

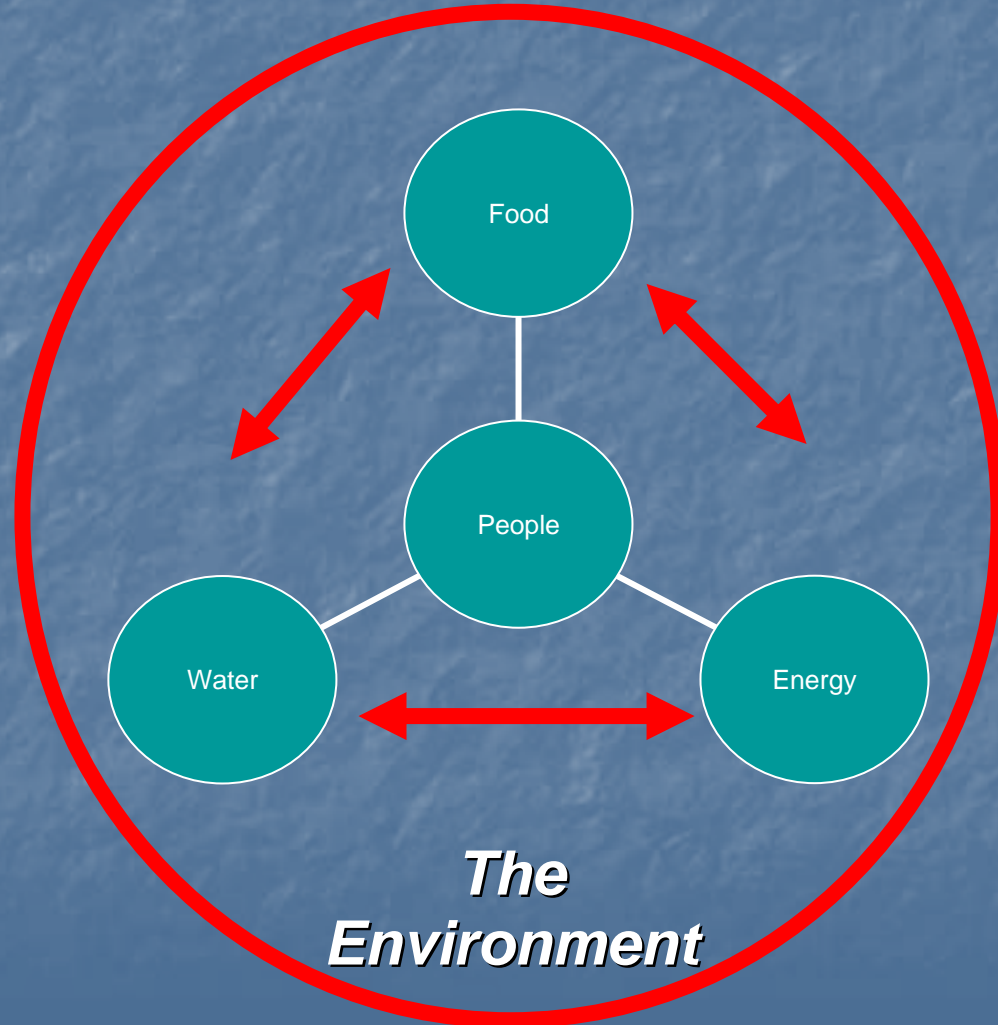
# Qualifying Energy's Value to Future Engineers and Scientists

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# CRITICAL THINKING

- What is assumed?
- What are the implications?
- How do systems fit together?
- What is the purpose of the technology?
- How are technologies applied to real needs?

