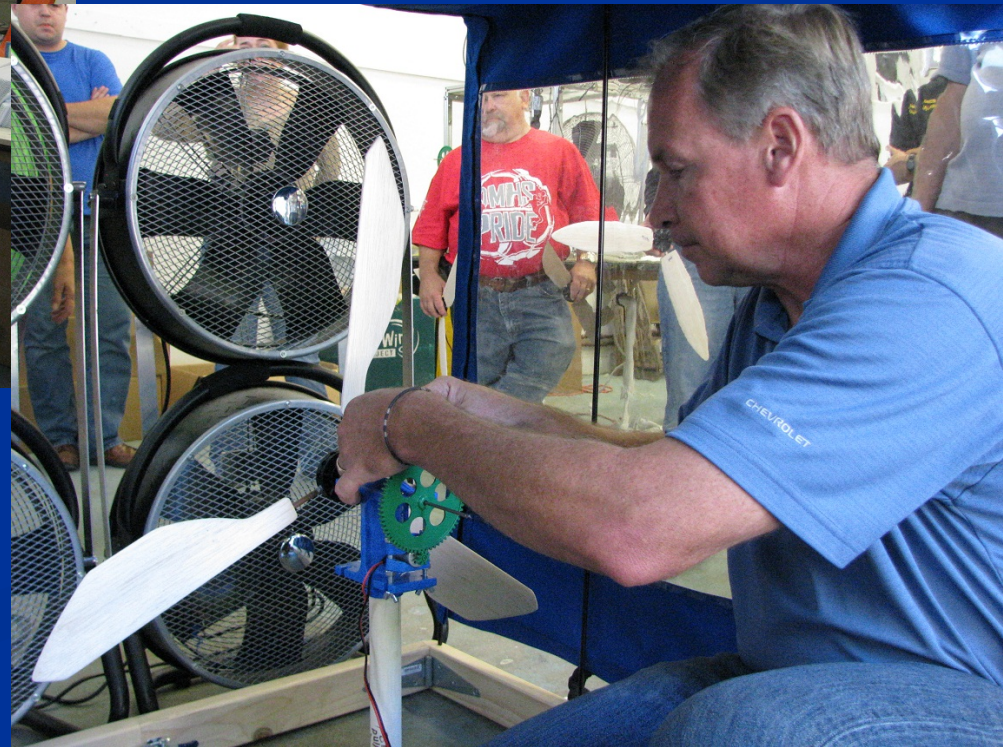


KidWind Challenge

Preparing to test in
the wind tunnel...

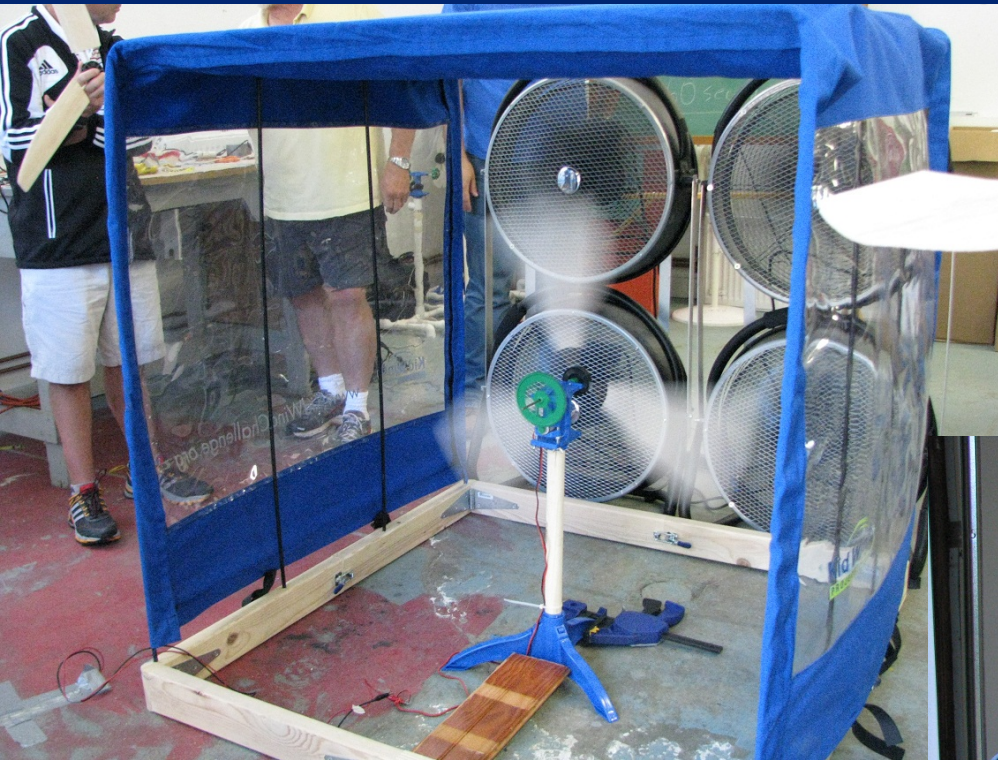


Checking pitch...



