

Levelizing the Playing Field for Renewables

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How RENEW and Focus on Energy Promote Renewables

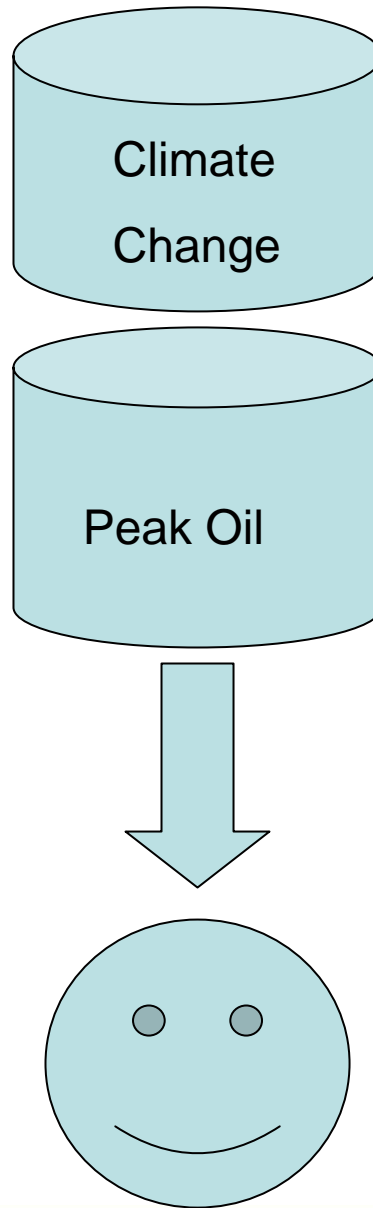
- Strengthening Utility Renewable Energy Requirements
- Fighting for Funding Security for Focus on Energy
- Promoting Voluntary RE Purchases
- Educating Media, Policymakers on RE Benefits
- Partnering with Proactive Utilities
- Increasing Renewable Energy Tariffs (buyback rates)

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*

- 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?



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?"

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



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

Renewable Energy Pluses

- Energy Security
 - Energy Security
 - Energy Security
 - Price Security
 - Environmental
 - Environmental
 - Economic
 - Economic
- Native to Wisconsin
 - Customer generation
 - 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
 - Economic
 - Physics
- Difficult to scale up
 - Non-dispatchable
 - Weather-dependent
 - Higher capital costs
 - More labor-intensive
 - Too many cars to fuel
 - Not commodity-based
 - Lower EROEI (except for commercial-scale wind)

