Greening the Grid: Making Powerful Choices

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Frames of Reference

- Deal in MegaWatts, Kilowatts, MegaWatt-hours, KiloWatt-hours
- 10 - 100 W bulb plugged in for 1 hour = 1 KWh
- Average NWE customer uses 750 KWh/month
- MWh = 1000 KWh; 10,000 100 W bulb for 1 hr
- Typical customer uses 0.75 MW/mo
- 1 MW of generation ≈ 750 homes

Frames of Reference

- 1000 MW of generation ≈ Seattle
- Colstrip coal plants = 2094 MW; ≈ 2 X Seattle
- Typical coal plant 500-800 MW
- Typical nuclear plant ~ 1000 MW
- Wind turbine 1.5 – 3 MW

Sources of Generation

	United States	Pacific Northwest
Coal	50%	13%
Nuclear	19%	6%
Natural gas	22%	8%
Hydro	6%	54%
Renewables	3%	10%

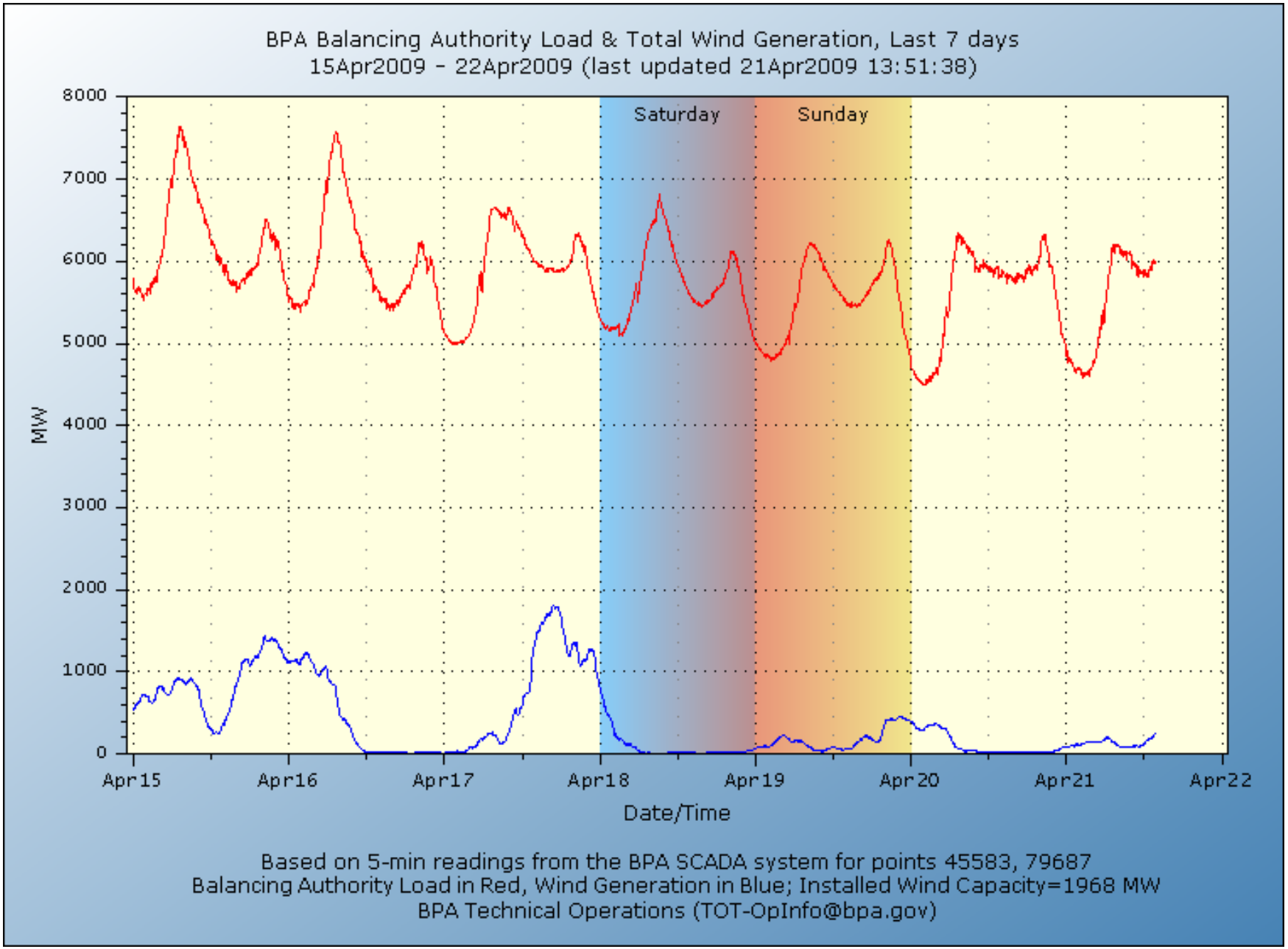
Sources: U.S.: 2007 Energy Information Administration
PNW: 2008 PNUCC Northwest Regional Forecast