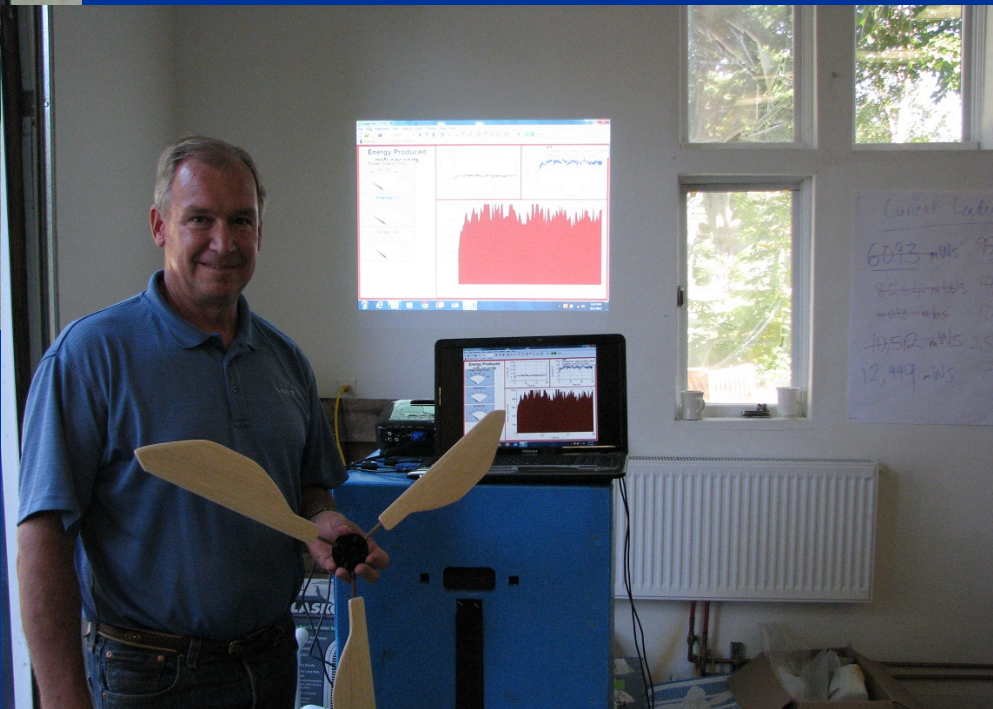


KidWind Challenge



Pretty good results!

Spinning fast! ...
and



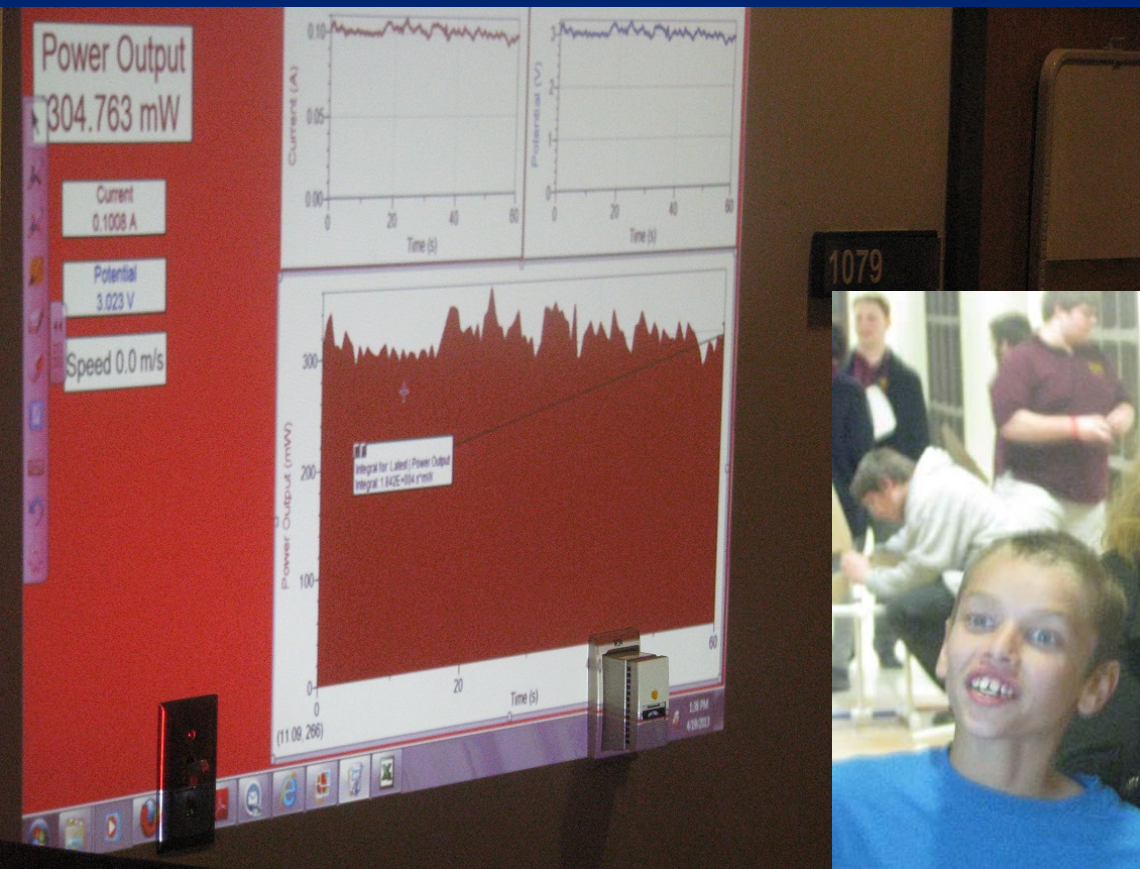
Thank You!!