Observation #1

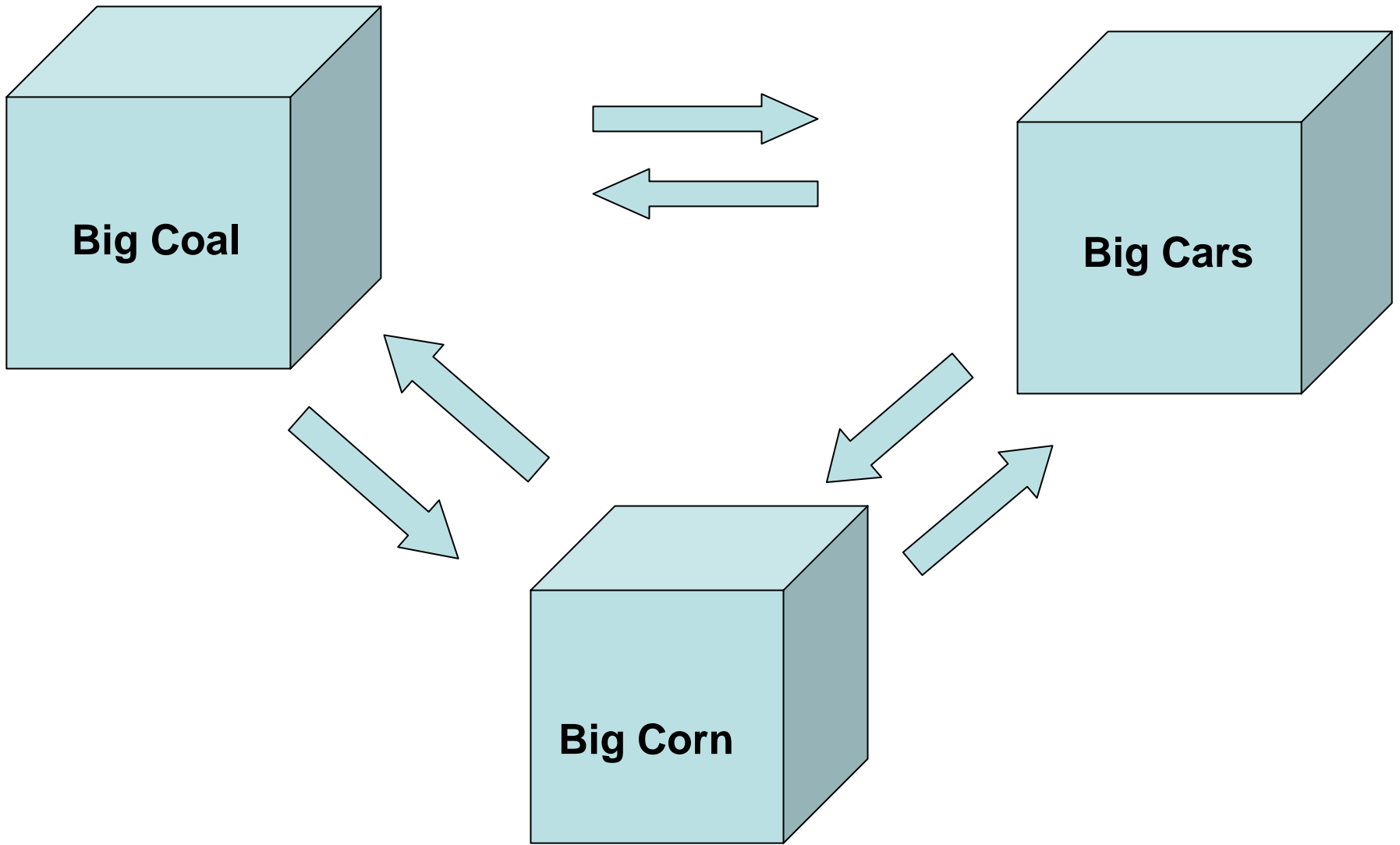
In an industrialized and highly mobile society built to run on cheap and abundant fossil fuels, renewable energy will always be swimming upstream, against the prevailing economic currents.

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 less than that of 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.).



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

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

The Scoop on Advanced Renewable Tariffs

➤ Pluses

- Enhances financeability of RE DG
- Locks in hedging value of DG resource
- Expands a utility's native RE base -- reduces risks
- Could eliminate need for grants and incentives

➤ Minuses

- Initially more expensive
- PSC puts cost above all other considerations

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 20,600 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 1.8 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>

Why Support Windpower?

- Clean → Environmental
- Non-depleting → Energy Security
- Fixed Price → Risk Management
- Creates Wealth → Economic Development
- Scalable to Utilities → Practicality

A sustainable source of wealth for Wisconsin!!

Energy Return on Energy Invested

Electricity

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

Liquid Fuels

- Crude Oil 20
- Gasoline 18
- Oil Shale 3-4
- Coal to Liquids 3
- Corn ethanol 1.3
- Biodiesel 3.0

Source: Cutler Cleveland et al, Center for Energy + Environmental Studies, Boston Univ. (unpublished)



***Montfort Wind Energy Center
Owner: FPL Energy
20 turbines, 30 MW
Iowa County, WI***



Project: Twin Groves
Owner: Horizon Wind Energy

Location: McLean County, IL
Size: 120 turbines, 198 MW



Project: Locust Ridge

Owner: Iberdrola

13 turbines (26 MW)

Mahanoy City, PA

Built on top of a belt of anthracite. Commissioned in 2006.



Atlantic City, NJ – 5 turbines, 7.5 MW

What Does 2005 Act 141 Do?

- 2015 – Sets renewable energy content goal of 10%
 - 2004 – Estimated content ~3.5%
 - 2010 – Increase of 2 percentage points
 - 2015 – Increase of 4 percentage points
- More than doubles existing quantity of RE
- Amount to be added equivalent of 1,700 MW of wind in Wisconsin
- Requires State of WI to purchase renewable electricity (10% by 2007; 20% by 2011)

Expected Contribution to Wisconsin's 10% Target (by resource)

- **Wind** **90+%**
- **Biogas (food + dairy)** **2-4%**
- **All others** **2-4%**
(solar, biomass, hydro)

Comparing Output - Wind vs. Solar

- A typical household-size PV system (1.65 kW) will produce 2,000 kWh/yr
- A typical commercial wind turbine (1.65 MW) will produce 4,000,000 kWh/yr
- It would take 2,000 household-sized PV systems to equal the output from one commercial wind turbine in Wisconsin

