Global Energy Statistics

Paul Wilson
UW-Madison Engineering Physics

8th Annual International Bioethics Forum

4.24.09

UNIVERSITY OF WISCONSIN
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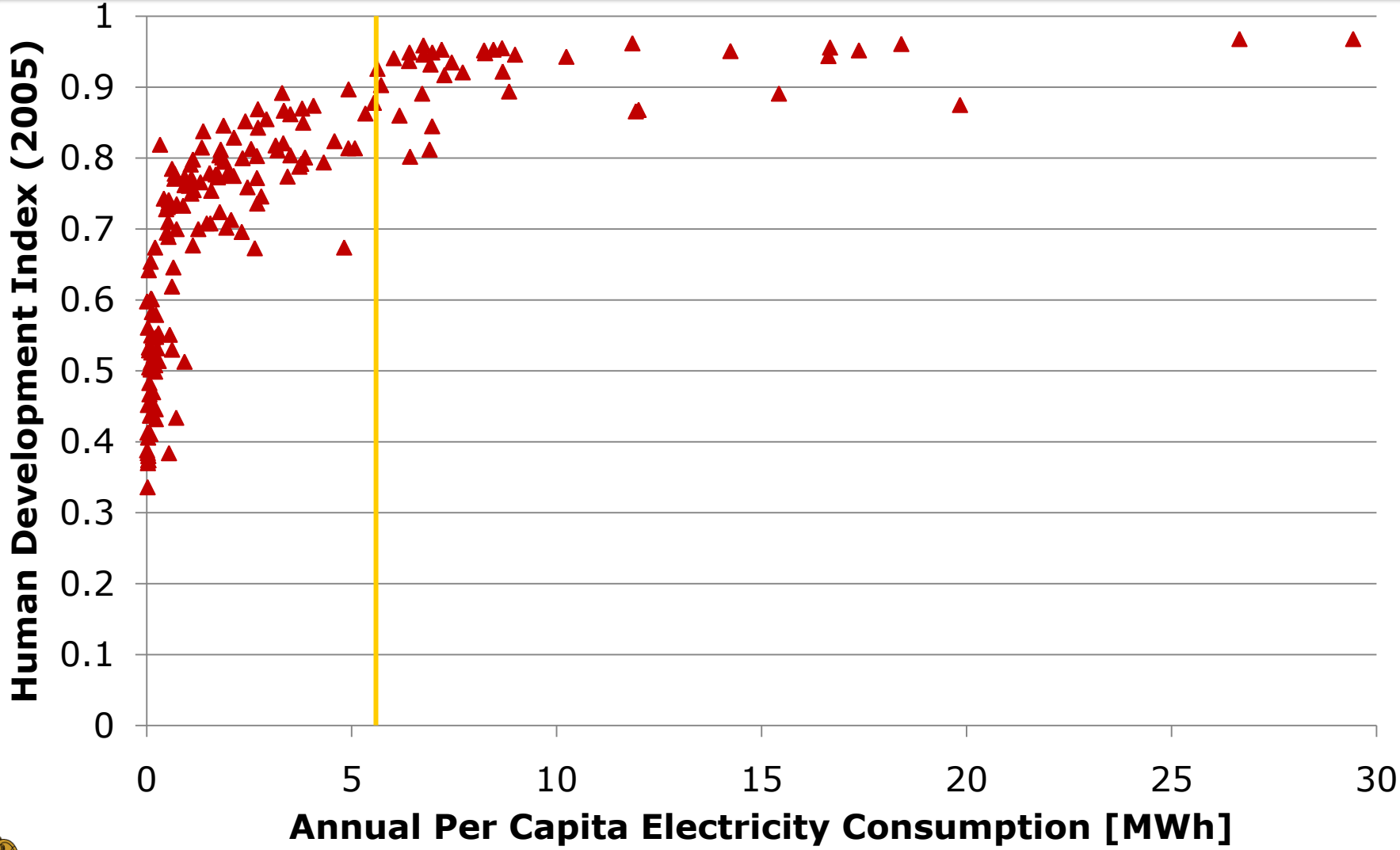
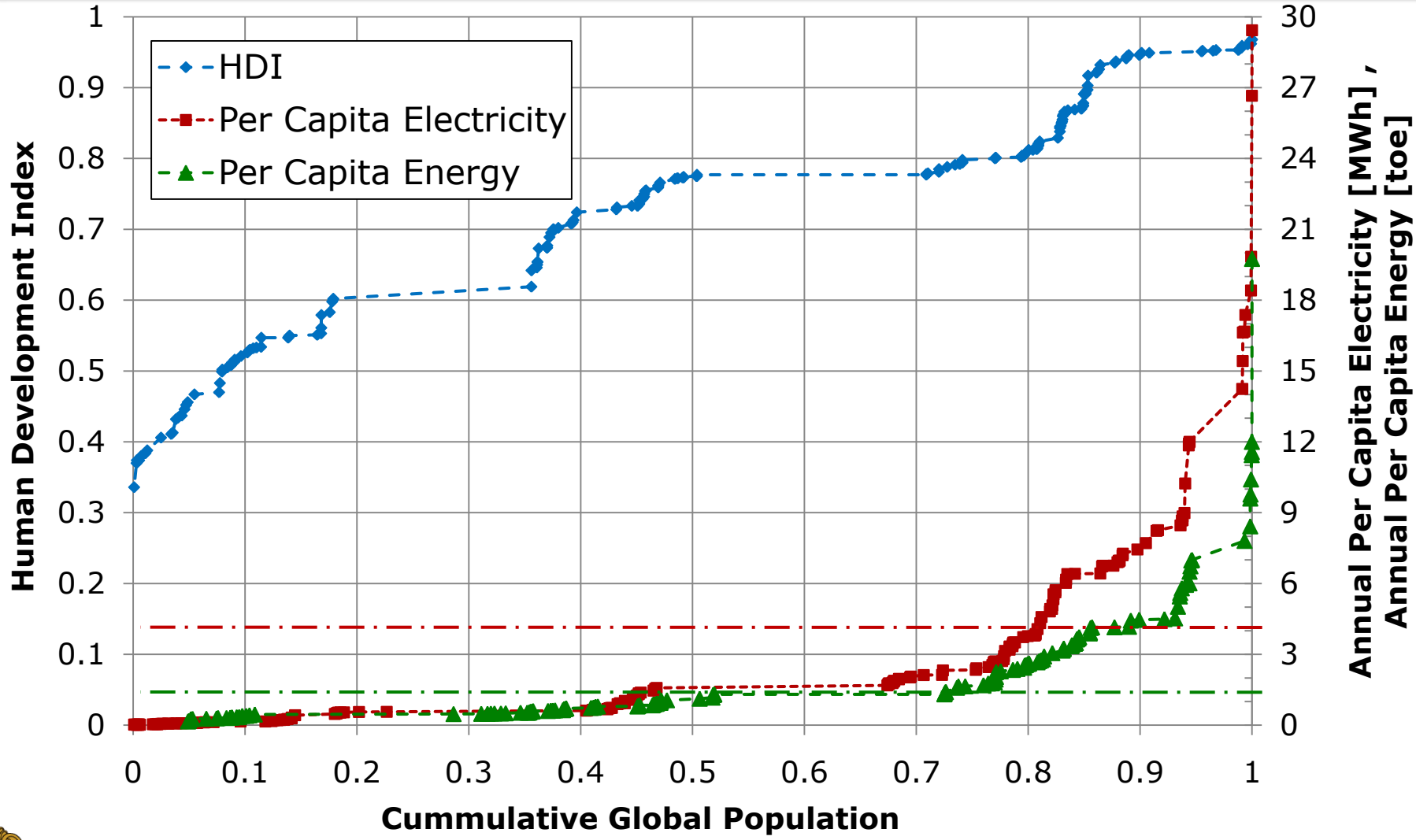
Access to Electricity is Correlated with Quality of Life



