

ENERGY-RELATED ENVIRONMENTAL SCIENCE AND POLICY: CHALLENGES AND STRATEGIES

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of Ecosystem Studies

Traditional Energy Sources

Petroleum

Coal

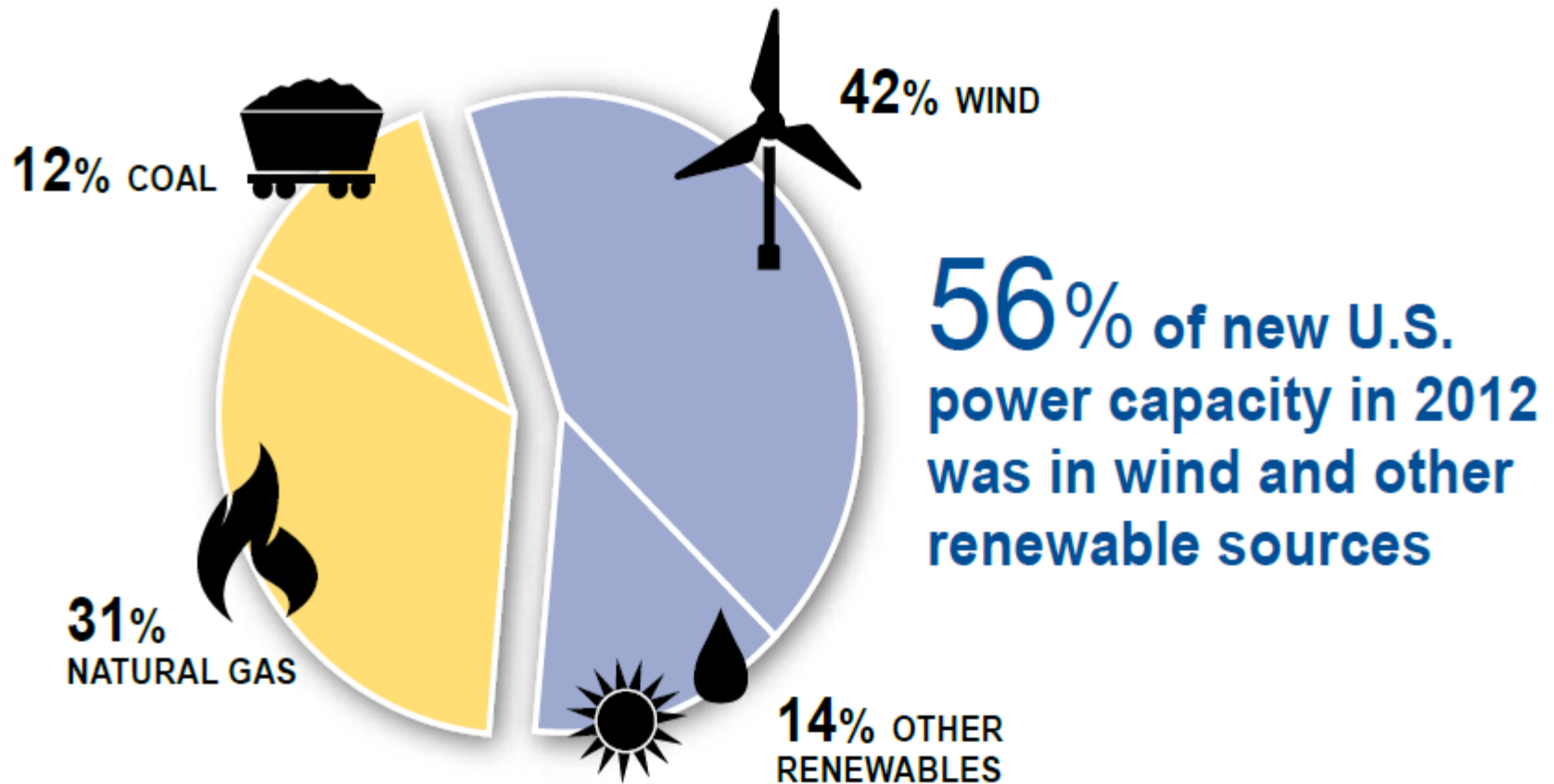
Nuclear

Natural Gas

Alternative Energy sources for New York