About Biogas Generation Systems

- Minimum herd size to support a biogas energy installation --- 700 cows
- Estimated number of Wisconsin farms that produce enough manure to justify a digester --- 200
- Some dairy farms sell the biogas they produce as natural gas instead of electricity

A Comparison of RE Mandates by State

- Minnesota 25% by 2025 (Xcel 30% by 2020)
- Illinois 25% by 2025 (Ameren + ComEd)
- Colorado 20% by 2020
- New Mexico 20% by 2020
- New York 25% by 2013 (now at 19%)
- **Wisconsin 10% by 2015 (now at ~4%)**
- Delaware 10% by 2019
- Maryland 7.5% by 2019

WI Wind Projects - Class of 2008

<u>Developer</u>	<u>Size (MW) - Turbines</u>		<u>County</u>	<u>Work started?</u>
We Energies	145	88	Fond du Lac	Yes
Invenergy	99	66	FDL/Dodge	Yes
Midwest	54	36	Dodge	No
Alliant/WPL	68	41	Fond du Lac	Yes
EcoEnergy	9	6	Dane	No

Estimated output from these projects → 925 million MWH
(1.3 – 1.4 percent of WI electricity sales)

Note: PSC approved first two projects.

Wind Projects Planned to Satisfy Renewable Energy Standard

<u>Developer</u>	<u>Name</u>	<u>(MW)</u>	<u>State</u>	<u>PPAs with</u>
We Energies	Blue Sky GF	145	WI	N/A
Invenergy	Forward	99	WI	MGE, WPPI, WPS
MWE	Butler Ridge	54	WI	WPPI
Alliant/WPL	Cedar Ridge	66-99	WI	N/A
Iberdrola	Top of Iowa 2	50	IA	WPPI
MG&E	Top of Iowa 3	30	IA	N/A
EcoEnergy	Various	12-24	WI	WPPI

Estimated output from these projects → 1.25 million MWH/yr
(1.7 percent of WI electricity sales in 2010)

But Coal Is Still King in WI

Look at the numbers

Elm Road 1+ 2

Capacity: 1200 MW

Approved in 2003

On-line: 2009/2010

Output: 9 billion kWh/yr

Weston 4

Capacity: 500 MW

Approved in 2004

On-line: 2008

Output: 3.7 billion kWh/yr

Percentage of WI load in 2010 to be served by these units: 17%

Impact of New Windpower on CO₂ Emissions

Amount of CO₂ discharged annually from WI sources:

122 million tons

Amount of CO₂ displaced by Class of 2007 - 2008
Act 141 wind projects (includes IA wind projects)

2.5 million tons ... a 2% improvement

What More Must We Do?

Goal: Future load growth must be addressed with efficiency and renewables

- ❖ Set a schedule with deadlines for reducing fossil fuel inputs
- ❖ Establish Advanced Renewable Tariffs
- ❖ Restore sanity to the wind energy permitting process (through legislation)
- ❖ Increase Focus on Energy \$\$ and broaden its scope

Some Progress to Report

- Biogas producers and RENEW intervened in current WE rate case calling for action on feed-in tariffs
 - ❖ 9-10 cents/kWh for biogas projects

Some utilities offer higher rates for PV

❖ WE	22.5 cents/kWh	approved
❖ MGE	25 cents	approved
❖ River Falls	30 cents	pending

- Tariff reform proposal (drafted by RENEW) is before the Governor's Global Warming Task Force

**It could be much worse
We could be living in Indiana**

**Casino,
French Lick,
Indiana**



Final Thoughts and Observations

- We are halfway through our (liquid) fossil inheritance.
- Continued profligacy guarantees an energy-constrained future.
- An orderly descent down the Hubbert Curve should be our No. 1 priority.

Further Reading

Web sites

www.energybulletin.net

www.theoildurm.com

www.aspo-usa.org

Articles

“Methane Madness,” “When Will the Joyride End?” and “From Cleopatra to Columbia,” by Randy Udall

<http://www.aspencore.org/sitepages/pid33.php>

Books

Big Coal, J. Goodell, 2006

Peak Everything, R. Heinberg, 2007

The Omnivore’s Dilemma, M. Pollan, 2006

Cape Wind, Williams/Whitcomb, 2007

RENEW on the Web

www.renewwisconsin.org

www.renew-energy-blog.org

www.madisonpeakoil-blog.blogspot.com

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