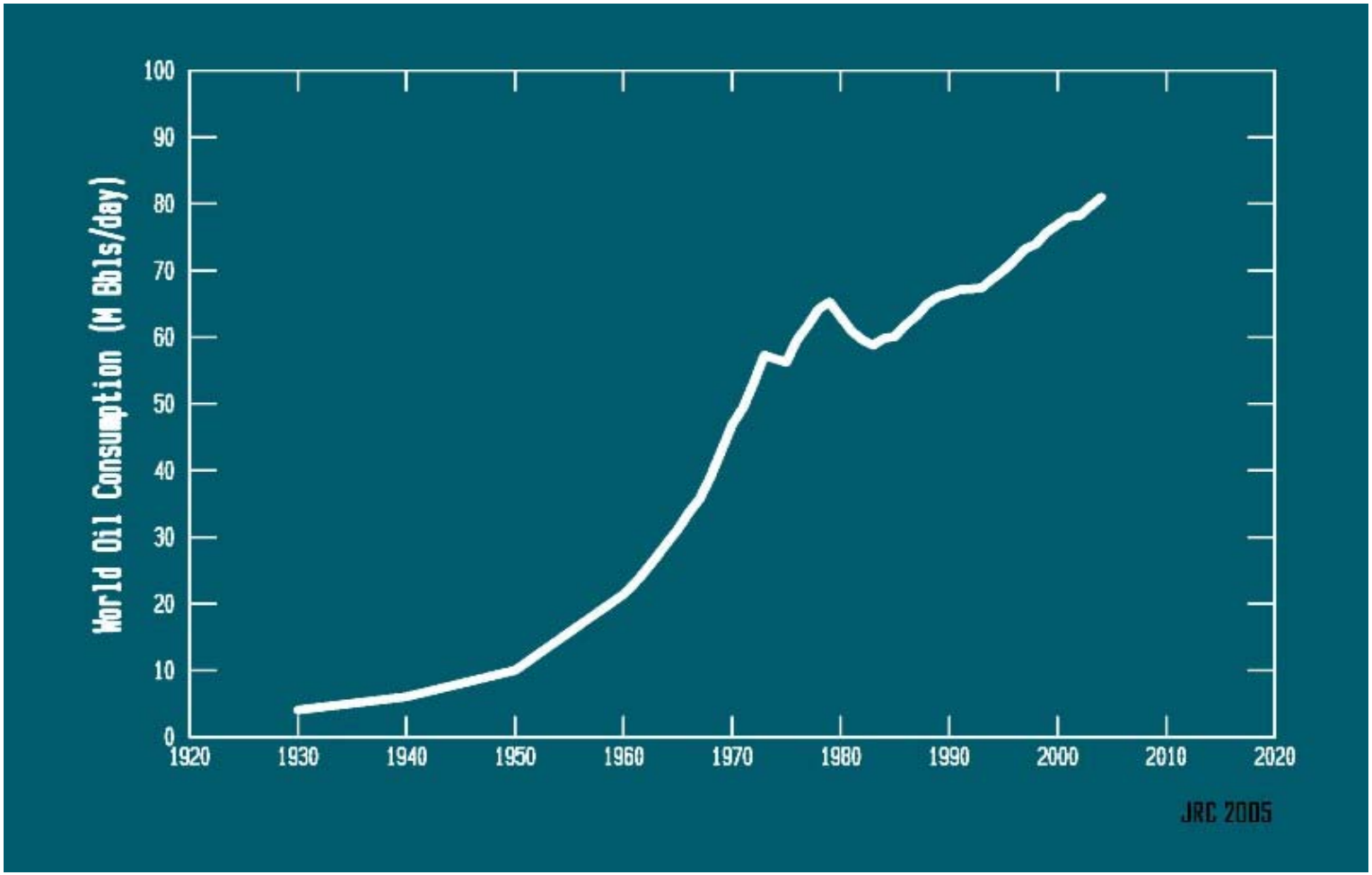
Oregon's Energy Challenge and Opportunity