Realistic	Likely Minor
Biofuels	Microhydropower
Solar	Tidal
Wind	Geothermal

Installed New Capacity



Source: AWEA

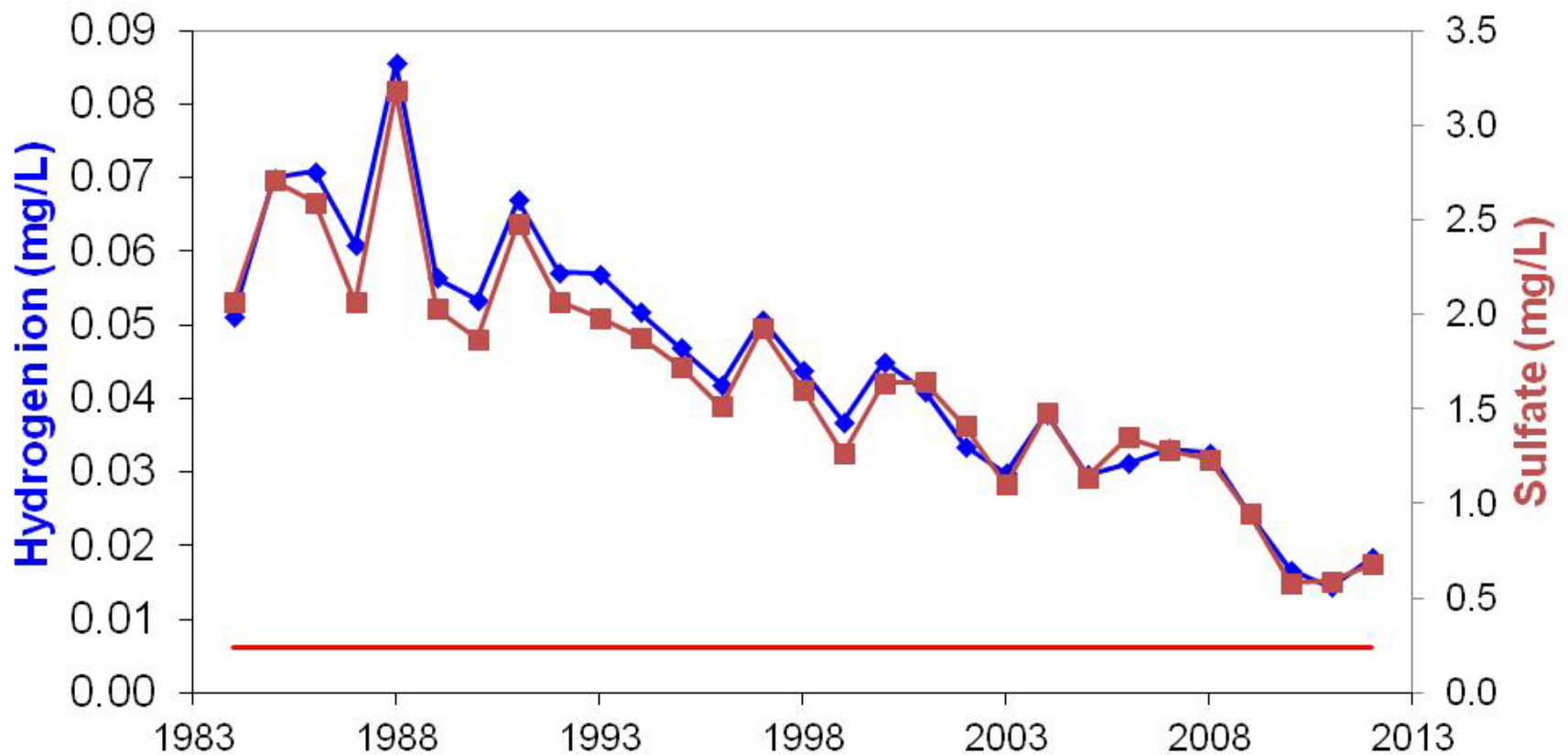
EDF Solutions Vol 44 No 4:7

Environmental Impacts: Coal

Mining Impacts

Acid Rain

SO₄ and H⁺ vs. Time



Cary Institute Environmental Monitoring Program Data.