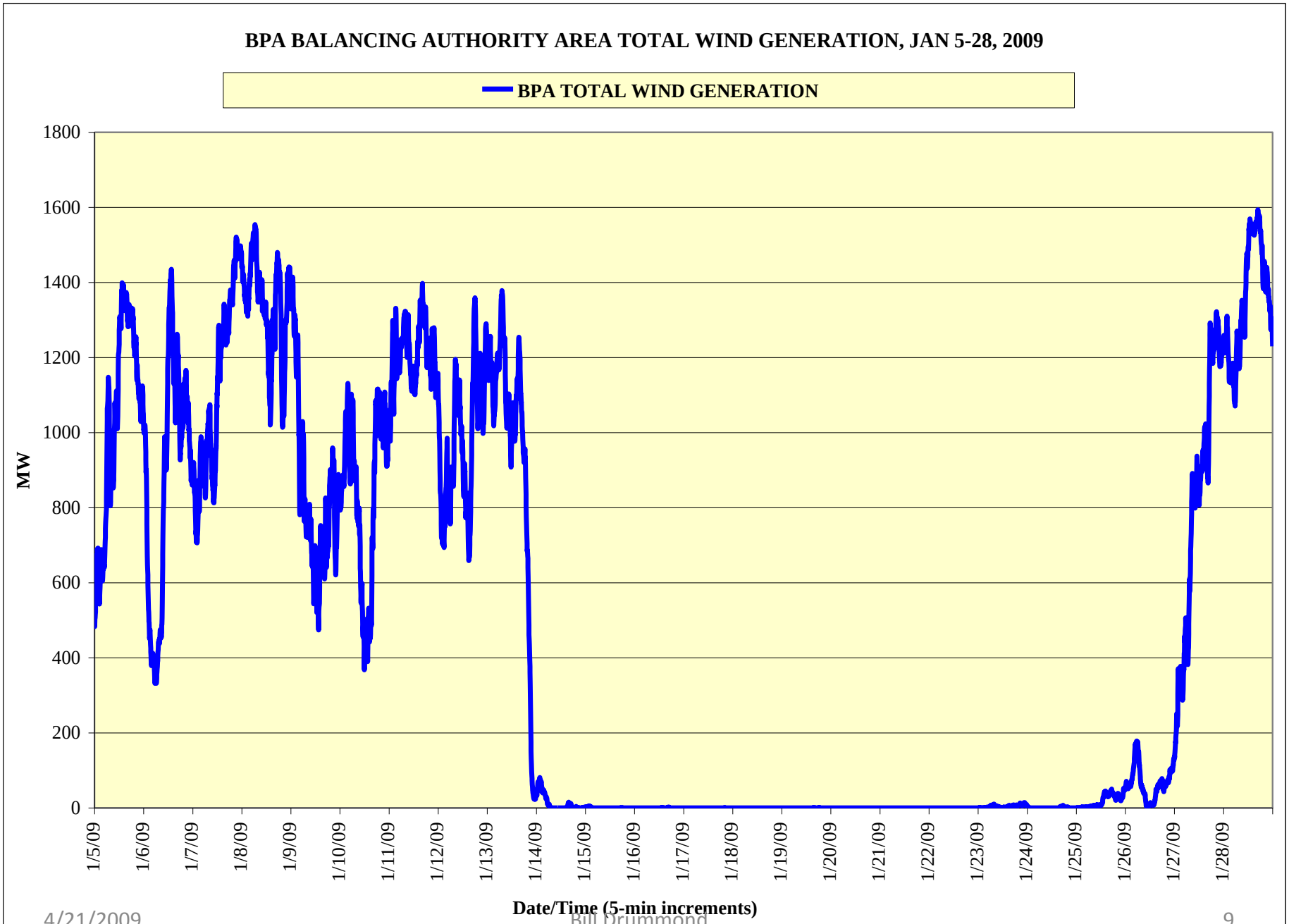
Resource Alternatives – Near-term

- Coal
- Energy Efficiency
- Transmission, transmission, transmission
- Wind
- Combustion Turbines
- Nuclear
- Geothermal
- Solar
  - Hot water heating
  - Photovoltaic
  - Concentrated solar (central station)