Cylvia Hayes, 3EStrategies

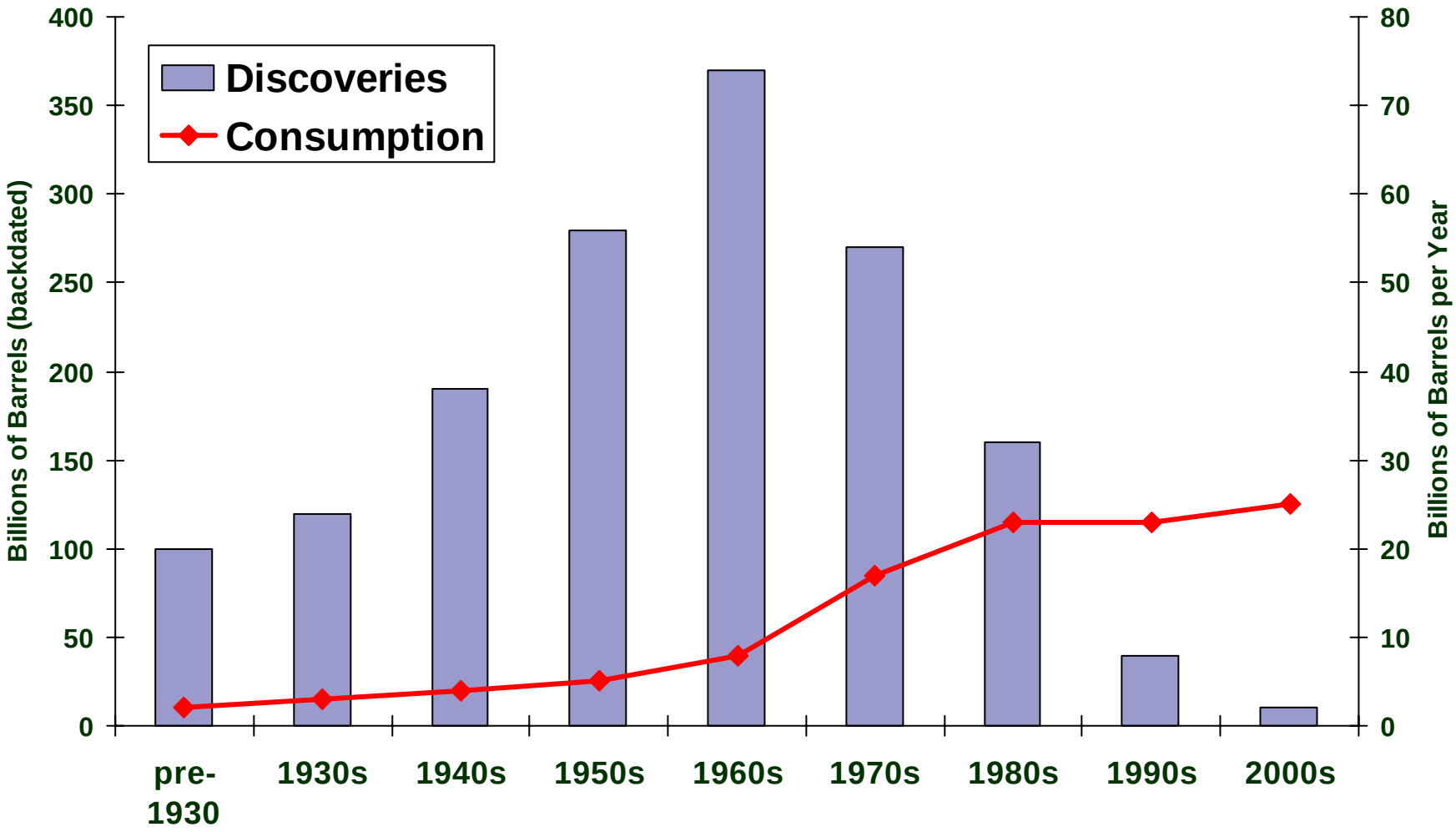
November, 2006

World Oil Consumption

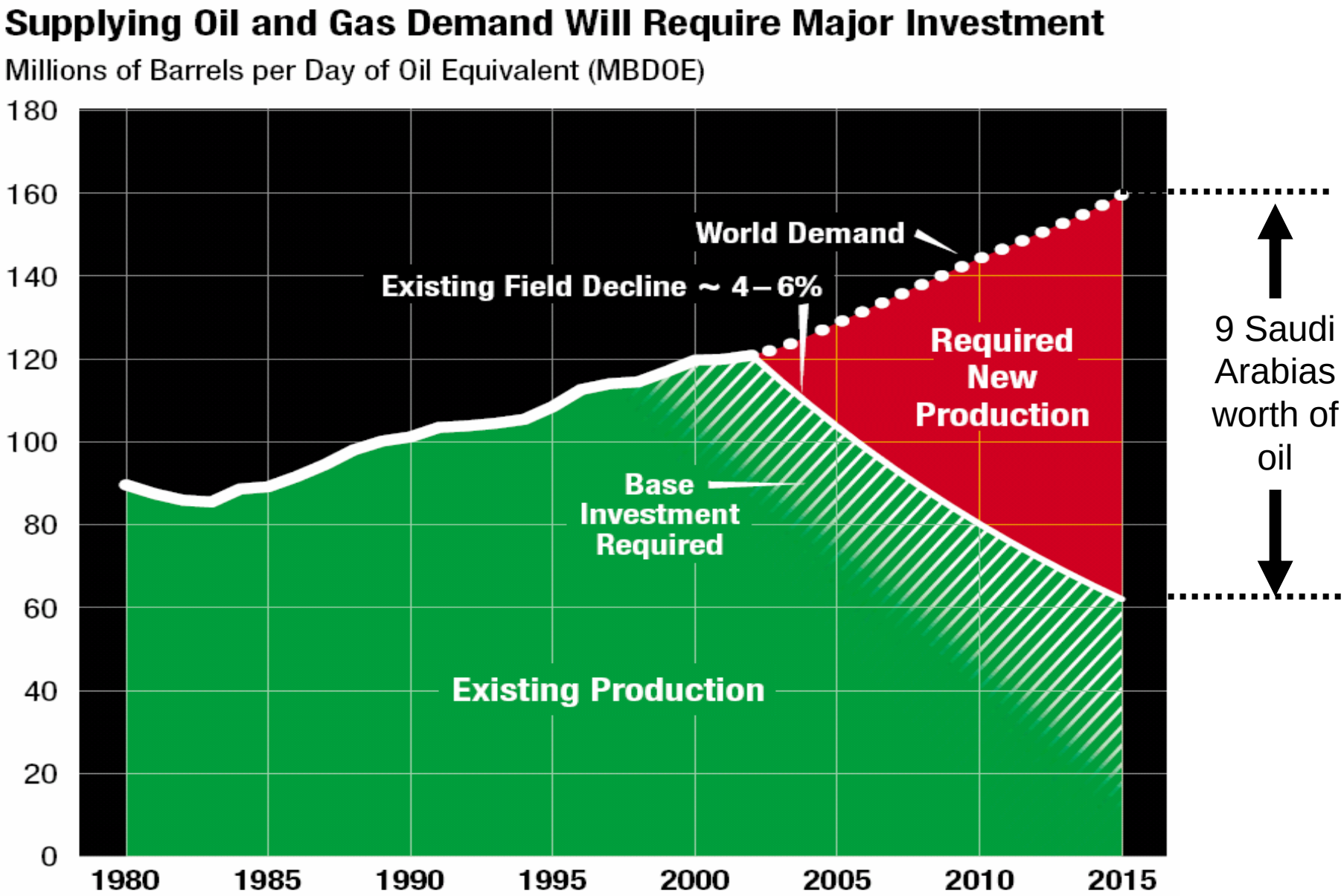


Energy Information Administration, Jim Clinton.