Coal

Mining Impacts

Acid Rain

Nitrogen Emissions

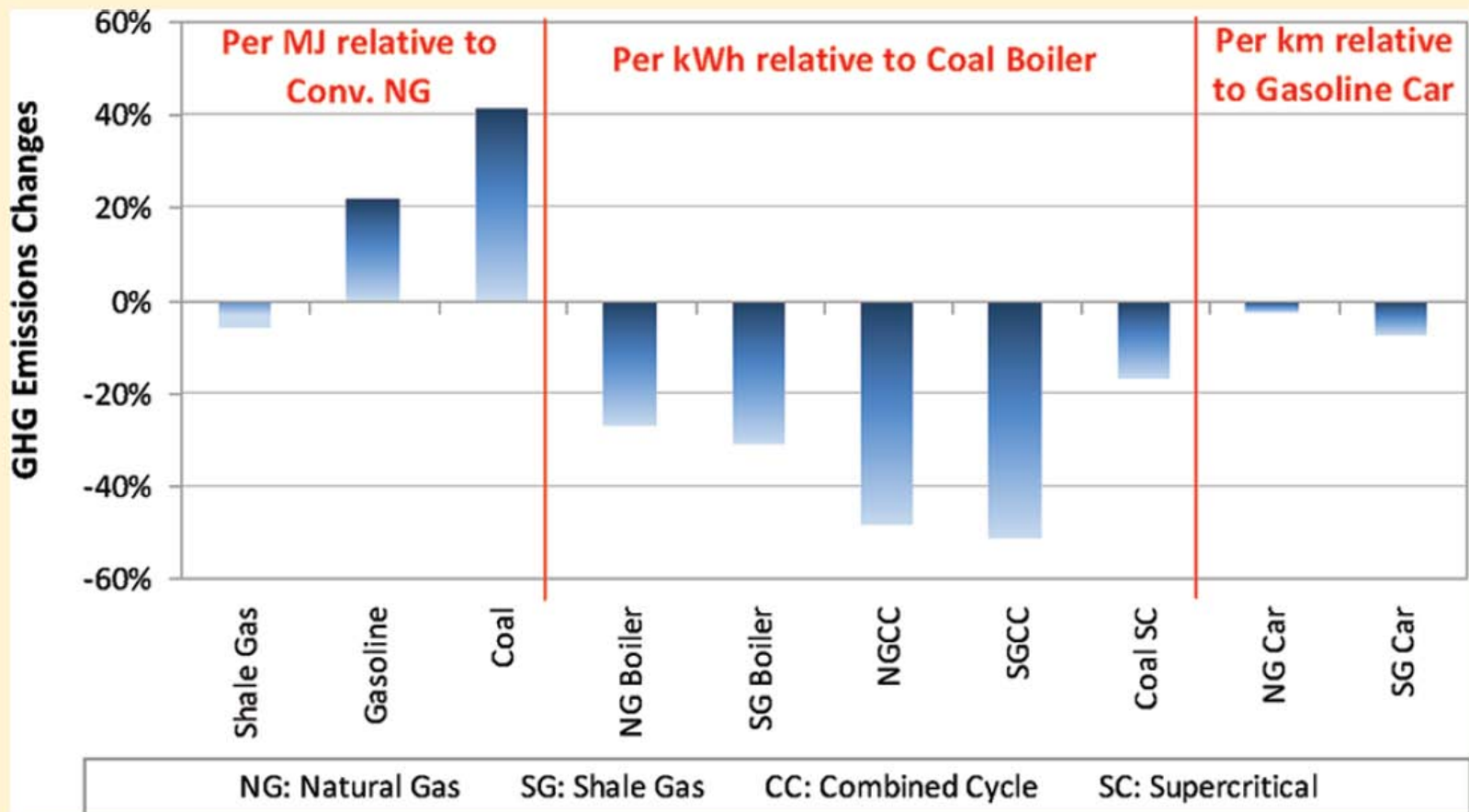
Mercury Deposition

Coal Ash Piles and Seepage

Natural Gas

Fracking

- A. Contamination of surface and groundwaters (Rn, Ba, Cl, others)
- B. Release of methane; negates global climate benefits