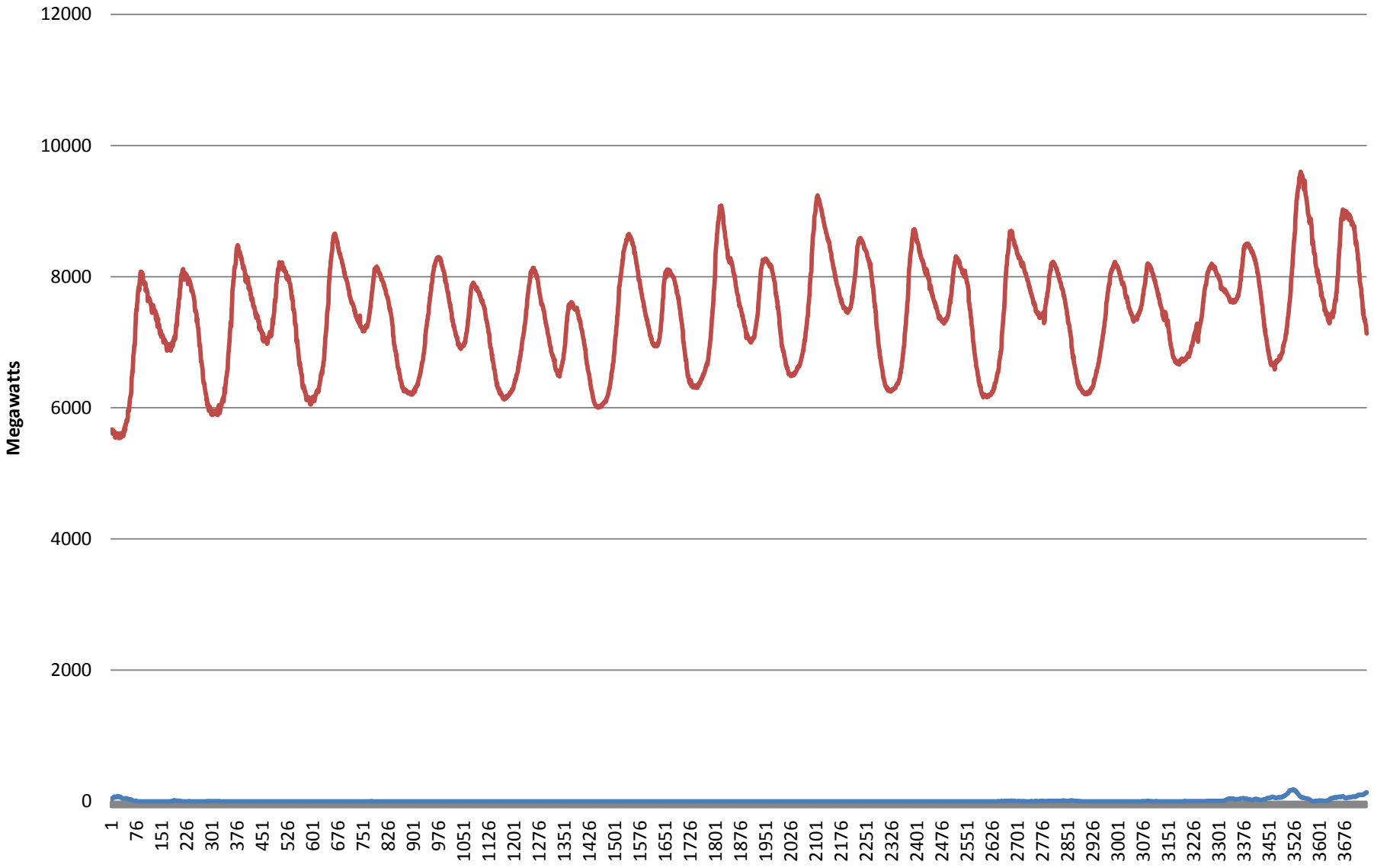
1st Policy Question

Objections by some states and other interested parties have often stalled major transmission projects. Is it appropriate for the federal government to exercise eminent domain authority to force a state to allow development of a transmission line that will carry green power? Is the same true regardless of the generation source?


BPA Balancing Authority Load & Total Wind Generation, Last 7 days
15Apr2009 - 22Apr2009 (last updated 21Apr2009 13:51:38)
Saturday
Sunday
8000
7000
6000
5000
4000
3000
2000
1000
0
MW
Apr15
Apr16
Apr17
Apr18
Apr19
Apr20
Apr21
Apr22
Date/Time
Based on 5-min readings from the BPA SCADA system for points 45583, 79687
Balancing Authority Load in Red, Wind Generation in Blue; Installed Wind Capacity=1968 MW
BPA Technical Operations (TOT-OpInfo@bpa.gov)


BPA BALANCING AUTHORITY AREA TOTAL WIND GENERATION, JAN 5-28, 2009
BPA TOTAL WIND GENERATION
MW
1800
1600
1400
1200
1000
800
600
400
200
0
1/5/09
1/6/09
1/7/09
1/8/09
1/9/09
1/10/09
1/11/09
1/12/09
1/13/09
1/14/09
1/15/09
1/16/09
1/17/09
1/18/09
1/19/09
1/20/09
1/21/09
1/22/09
1/23/09
1/24/09
1/25/09
1/26/09
1/27/09
1/28/09
Date/Time (5-min increments)

Load and Wind Generation
Jan 14 - 26, 2009



2nd Policy Question

In the past, Montana has built major parts of its economy on exploitation of its natural resources for out of state beneficiaries, including mining, timber, coal and power developments. Should Montana continue this pattern and develop large wind generation projects to serve out of state loads thus reducing GHG production nationally but despoiling our landscape?

Alternatives Long-term

- Energy Efficiency
- Transmission, transmission, transmission
- Wind with storage
- Solar
- Nuclear
- Coal with capture & sequestration
- Smart Grid
- Wave/Tidal
- Nano-technologies

3rd Policy Question

It's just before Christmas and you are standing at the hardware store looking at LED Christmas lights, which happen to cost 3-4X what the incandescent strings cost but use far less energy. You look up and there standing next to you is a world-renowned expert on global warming contemplating the same decision. Which light string do you buy?

Interesting websites/articles

- "Use Energy, Get Rich, Save the Planet" by John Tierney: http://www.nytimes.com/2009/04/21/science/earth/21tier.html?ref=science
- Wind generation site: http://www.transmission.bpa.gov/business/operations/Wind/baltwg.aspx
- Green tags: www.b_e_f.org