World Oil Discoveries



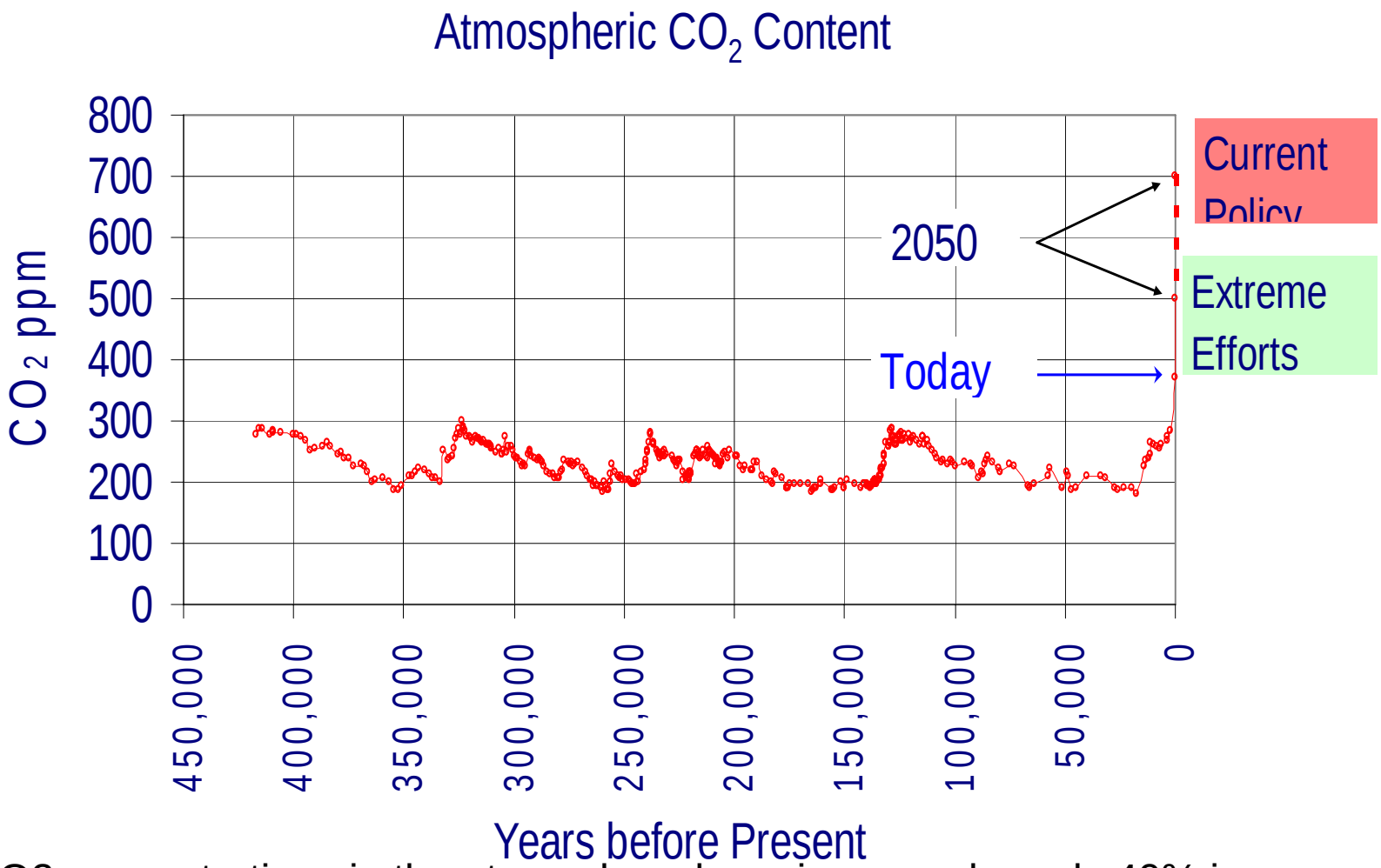
ExxonMobil World Projections 2004



World Oil Status

- **Demand is growing at 2.8 percent per year**
- **To meet demand the world needs to find and bring into production 4-6 million barrels per day by the end of 2006**
- **In 1973 America imported 34 percent of its oil. Now we import 60 percent. Projections suggest that soon we will be importing over 70 percent.**