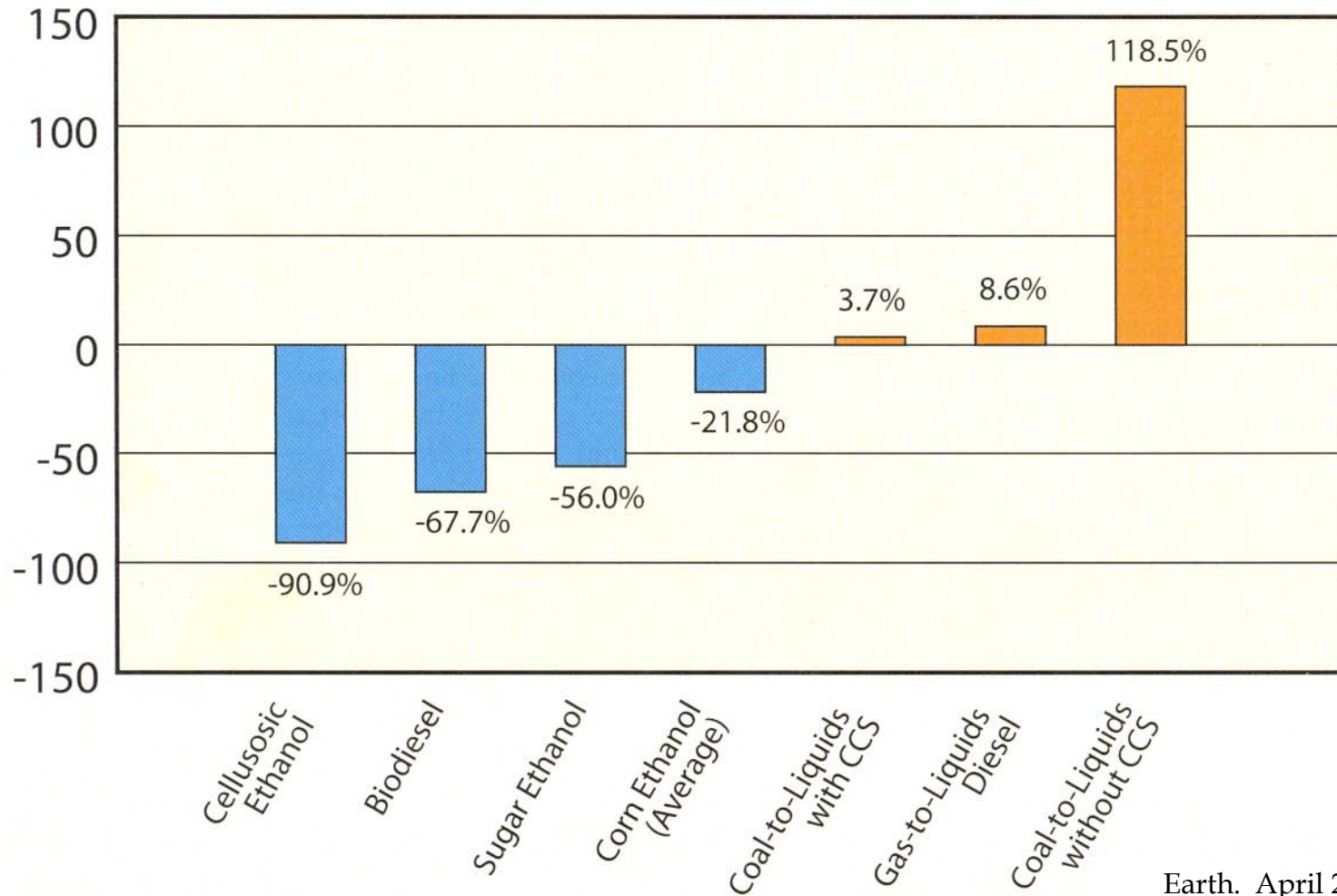


Environ. Sci. Technol. 2012. 46:619.