- This KidWind Wind Tunnel provided to ESSDAK by the generous support of:





KidWind Challenge





KidWind Challenge



National KidWind Challenge – April 26, 2014 in Washington, DC!

SMART Ink

http://challenge.kidwind.org/events/national/2014

The 2014 National Challenge...

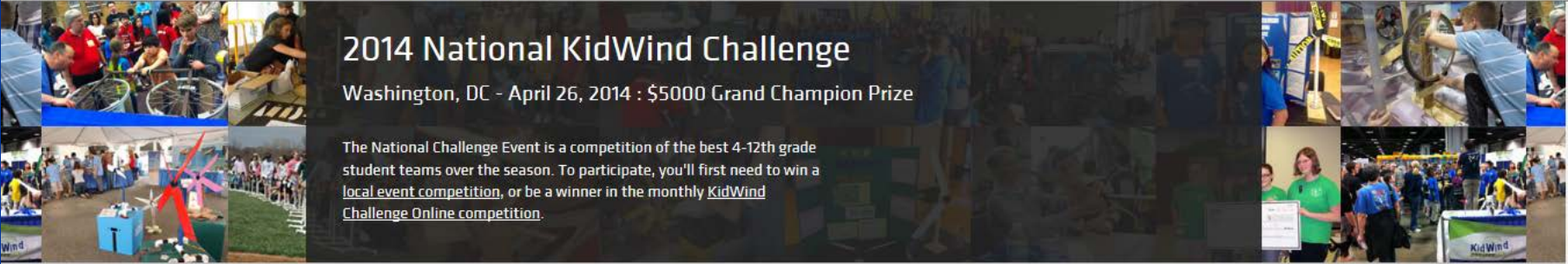
File Edit View Favorites Tools Help

Page Safety Tools

2014 National KidWind Challenge

Washington, DC - April 26, 2014 : \$5000 Grand Champion Prize

The National Challenge Event is a competition of the best 4-12th grade student teams over the season. To participate, you'll first need to win a [local event competition](#), or be a winner in the monthly [KidWind Challenge Online competition](#).



The 2014 National Challenge Event

← KidWind Challenge
← Event competitions

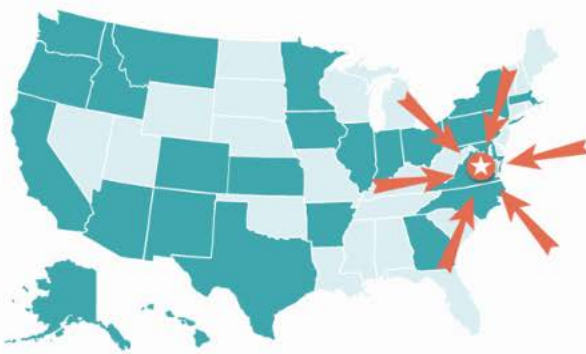
Challenge events

- [Choosing an event](#)
- [Upcoming Challenges](#)
- National Challenge

How to compete

- [Get started](#)
- [Rules and prizes](#)
- [Event registration](#)
- [Learning resources](#)

Build and test



NATIONAL SPONSORS

WIND ENERGY FOUNDATION

NREL
NATIONAL RENEWABLE ENERGY LABORATORY

[Become a sponsor](#)

NATIONAL PARTNERS

AWEA
AMERICAN WIND ENERGY ASSOCIATION

Vernier

12:48 PM
11/5/2013

STERLING HIGH SCHOOL



**A big thank you to JACAM
Chemicals as our major sponsor!!**



Additional Volt Project Sponsors



United Industries

What is Media Bias?



[Sign In](#) | [Sign Up](#)


[Contact Us](#)

[HOME](#) [ON AIR](#) [NEWSMEMBERS](#) [WEATHER](#) [LOCAL EXPERTS](#) [CONTESTS](#) [TRAVEL SHOW](#) +

[f](#) [t](#)

Fox News Tests The Chevy Volt And It Runs Out of Charge In Lincoln Tunnel!

By: John McKay | February 7, 2012




(photo by Bill Pugliano/Getty Images)

This won't help Chevrolet in their efforts to get the public to buy the Volt, it's new 'electric' car.

