

# Leveling the Playing Field for Renewables

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Midwest Renewable Energy Fair

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# About RENEW Wisconsin



**Advocates for state-level sustainable energy policies since 1991**

**One of the architects of the state's Renewable Energy Standard and ratepayer-funded public benefits program**

**A Focus on Energy subcontractor promoting commercial solar thermal systems and reducing barriers to customer-sited renewable energy**

***An organized voice for renewable energy producers and purchasers!***

# Key Terms and Concepts

- Stores (fossil energy) vs. flows (renewables)
- On-demand energy vs. as-available energy
- The Solar Ration (using the interest, not the principal)
- Energy Return on Energy Invested (EROEI)
  - Means transition from highly energetic resources like petroleum + NG to less energetic renewable resources is like swimming upstream
- Hubbert's Curve (Peak Oil/Peak Energy)
- Sources vs. sinks
- Energy literacy vs. energy numeracy

# Overcoming Economics 101

“Anyone who believes exponential growth can go on forever in a finite world is either a madman or an economist.” – *Kenneth Boulding*

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Q. How many economists does it take to screw in a light bulb?

A. None. If it really needed changing, market forces would have caused it to happen.

**How effective will magical thinking be in dealing with these world-transforming problems?**

Climate Change

Peak Oil



**Our descent down the energy canyon has begun. Unlike the animated world inhabited by Wile E. Coyote, our reality won't let us pull out a sign that says "how about ending this cartoon before I hit?"**

It took us 125 years to use  
the first trillion barrels of oil.  
We'll use the next trillion in 30.

So why should you care?

willyoujoinus.com

DAVID J. O'REILLY  
CHAIRMAN & CEO  
CHEVRON CORPORATION



Energy will be one of the defining issues of this century. One thing is clear:  
the era of easy oil is over. What we all do next will determine how well we meet  
the energy needs of the entire world in this century and beyond.

# August, 2005: Chevron Full Page Magazine Adds

# Lessons from Petroleum Geologists

- Discoveries precede extraction; a peak in discoveries precedes a peak in extraction volumes
- Global oil discoveries peaked in 1964
- The largest oil structures are discovered first
- Today's discoveries replace 1 barrel for every 3-4 consumed
  - ***This conclusion is not disputed***
  - ***Technology will not change this reality***

# Signs of Magical Thinking

**Responding to the coming energy squeeze  
with the following assumptions**

- We don't need to change our driving habits
- We can find convenient substitutes for oil
- We don't have to worry about mobilizing the capital needed to invest in successor energy sources
- We can support complex societies with less energetic fuel sources
- We don't need to re-engineer the built environment

# Compared w/ climate change, Peak Oil packs an economic hammer

- Climate change is an externalized phenomenon. The economic impacts from increased CO<sub>2</sub> emissions have had no material effect so far on energy usage worldwide.
- Oil underpins the global economy and has fed its remarkable growth since 1945. The economic signals from increasingly scarce supplies of petroleum will be disruptive and transformational.
- Whereas ethical considerations drive CO<sub>2</sub> reduction strategies, the stark economic realities occasioned by Peak Oil will trump both Business As Usual *and* enlightened environmental policies.

# Energy Return on Energy Invested

## Electricity

- Nuclear 6
- Coal 8
- Hydro 12
- Wind 17 - 35
- PV 6 - 8

## Liquid Fuels

- Crude Oil 20
- Gasoline 18
- Tar Sands 3-4
- Coal to Liquids 3
- Corn ethanol 2
- Biodiesel 3

***THESE NUMBERS MATTER!!!***

# Renewable Energy Pluses

- Energy Security
  - Energy Security
  - Energy Security
  - Price Security
  - Environmental
  - Environmental
  - Economic
  - Economic
- Native to Wisconsin
  - Customer production
  - Non-depleting
  - No fuel-based inflation
  - No air/water emissions
  - Small physical footprint
  - Local contractors/labor
  - Strengthens tax base

# Renewable Energy Minuses

- Energy Supply
  - Energy Supply
  - Energy Supply
  - Economic
  - Economic
  - Economic
  - Physics
- Difficult to scale up
  - Not dispatchable
  - Weather-dependent
  - Higher capital costs
  - More labor-intensive
  - Not commodity-based
  - Lower EROEI (except for commercial-scale wind)

# Observation #1

In an industrialized and highly mobile society built to run on cheap and abundant fossil fuels, renewable energy will always be swimming upstream, against the prevailing economic currents.