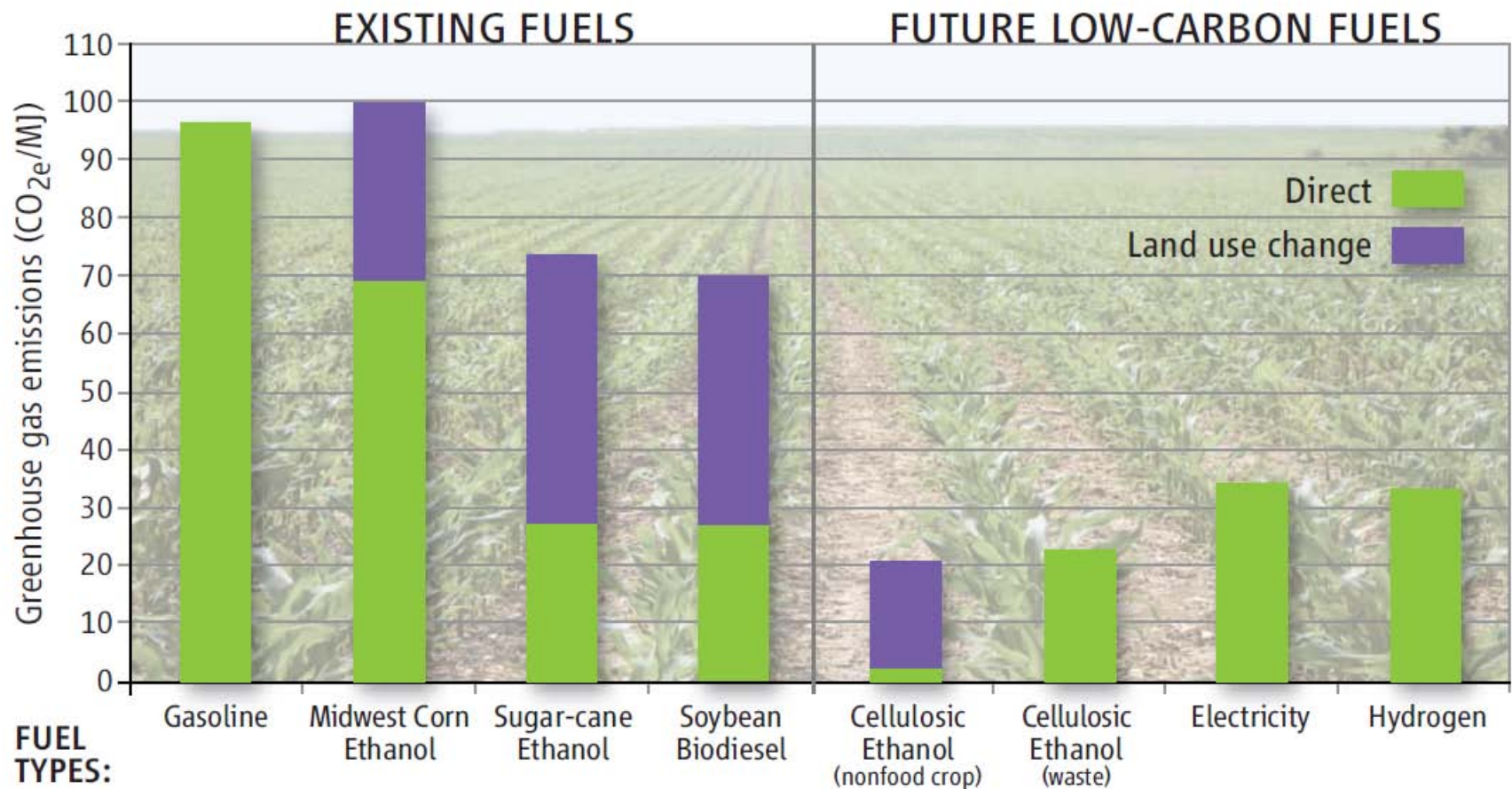
Biofuels and related

A. What is net energy and/or climate benefit?

Percent Change in Greenhouse Gas Emissions Relative to Gasoline



Earth. April 2009:49.