Fox News reporter Eric Bolling, who is part of the feature called "The Five," recently test drove a Chevy Volt for a few days and his report was less than stellar. Bolling, who with Neil Cavuto anchors Fox Business segments, was recently very hard on the Volt in his business appraisal. He went to Chevy and asked them to let him demo drive the car with an open mind. Bolling reports that the car consistently ran out of charge between 20-24 miles of electric use — and this after two nights of charging the car for over 12 hours. He also reports it ran out of juice in the Lincoln Tunnel. Fortunately, the car has a gas engine that will kick in when needed, so he was not stranded. Watch "The Five on Fox" discuss his adventures. Some of the panel members said GM is selling the car on the "Girl Scout Cookie" mantra: you don't buy the cookies because they are affordable and delicious, you buy them to


ON AIR



The Glenn Beck Program

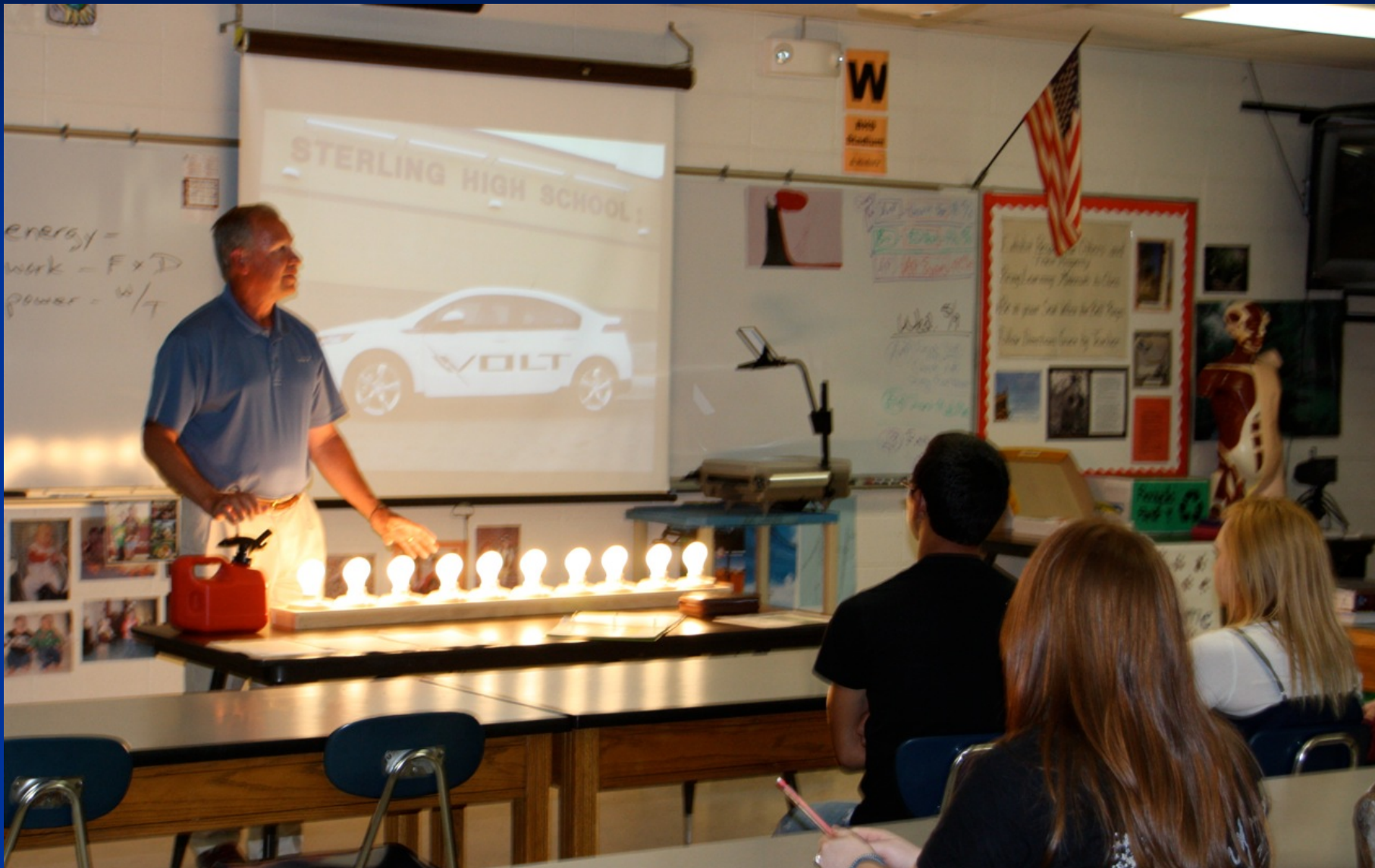
[Wall](#) | [Posts](#) | [Email](#)