# Observation #2

The commodity energy markets, which set the price of our primary energy sources, never assume any profound and structural changes in the supply/demand balance of the resources traded. To the extent the marketplace has a mindset, it is this: the world we have today is the one we will always have.

# Observation #3

To run a world on renewable energy, a new infrastructure and set of expectations must be created. Because the EROEI of renewables is generally less than that of liquid fossil fuels, the new infrastructure must be built with today's wealth before it is frittered away on socially unproductive products and activities (McMansions, NASCAR, casinos, etc.).



Using the solar ration available on the morning of November 24, 2007 to preheat water and dry clothes

# The Psychology of Previous Investment

Casino,  
French Lick,  
Indiana



Wealth Source or Wealth Sink?

# Policy Is Required to Overcome the “Psychology of Previous Investment”

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February 5, 2007

## Feed Law Powers Germany to New Renewable Energy Record

by Paul Gipe, Contributing Writer

German farmers, homeowners and industrialists set a world record for the development of renewable energy in 2006. Using the country's pioneering electricity feed law, Germans invested more than U.S.\$10 billion in new sources of renewable energy last year, including wind turbines, solar panels and biogas power plants.

<snip>

# What Are Feed-in Tariffs?

Feed-in Tariffs (a/k/a Advanced Renewable Tariffs) are buyback rates that are:

- Production cost-based
- Fixed over a defined period of time
- Uniformly applied across utility boundaries
- A source of REC's for utilities

# German Solar Photovoltaics

“Germany installed an astounding 100,000 solar systems in 2006, representing 750 MW of solar-electric generation. This follows on the back-to-back record-setting years of 2005 (750 MW) and 2004 (600 MW).”

“Analysts estimate that solar cells in Germany now generate about 2 TWh of electricity per year, or nearly one-half of one percent of German electricity consumption.”

<http://www.renewableenergyaccess.com/rea/news/story?id=47322>

# German Solar Hot Water

“The German solar boom is not solely limited to solar photovoltaics, the perennial favorite of environmentalists, but also to the more pedestrian solar domestic hot water systems. In 2006, Germans installed 140,000 solar hot water systems or 1,050 MW of solar thermal capacity. Altogether, there are the equivalent of 6,300 MW of solar hot water heating in Germany today. Often overlooked in preference for the sexier solar photovoltaics, solar thermal systems generate the equivalent of 4.3 TWh per year. The German solar hot water market employs 18,000 and earns gross revenues of U.S.\$1.5 billion per year.”

<http://www.renewableenergyaccess.com/rea/news/story?id=47322>

# German Biogas

Germany employs 8,000 in the on-farm biogas industry. Manure-fired power plants generate nearly 5 TWh per year of electricity, or about one percent of consumption, says the ... German Renewable Energy Association.

<http://www.renewableenergyaccess.com/rea/news/story?id=47322>

# German Wind

Again in 2006, Germany remained one of the world's largest markets for wind turbines, installing nearly 2,200 MW from Bavaria to the Danish border. Germany not only was the world's second largest market for wind energy, behind only the U.S., but also continued to lead the world with a total installed wind-generating capacity of 22,247 MW, according to the World Wind Energy Association.

<http://www.renewableenergyaccess.com/rea/news/story?id=47322>

# German Wind (continued)

“With only 1/4th of the United States population and only 1/20th the land area, Germany operates 30% times more wind generating capacity than that of the entire lower 48 states. Germany currently provides about 6% of its electricity from wind energy alone. German heavy industry employs 70,000 in the wind energy sector, and last year Germans invested more than U.S.\$4.5 billion in new wind turbines.”

<http://www.renewableenergyaccess.com/rea/news/story?id=47322>

# Initial Activity (2005-2006)

## RENEW intervenes in utility rate cases

- Seeking higher buyback rates for wind, biogas
- PSC suggests pegging buyback rates to MISO prices – issue is then addressed by WIDRC.

## WIDRC and Focus on Energy model RE production costs – bring Paul Gipe to Wisconsin to discuss ART's

## WE proposes higher PV and biogas buyback rates for 2006

- Proposes 22.5 cents/kWh for solar – up to 500 kW
- Tariff to be absorbed through voluntary RE program – no ratepayer impacts
- RENEW supports solar tariff/PSC approves solar tariff

# Estimated Break-Even Production Costs of Distributed RE Sources

<i>Distributed Generator Type</i>	100% Financed	Not Financed
30 kW Solar Electric System	\$0.518	\$0.396
90 kW Wind Turbine	\$0.200	\$0.151
225 kW Biogas Digester (dairy manure)	\$0.116	\$0.0953