Most of the World Lives Without Access to "Adequate" Supply of Energy

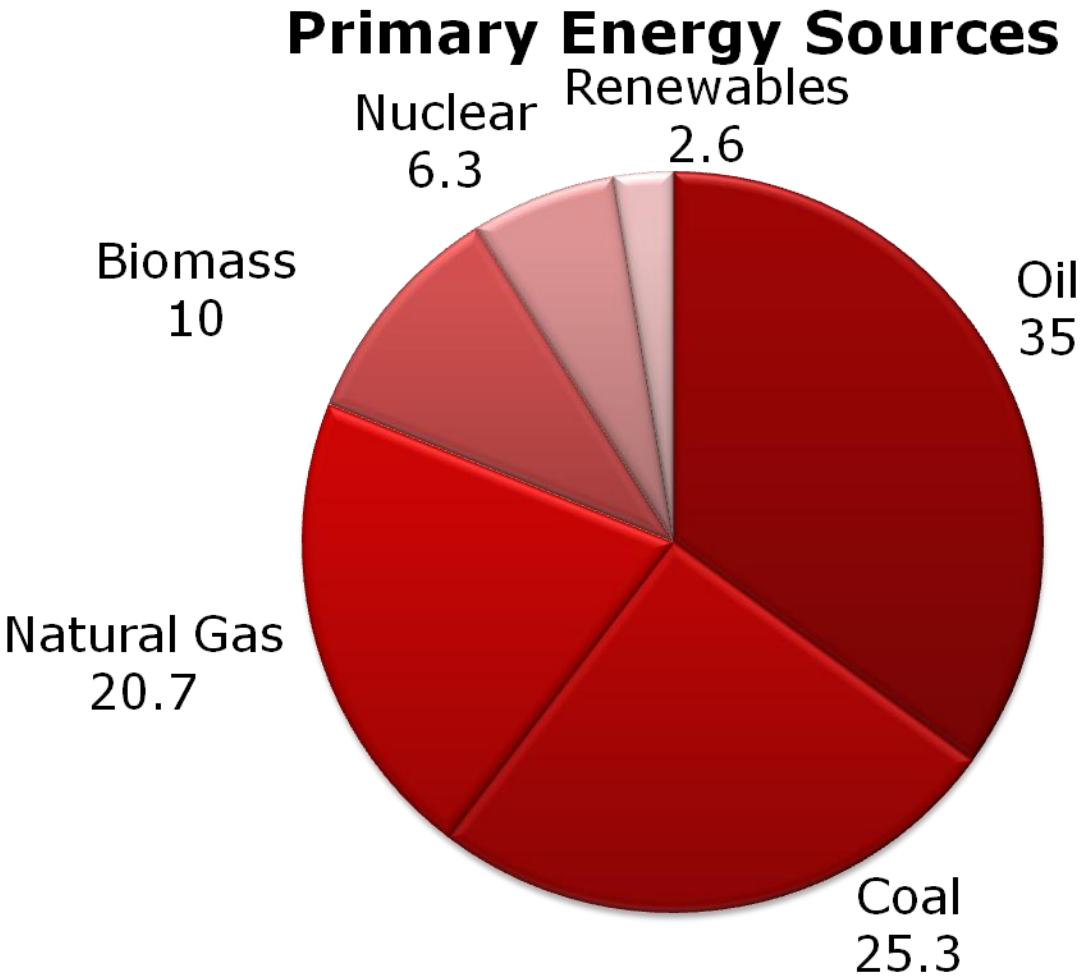


Energy Deficits

- Electricity: 5.6 MWh/y/capita
  - 18% of population: 11.0 million MWh/y
  - 82% of population: 6.4 million MWh/y
  - Electricity deficit: 23.6 million MWh/y

- Energy: 2.55 toe/y/capita
  - 20% of population: 6.5 Btoe/y
  - 80% of population: 11.0 Btoe/y
  - Energy deficit: 8.6 Btoe/y

Major Sources of Primary Energy



Managing the Global Expansion of Nuclear Energy

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Nuclear Energy is an Important Source of Low-Emission Electricity

- 75% of US low-emission electricity
  - 20% of electricity
    - 104 reactors operating 91% of the time
- 45% of global low-emission electricity
  - 15% of electricity
    - 439 reactors in 30 countries

Many Countries Are Considering Expanding Nuclear Energy

- Considering construction of their first reactors (43 countries)
  - Thailand, Jordan, Egypt, Vietnam,
- Reconsidering bans
  - Italy
- Reconsidering phaseout
  - Sweden, (Germany?)
- Seeking permits for new reactors
  - US (16 applications for 30 reactors)

New Nuclear Energy Programs Driven by Sustainability Concerns[‡]

- Growing energy needs
- Security of energy supply
- Environmental concerns/constraints
- Rising/volatile prices of fossil fuels
- Increased experience of good performance
- Advanced applications

[‡]"International Status and Prospects of Nuclear Power," International Atomic Energy Agency, Vienna, 2008

Questioning Sustainability of Nuclear Energy

- Clear benefits for emissions to biosphere

- Generates spent nuclear fuel
- Limited uranium resources
- Risk of proliferation of nuclear weapons

Spent Nuclear Fuel: An Active Demonstration of Managing

- Compact, Contained, Cared for
- Array of viable long-term solutions
  - Deep geologic storage
  - Reprocessing & recycling

Limited Uranium Resources Can Be Extended through Recycling

- Changing estimates of global uranium resources
  - Probably at least 200 years
- Current technology only uses less than 1% of the uranium mined from the ground
- Recycling offers about 140x improvement

Nuclear Non-proliferation has been Successful but Faces New Challenges

- All but 3 countries participate in Nuclear Non-proliferation Treaty (NPT)
- Extended indefinitely, but…
  - Deadlock and impasse in current meetings
- Need credible action on disarmament
  - CTBT
  - Production moratorium
- Special cases
  - India, Pakistan & Israel
  - Iran & North Korea

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