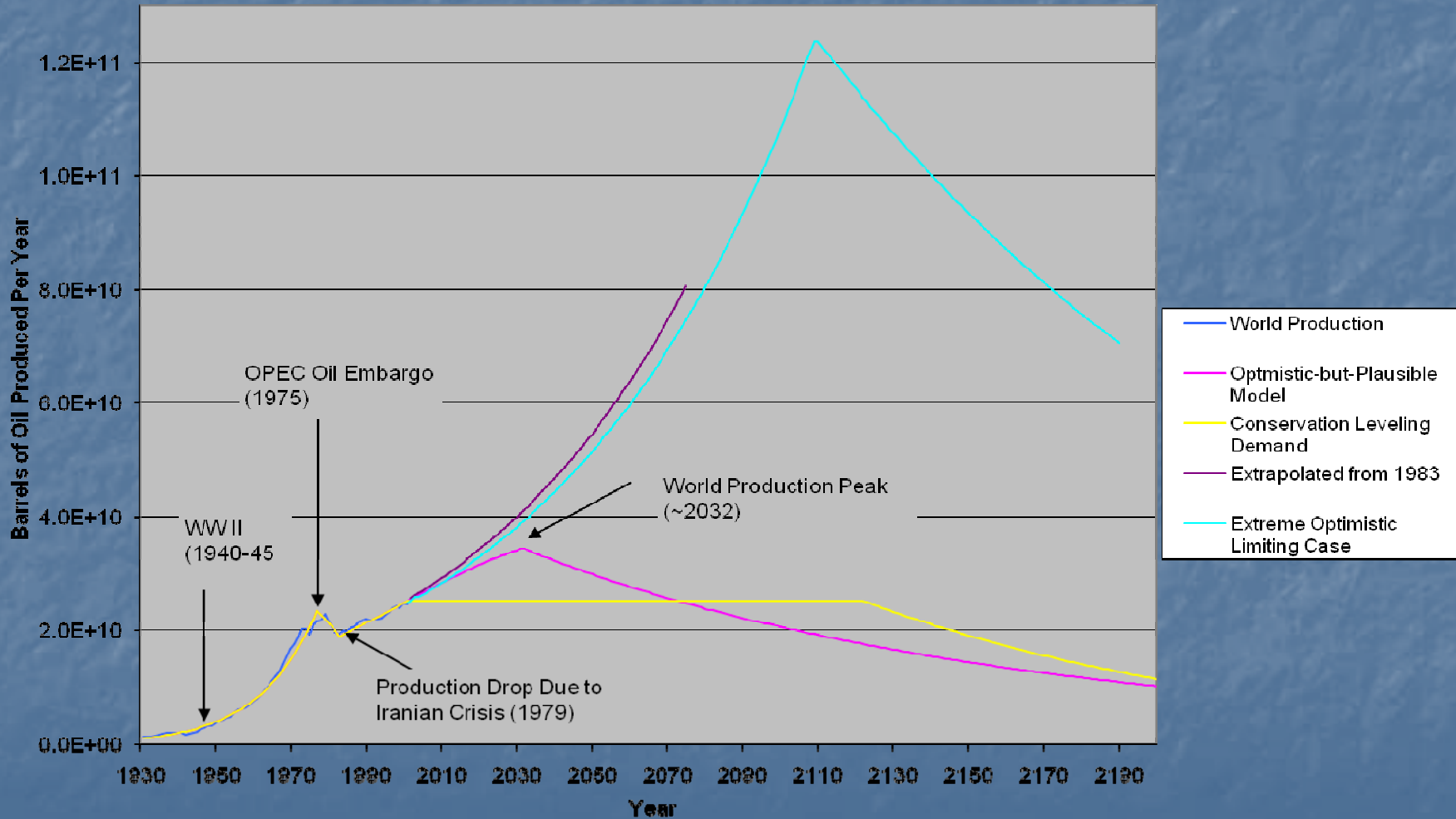
# Global Systems



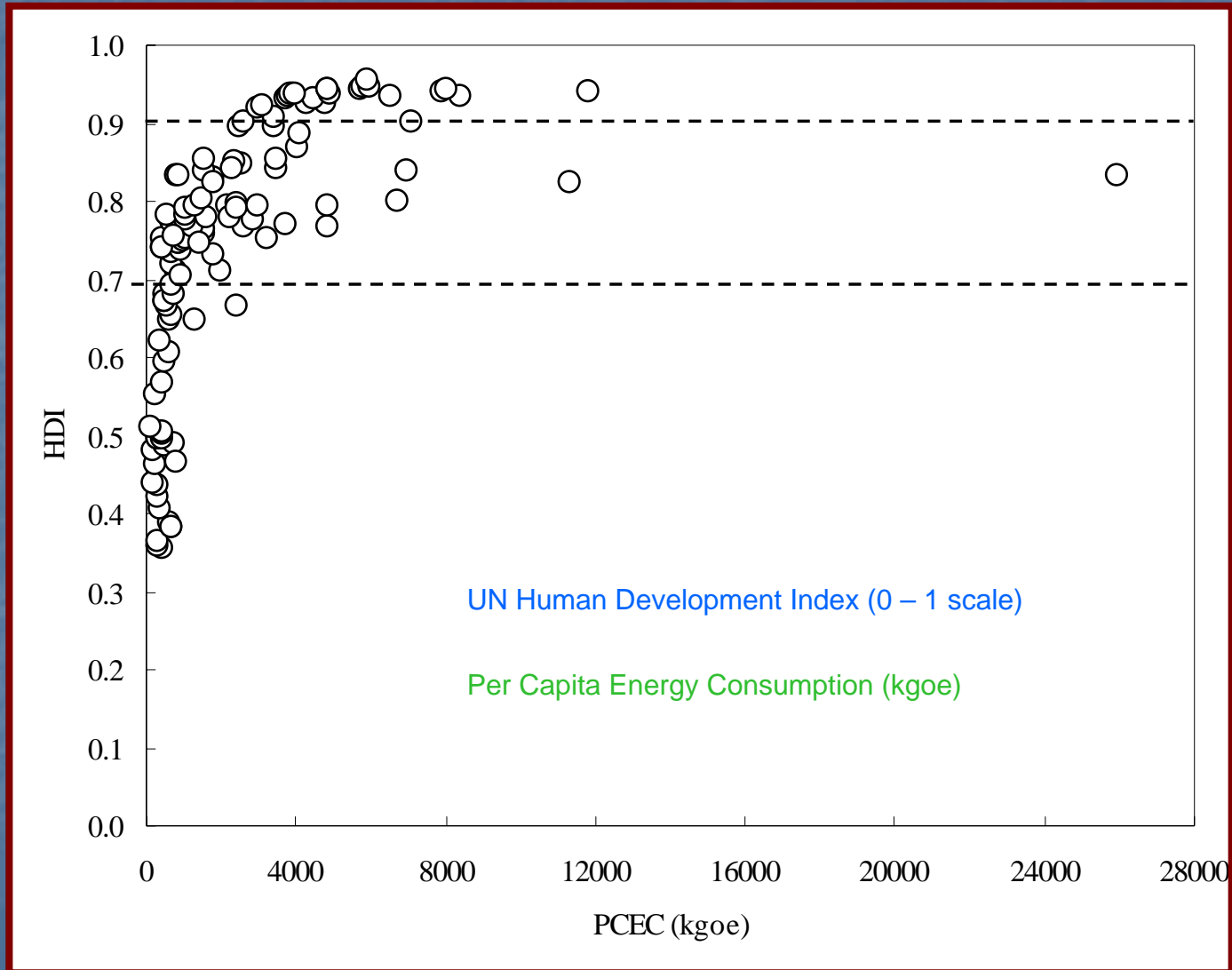
# ANALYSIS IN UNCERTAINTY

- What can we know?
- Limiting case scenarios
- Sensitivity analyses

# What Can We Know about Peak Oil?

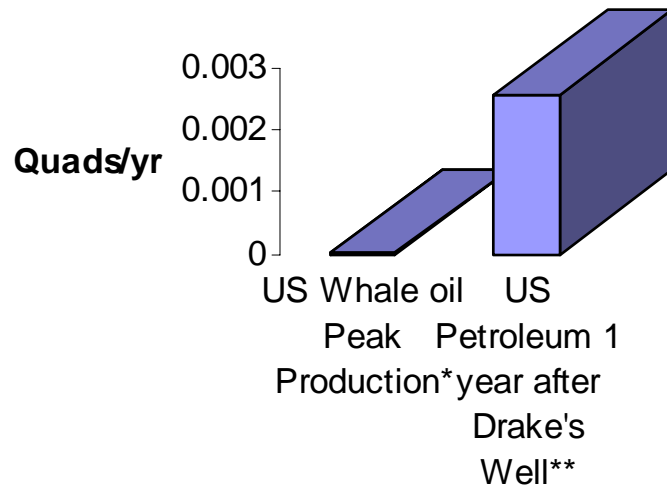


# What Can We Know About Energy Consumption?

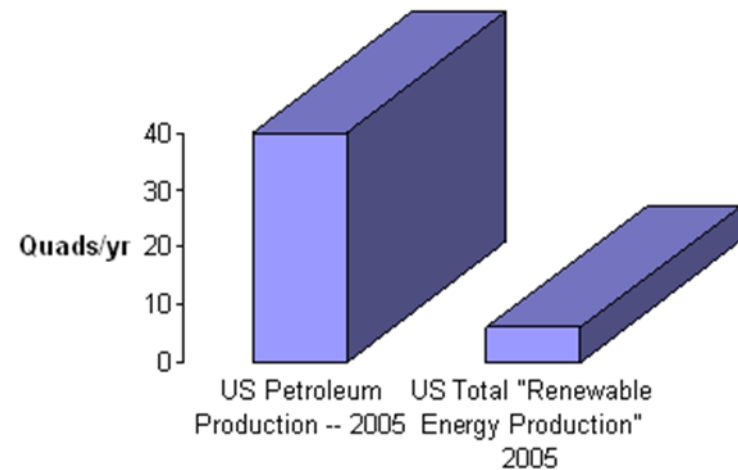


# The Transition Will Not Be Easy for Alternatives

## The Transition to Petroleum



## The Transition from Petroleum



### ■ SOURCES:

<http://www.aspoitalia.net/aspoenglish/documents/bardi/whaleoil/whaleoil.html>

<http://www.che.utexas.edu/~kenneth/petrol/>

<http://www.eia.doe.gov/cneaf/solar.renewables/page/trends/table1.html>

**BWE1**

This slide shows a few things:

first, worth noting that petroleum originally competed against whale oil -- a relatively high value, low volume comm. the new alternatives are competing against a very high volume, i would argue under-priced commodity

2 that oil well drilling was a breakthrough -- it radically changed the face of energy production in planning for the future bt's cannot be counted on

3

Ben W. Ebenhack, 22/09/2006

# Scale of Shift

- 1850
  - 85% of the world's total primary energy came from biomass
- 1890 Consumption
  - Biomass energy = fossil energy = 0.7 TW
- Today
  - 86% of the world's total primary energy comes from fossil fuels
- Today' Consumption
  - Fossil Energy = 12 TW
    - New Renewables = 250 GW
    - We need to increase production by 48x

**There is currently no non-fossil energy source large enough to practically match such a shift**

# CONNECTING ENGINEERING TO THE PEOPLE SERVED

- What do we want?
- What values does technology provide?
- Are there limits to the value?

# Energy Access: Our Past, Their Present

Firewood



Charcoal



Dung Patties



1.6 billion people lack access to electricity  
(All of these picture taken this decade)

# Experiential Learning

- AHEAD Energy – Applied Projects
- Planning and Site Visits



Research



Proposing Solutions



Learning from the local people



Understanding the needs

# Experiential Learning

- AHEAD Energy
- Implementation and Right-scaled Innovation



Investigating Emerging Technologies



Deploying Proven Technologies



Addressing Urgent Needs



Testing New Ideas