10% OFF ALL THINKPAD LAPTOP ORDERS OVER \$899



Lenovo IdeaPad U300e

Energy Comparison 33.7 kWh = 1 gal. gas

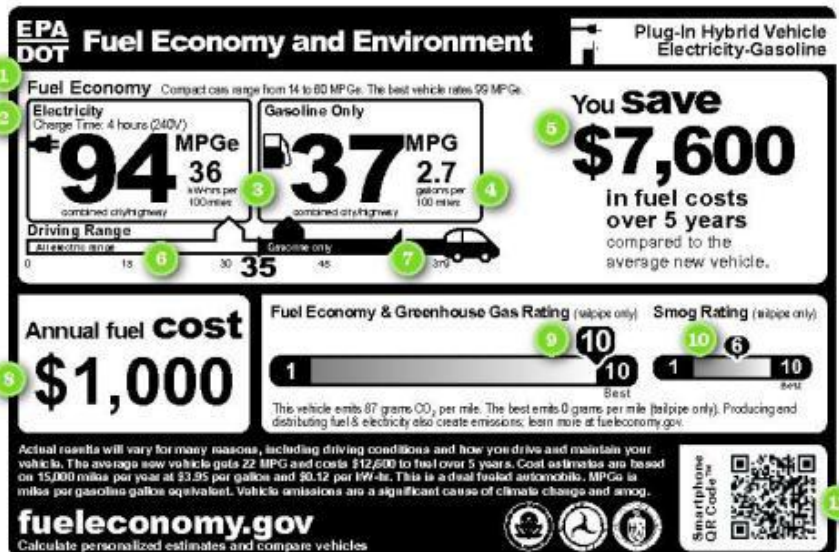


Understanding the 2012 VOLT EPA FUEL ECONOMY LABEL

With the growth of new technology vehicles, the U.S. Environmental Protection Agency and the U.S. Department of Transportation are revising the fuel economy labels required on electric vehicles for 2013. Chevrolet will implement this change on its 2012 Volt. Below are a few tips to understanding what it all means. You can also visit fuelconomy.gov for more information.



2011 Volt shown.



- 1. MPGe Range.** This line indicates the best and worst fuel economy within the Compact Car segment for 2012. The range of 14–60 MPGe represents combined fuels. While most vehicles in the segment run on gas only, Volt uses gas and electricity. MPGe ratings for each are taken into account to determine Volt's 60 MPGe combined rating — the best in the segment. For comparison, Nissan Leaf, a midsize utilizing a single source of fuel, achieves the best combined MPGe (99) among all vehicles.
- 2. Charge Time.** Volt takes four hours to charge when using an optional 240V charging station. It takes about 10 hours to charge, depending on climate, using a standard 120V household outlet.
- 3. MPGe Equivalent (MPGe).** All-electric MPGe lets consumers compare electric vehicle (EV) operating efficiency against cars that use gasoline. Basically, the EPA converted all-electric efficiency into MPG by using the electrical equivalent of energy produced from one gallon of gasoline. When running on the battery, Volt offers an equivalent of 94 MPGe combined city/highway.
- 4. Gas Only.** This number signifies the MPG Volt offers when the battery is depleted and the vehicle is running on the gasoline-powered electric generator. With the exception of long trips, most Volt drivers will plug in regularly to maximize efficiency and lower operating costs.

- 5. Fuel Savings.** Volt drivers will save \$7,600 in fuel costs over five years compared to an average vehicle that gets 22 MPG. This equation takes into account both gas and electricity costs for Volt assuming 15,000 miles per year and translates to more than \$125 a month in fuel savings. As gas prices increase, the savings Volt represents also will increase.
- 6. All-Electric Range.** The EPA has determined that, on a full charge, Volt offers an estimated 35 miles of electric driving range. In moderate conditions, Volt customers can expect to see a variation of EV range from 25 to 50 miles depending on temperature, terrain, driving techniques and battery age.
- 7. Total Range.** Volt's total range, as determined by the EPA, is 379 miles. This number combines the all-electric range (35 miles) with the extended range (344 miles). For comparison, Nissan Leaf's EPA estimated total range is 73 miles.
- 8. Annual Fuel Cost.** The EPA estimated fuel cost is for both gas (\$600) and electricity (\$400). This is less than \$85 per month.

- 9. Fuel Economy and Greenhouse Gas Rating.** Volt achieves the best rating (10) in both fuel economy and greenhouse gas (GHG) emissions (i.e., how much carbon dioxide its tailpipe emits each mile). While these are two separate measures, one rating is shown since CO₂ emissions are directly related to the amount of fuel consumed.
- 10. Smog Rating.** This is a rating for vehicle tailpipe emissions of those pollutants that cause smog and other local air pollution. The scale, in which 1 is the worst and 10 is the best, is based on the U.S. vehicle emissions standards, which incorporate specific thresholds for nitrogen oxide, non-methane organic gas, carbon monoxide, particulate matter and formaldehyde.
- 11. QR Code.** You can scan this two-dimensional barcode using your smartphone, provided you have downloaded a scanner app. Your mobile browser will be redirected to fuelconomy.gov for access to helpful tools and additional information on Volt.



240V SPX Charging Station – allows the Volt to be charged in 4 hrs.

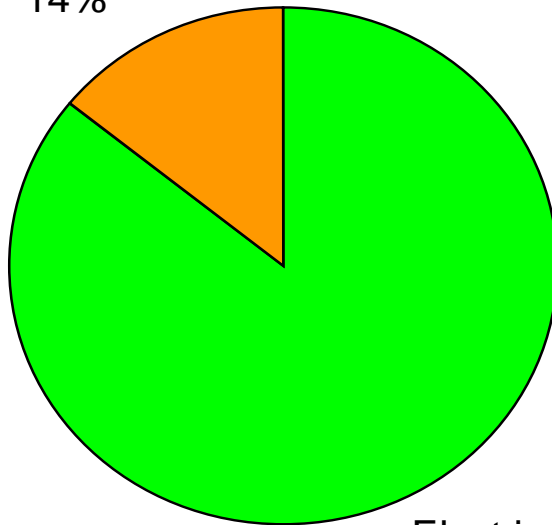


On August 29th of this year we had 90 miles of driving with just 11 miles using gas – .26 gallons to be exact!