- **U.S. consumes 25 percent of the world's oil, but has only about 2 percent of the reserves.**
- **The China factor. Now, the world's second largest importer of oil, right behind the U.S.**

We'll Run out of Atmosphere Before We Run out of Oil



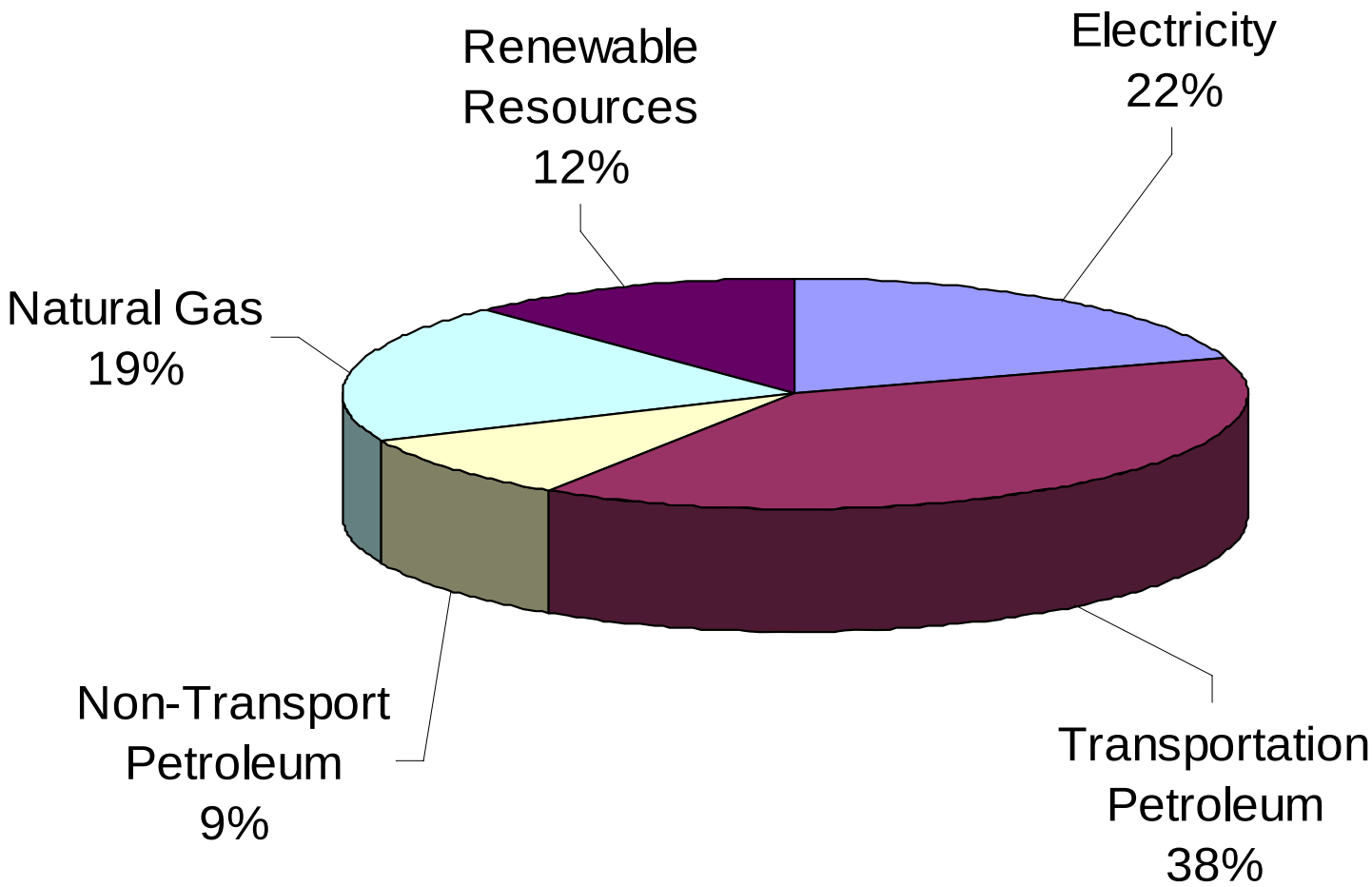
CO2 concentrations in the atmosphere have increased nearly 40% in just the past 100 years