*Source: WIDRC (March 2007)*

*Costs expressed in 2006 \$\$*

# Recent Activity (2007-2008)

***Through WIDRC, utilities and other organizations are working together on special RE tariffs***

Biogas	-	Alliant-WPL	9 cents/kWh	proposed
		We Energies	8.1	approved
		Xcel	7.3	approved
Wind	-	Alliant-WPL	9	proposed
		Xcel	6.6	approved
Solar		MGE	25	approved
		Alliant-WPL	25	pending
		We Energies	22.5	approved

# Are These Truly Advanced Renewable Tariffs (ART's)?

*In a word, no.*

- ✓ Technology-specific
- ✓ Fixed over time
- Not based on production costs
- Solar buyback rates are subsidized by renewable energy subscriptions
- Solar offerings are capped at pre-determined levels
- Rates are designed to be layered on top of other incentives (Focus on Energy, federal tax credits, USDA grants)
- Buyback rates vary from utility to utility

# Effect of Solar Rates + Incentives on PV Market

- Current sweet spot in WI is between 20kW and 35 kW (50 kW for nonprofits)
- WE also offers special buydown for nonprofit-owned systems (35% on top of 35% from Focus on Energy)
- When layered on Focus on Energy incentives and federal tax credit, special tariff boosts ROI on commercial systems to about 10%
- WE's tariff now capped at 1 MW – MGE's cap is 150 kW – Alliant proposing 250 kW cap

# Pressure Is Building for a State Policy on ART's

- Biogas producers and RENEW intervened in We Energies rate case calling for ART's. WE responded with a higher biogas tariff.
- Alliant has proposed ART's in current rate case.
- Governor's GW Task Force will decide this spring whether to endorse workgroup recommendation to implement ART's statewide.

# Where We Are Today

- ❖ The skirmishing stage is over. ART's are ready move to center stage.
- ❖ Executive branch has yet to take a stand on ART's.
- ❖ Outreach effort to date has been limited to utilities and PSC. Legislature has not been approached yet.
  - What's missing is foundation support or industry \$\$ to wage a serious statewide campaign. Same is true with Minnesota and Michigan.

# Renewable Electricity for Transportation

- Renewable electricity is a superior alternative to biofuels for transporting people
  - Higher EROEI, creating more wealth
  - Cheaper – 50 miles/two gallons gasoline - \$8.00  
50 miles/12 kWh electricity - \$1.50
  - Less price volatility – electricity is a regulated product – in contrast, diesel prices have increased 70% over the last 12 months - \$2.80 → \$4.70/gallon
  - Easy to access – plug in your vehicle
- Energy storage (battery lifespan and expense) remains an issue, limiting mobility and convenience

# Cost Comparison

- E-10 gasoline at the pump 16 cents/mile
- Wind/solar @20 cents/kWh 5 cents/mile

## *However ...*

Most definitions of renewable fuels do not include electricity produced from solar, wind, hydro, and bioenergy. It is highly doubtful that renewable fuel standards above 10% can be achieved when renewable electricity sources are excluded from the mix.

# Other Benefits of Renewable Electric Transportation

- The grid offers multiple access points, including residences and workplaces
- A great use for nighttime wind energy
- Price of electricity not influenced by demand for food crops and Midwestern floods
- EV's last longer – require less maintenance
- Delivers far more CO<sub>2</sub> reduction benefits than biofuels
- Takes demand pressure off nonrenewable liquid fuels
- Electrification makes higher-speed rail and transit systems a more cost-effective investment

# What Are the Trade-Offs?

- Reduced mobility due to energy storage limitations, frequent recharges
- Smaller cars - less room for people and things
- Lower driving speeds – not suitable for highways
- Automobile manufacturers haven't figured out how to manufacture profits with EV's

# Other Responses to the New Energy Reality

- Carpools, ride-sharing and jitney services
- Fewer, better-organized trips for running errands
- Reductions in discretionary travel
- Working at home more often
- Less aggressive driving behavior
- Take a walk/ride a bicycle
- A more localized relationship with the world

# Resources

## RENEW's blogs

[www.renewenergyblog.wordpress.com](http://www.renewenergyblog.wordpress.com)

[www.madisonpeakoil.blogspot.com](http://www.madisonpeakoil.blogspot.com)

## Paul Gipe's web site (for ART's)

[www.wind-works.org](http://www.wind-works.org)

## Other great web sites

[www.theoildrum.com](http://www.theoildrum.com)

[www.aspousa.org](http://www.aspousa.org)

# Questions?

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