Cost-Benefit Analysis – One Charging Station vs Two

**One Charging Station
Spring 2012**

Gas Miles
14%

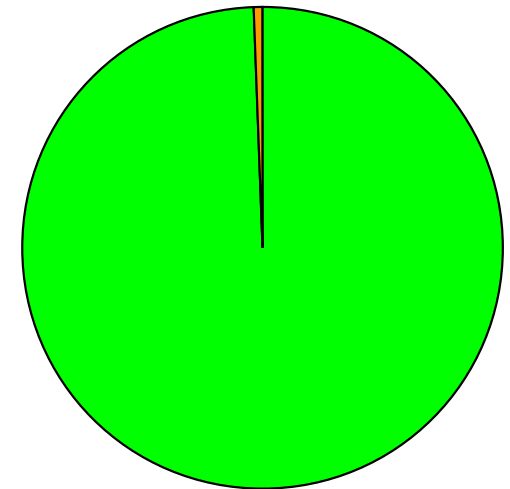


59 days
2567 Total Miles

Electric
Miles
86%

**Two Charging Stations
Fall 2012**

Gas
Miles
1%



49 days
2045 Total Miles

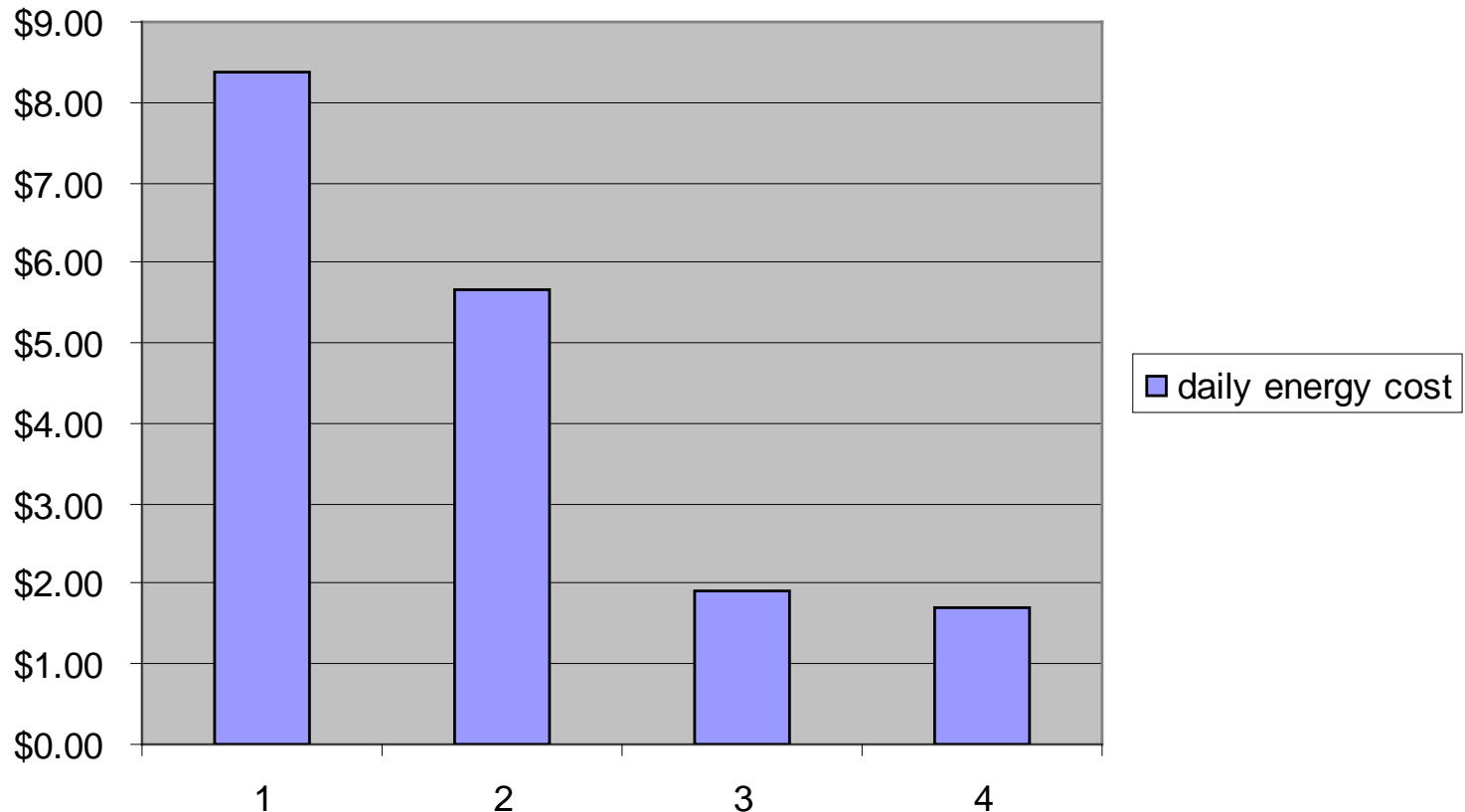
Electric
Miles
99%

Miles on electric vs. gasoline power with one and two charging stations.