There Really is No Question

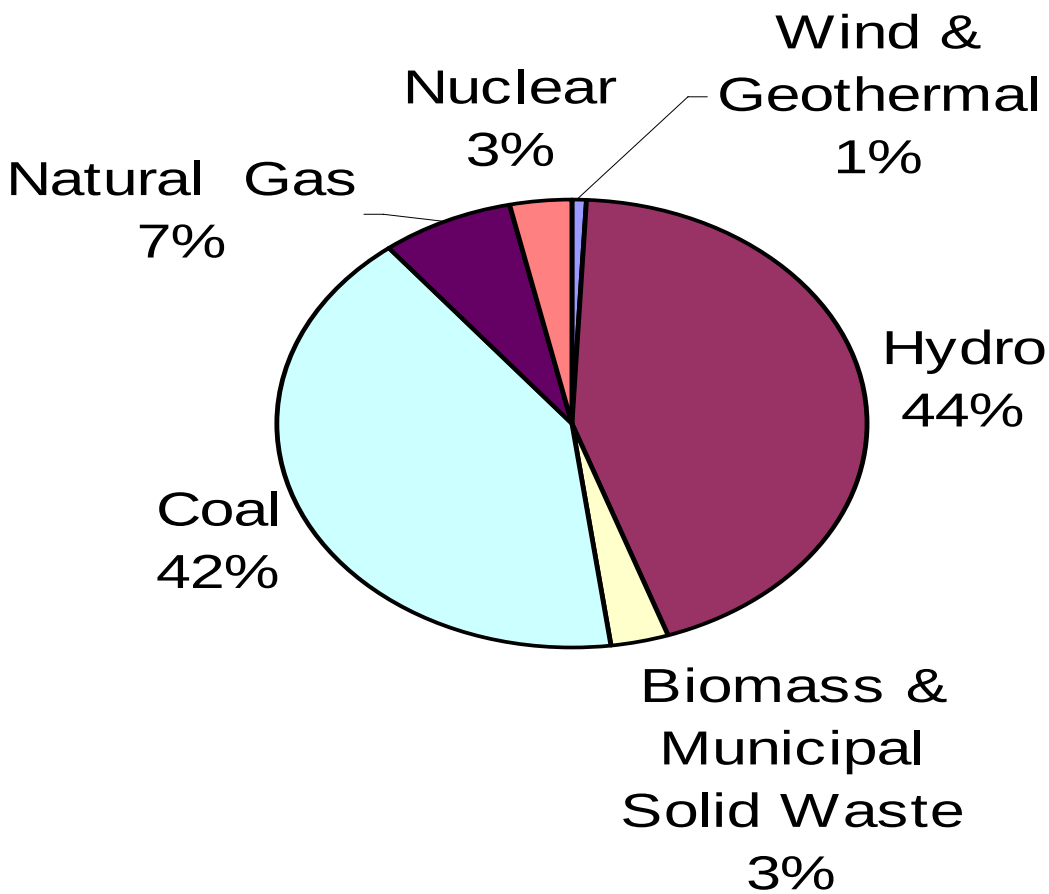
"The scientific understanding of climate change is now sufficiently clear to justify nations taking prompt action. It is vital that all nations identify cost-effective steps that they can take now, to contribute to substantial and long-term reduction in net global greenhouse gas emissions. We urge all nations to take prompt action to reduce the causes of climate change, adapt to its impacts and ensure that the issue is included in all relevant national and international strategies."