Degrees of green. California officials say today's ethanol is no better than gasoline, but they're banking on cleaner biofuels by 2020.

Science. 2009. 324:587

Biofuels and related

A. What is net energy and/or climate benefit?

B. Biochar benefits?

Solar

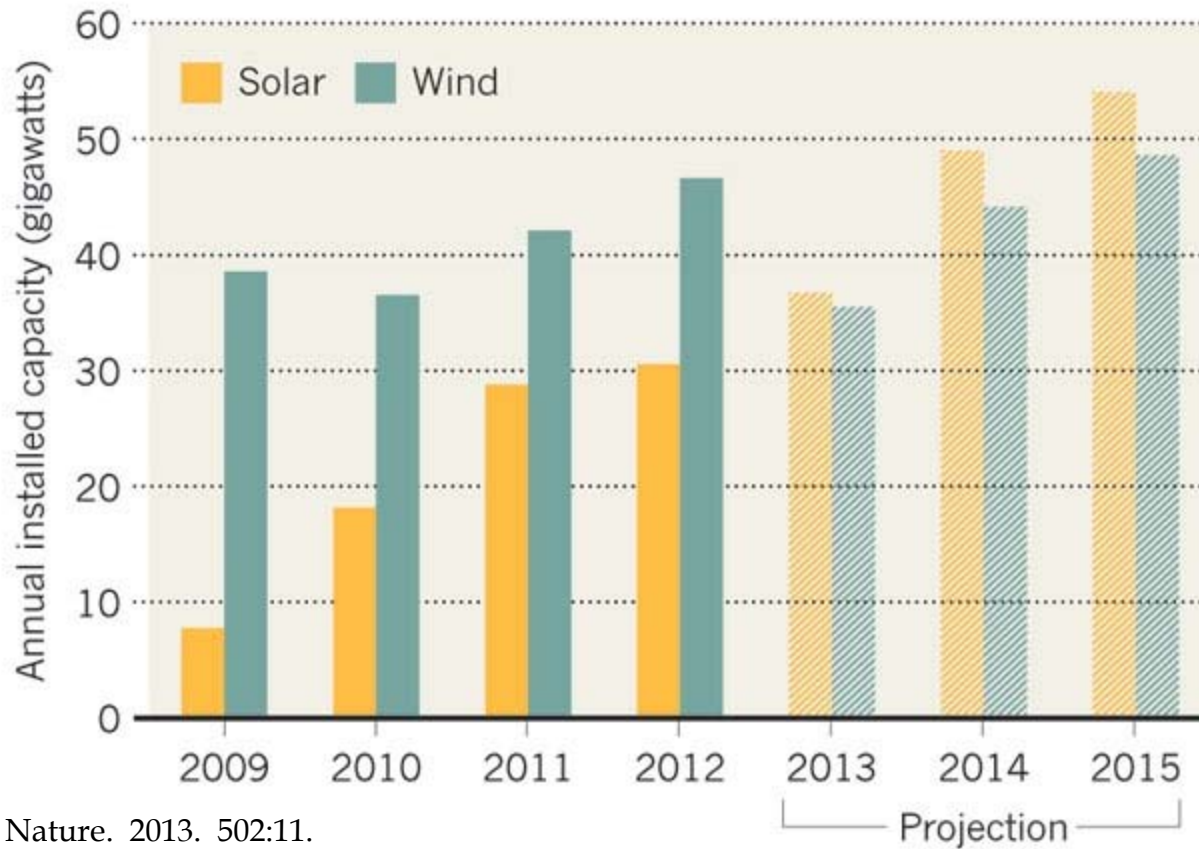
- A. Is solar viable without subsidy?
- B. Embedded energy in panels; 3-4 years?
- C. Disposal and recycling of panels (Li, Ga, Cd, As, Te, others)



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MORE SOLAR THAN WIND

The number of new photovoltaic panels will overtake the number of new wind-power installations this year, say analysts.



Nature. 2013. 502:11.

Wind

- A. Bird and bat mortality (vs. cats)
- B. Effects on micrometeorology
- C. Aesthetics

Research Needs

- A. A priori studies of potential impacts
- B. Life-cycle analysis of advantages



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