Fig. by Taryn Gillespie

A Lesson in Economics

Daily Energy Expenses



Comparison of ICE getting 17 mpg (1) and 25 mpg (2) @ \$3.50/gal. compared to actual expenses with our Volt - spring semester (3) and fall semester (4)

Electric power for the Volt does NOT mean zero emissions... how is the electricity produced?



How is the electricity produced?

Westar Energy fuel mix for 2012
through September:

Coal - 74%

Nuclear - 14%

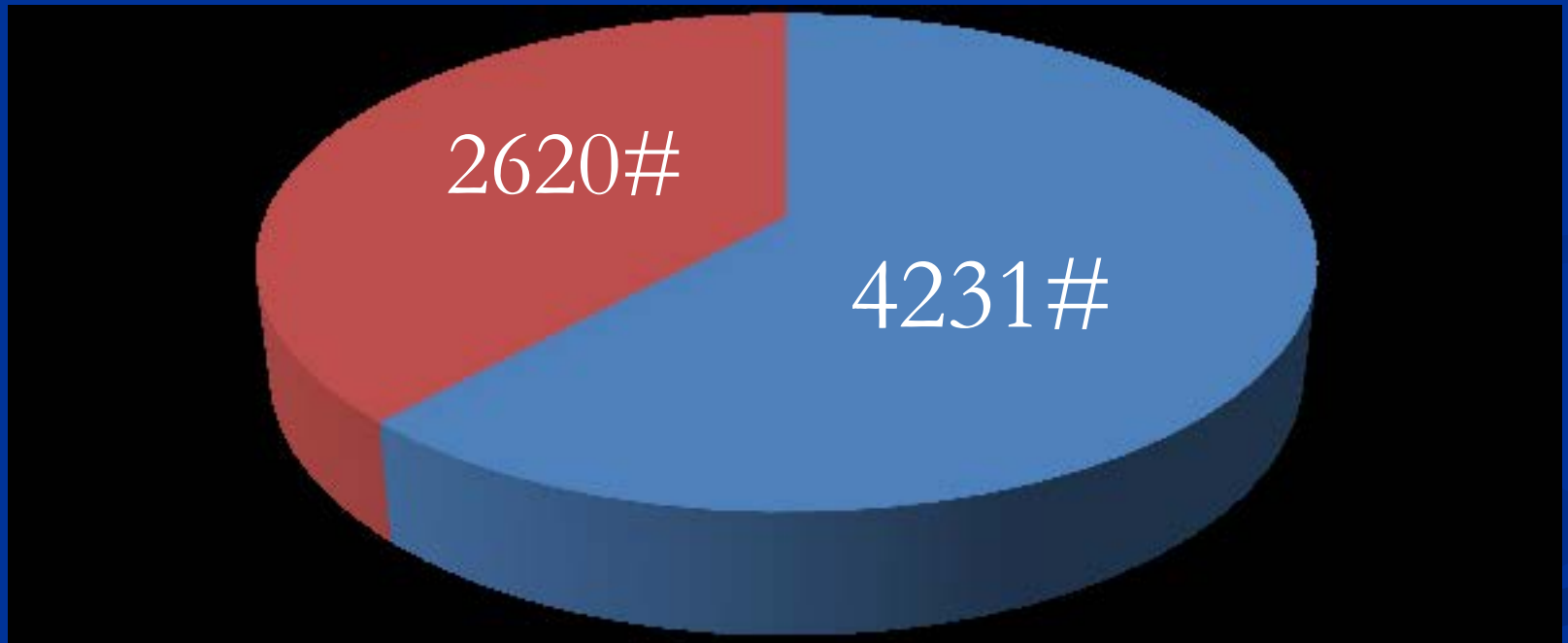
Gas - 9%

Wind - 4%

Volt Avoided CO₂ Emissions

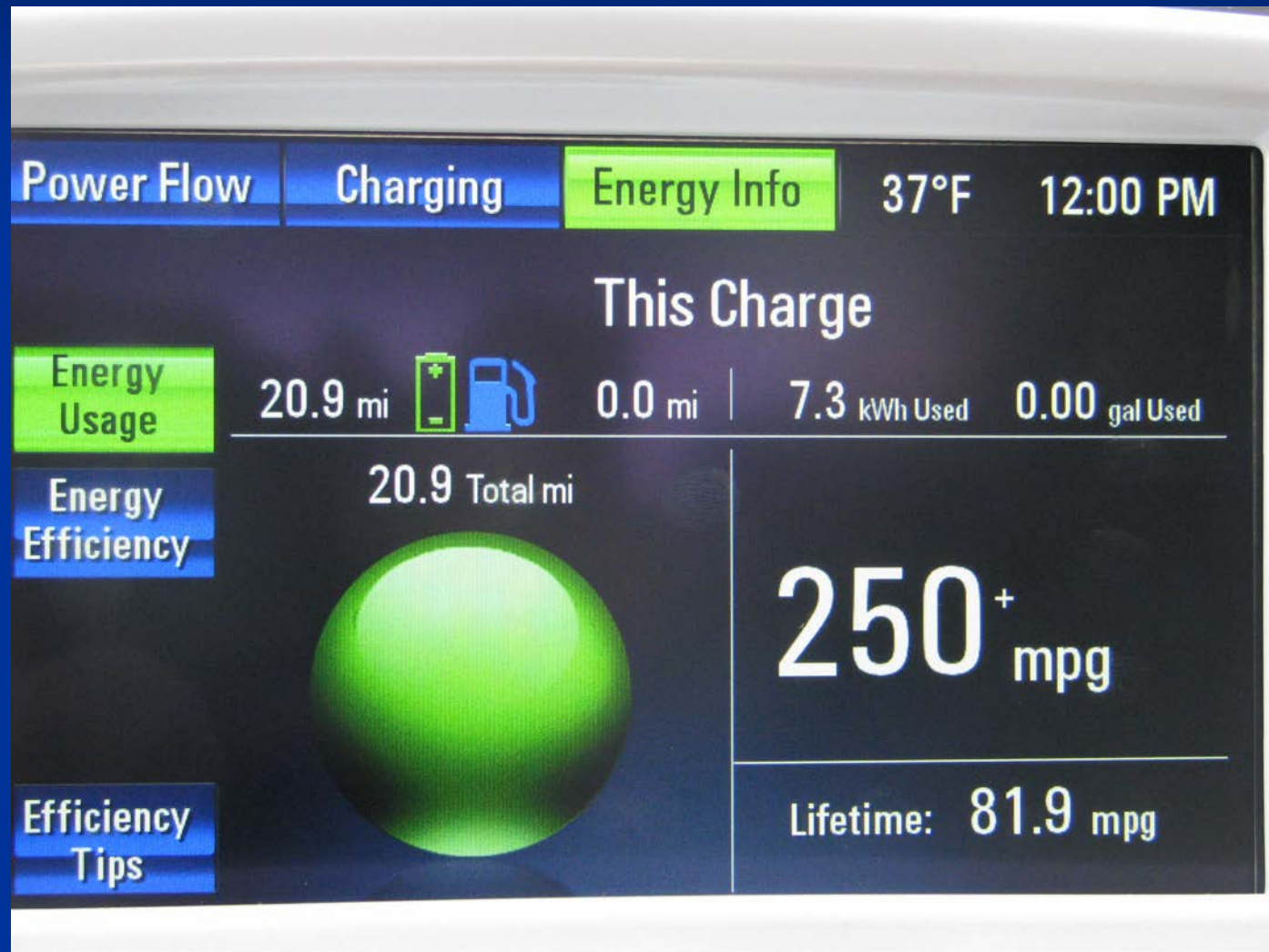
blue: CO₂ from electricity

red: CO₂ not emitted



Our data shows nearly a 40% reduction!

Onboard Touch Screen Computer Monitor Provides Data for Every Drive



Gathering Data from the Volt



Based on our four month OnStar report:

- Looking at our data for days where the Volt was driven 50 miles or less:
(47 days of data) total miles - 1995.9
- electric miles – 1700 85% During the colder months of Jan/Feb:
gas miles – 295.9 15% 78%/22%

Energy used:

- 578 kWh of electricity 99.4 MPGe
(avg. cost of \$.03/mi.)
- 8.33 gallons of gas 35.5 MPG