-- National Academy of Science and 11 other International Scientific Institutions
June 2005

2000 Oregon End Use Energy



Oregon Electricity Sources



Cost to Oregonians

- Spend over $10 billion per year – over 85% leaves the state
- Between 1999 and 2003 retail electricity rates rose 29 percent (in 2005??)
- Between 1999 and 2003 costs for heating oil, on-highway diesel and regular gasoline increased 39, 25 and 30 percent respectively (to 2005??)
- Wholesale natural gas rose 168 percent between Jan. 1999 and July 2004 – Retail rose 94 percent.
- 100 percent of natural gas and oil is imported (as compared to 15 percent and 56 percent, respectively average in U.S.)
- Natural gas comes from British Columbia, Alberta, Wyoming, Colorado and New Mexico.
- Four refineries in Puget Sound Washington produce 90 percent of Oregon's refined petroleum products. These have been operating at above 90 percent capacity for a decade. Salt Lake City and British Columbia supply the rest.
- 80 percent from Alaska, 15 percent from Canada, 5 percent from Middle East.

It’ll be Tough, but It’ll be Profitable

- **Renewable energy industry in U.S is projected to grow to $180 billion annually over the next 15 years – twice the size of the passenger and cargo airline industries.**

- **Project the clean energy industry in Oregon, Washington, and British Columbia will grow to $2.5 billion and 12,000 jobs over that period of time (extremely conservative estimate).**

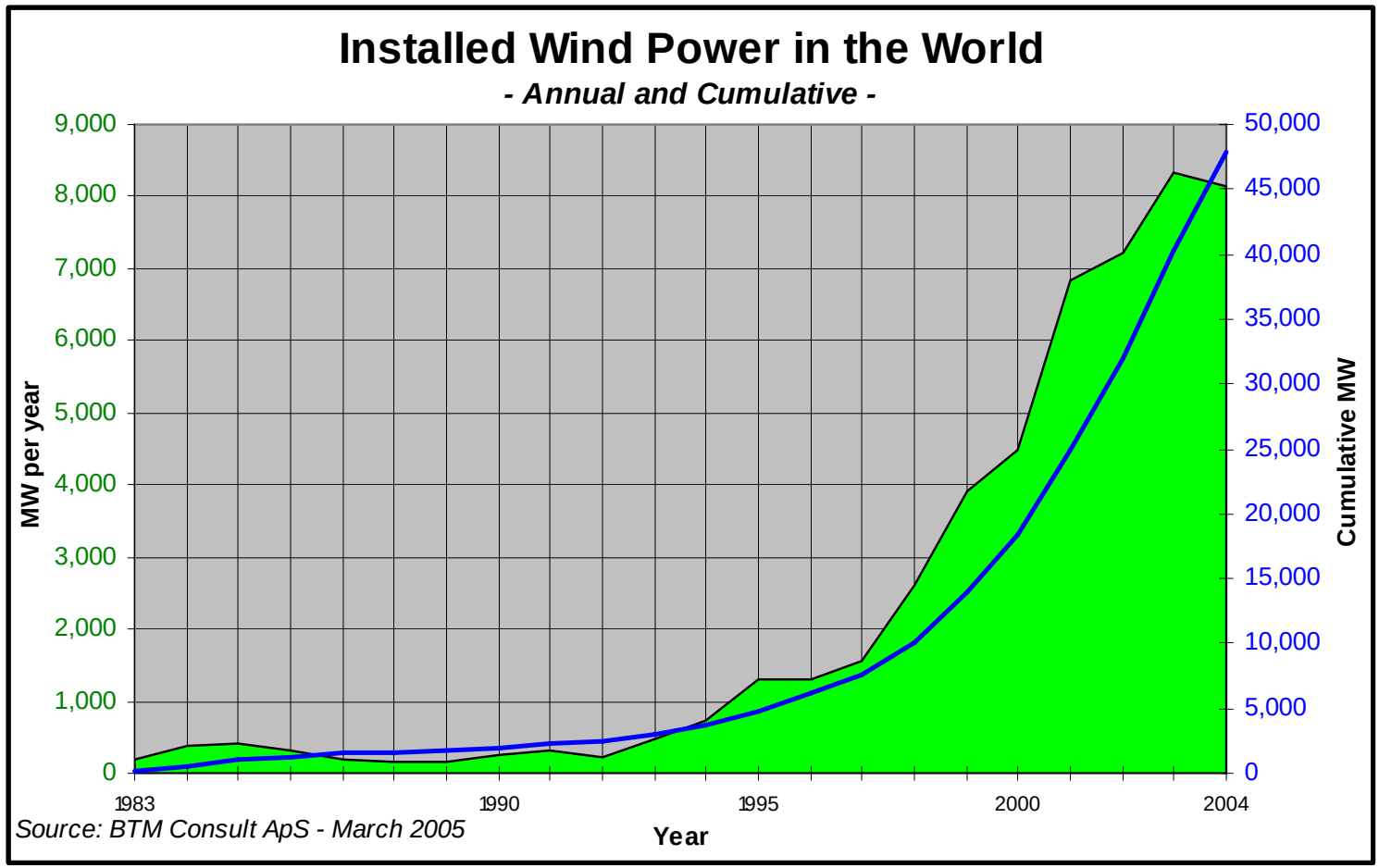
- **Wind is the fastest growing sector of the global energy industry.**

- **Solar grew 66% globally last year.**

- **Shell and BP both have solar and wind energy departments.**

- **Goldman Sachs purchased local wind company.**

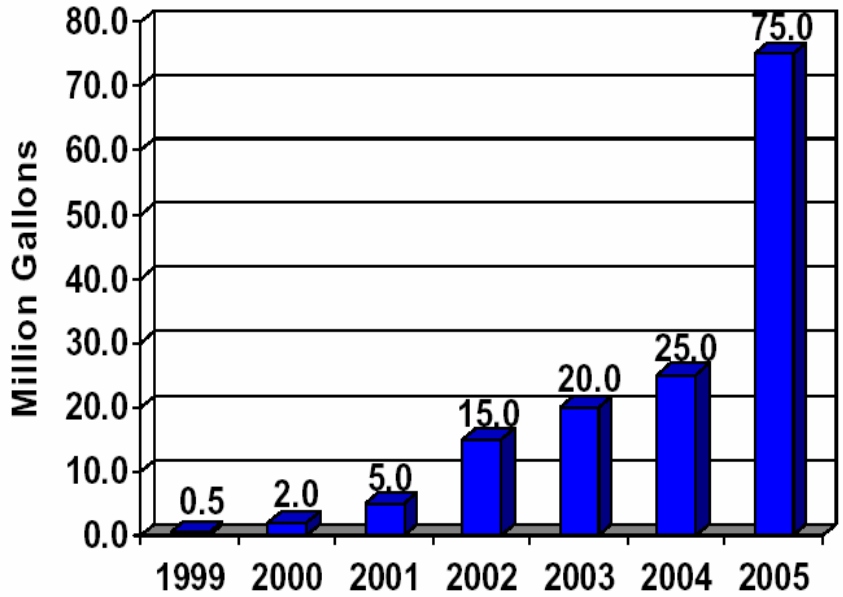
Wind is the fastest growing energy segment in the world with ~30% growth rates.

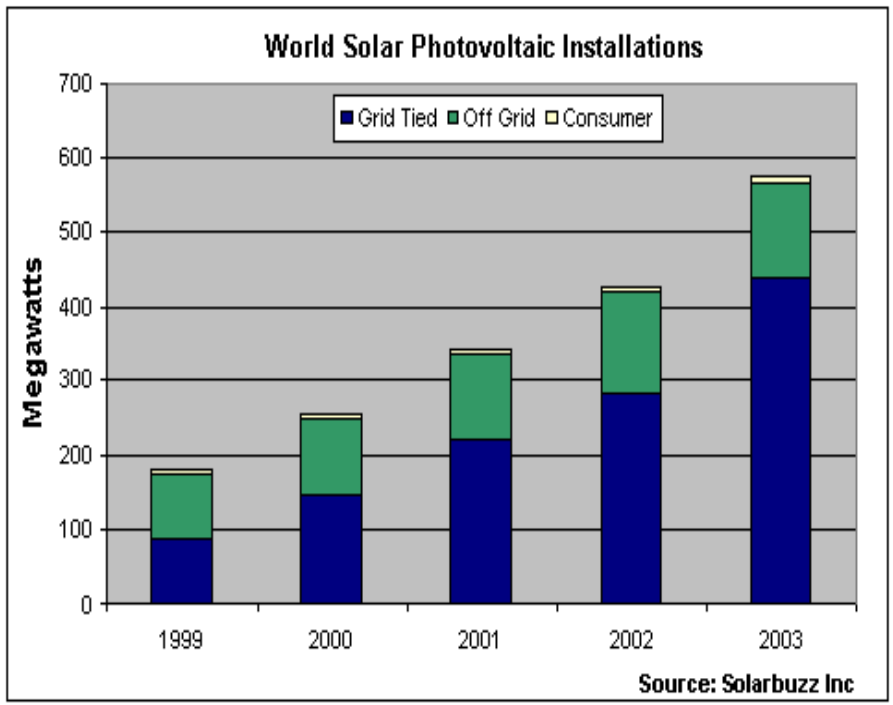


Wind energy has become a significant portion of GE Energy's sales.