(avg. cost of \$.10-.11/mi.)

Estimating Annual Energy Expenses

- **1000 miles per month - 85% electric & 15% gas**
- 12¢ per kWh - 2.95 miles per kWh \$3.75 per gal. - 35.5 mpg
- $850 \text{ miles} / 2.95 \text{ mi/kWh} = 288.14 \text{ kWh/month}$
- $288.1 \text{ kWh/month} \times \$0.12/\text{kWh} = \$34.57 \text{ per month}$
- $\$34.57/\text{month} \times 12 \text{ months} = \414.84 per year
- $150 \text{ miles} / 35.5 \text{ miles/gallon} = 4.23 \text{ gallons/month}$
- $4.23 \text{ gallons/month} \times \$3.75/\text{gallon} = \$15.85 \text{ per month}$
- $\$15.85/\text{month} \times 12 \text{ months} = \190.14 per year
- $\$34.47 + \$15.85 = \$50.42 \text{ total per month}$
- **$\$414.84 \text{ (electric)} + \$190.14 \text{ (gas)} = \$604.98 \text{ total per year}$**
- In comparison, a car getting 25MPG would use 40 gallons gas/month:
- $40 \text{ gallons/month} \times \$3.75/\text{gal.} = \$150/\text{month}$
- **$\$150/\text{month} \times 12 \text{ months} = \$1800/\text{year}$**

Planning for THEIR future...

H
I
&
J
O
E
S



© 1988 King Features Syndicate, Inc. All rights reserved.

Powered by the Wind!