Solar and Bio-fuels Show Dramatic Growth

Estimated US Biodiesel Production





Oregon's Clean Energy Opportunity

- **Diversity of renewable energy resources unparalleled by any place of similar geographic size in the country (wind, solar, biomass, biofuel, fuel cell, wave, small hydro)**

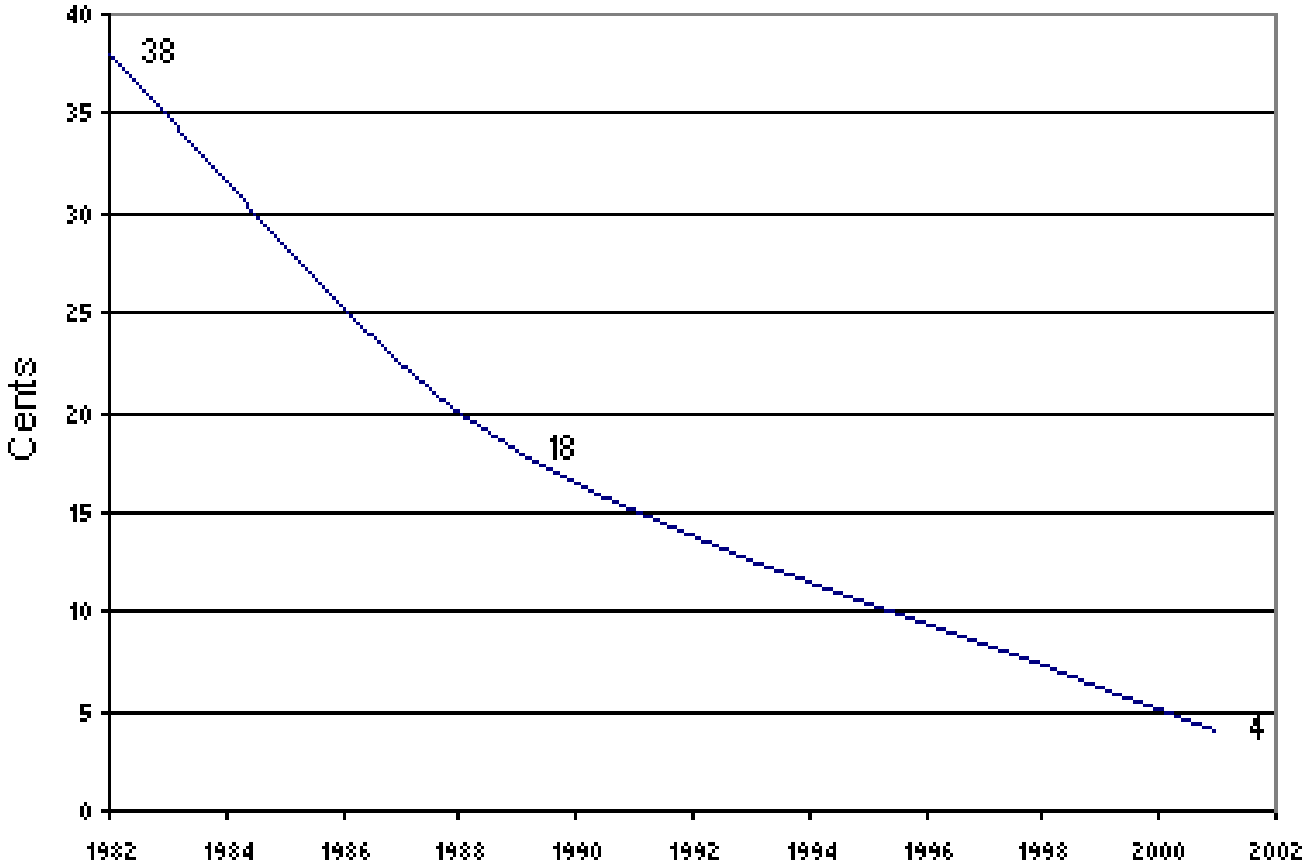
- **At least 200 clean energy companies**

- **High tech sector present**

Oregon Sustainable Energy Status

- **Clean Energy is currently a $1.4 billion industry in Oregon, Washington and British Columbia.**
- **Wind: Five large projects (338 MW) – 10th in nation for wind in ground. 750 MW in process.**
- **Solar:**
  - **18,000 residential water heating systems**
  - **300 solar photovoltaic systems / 1.5 MW installed**
- **Geothermal:**
  - **Heat pumps in 2,500 Oregon homes**
  - **Direct use in Klamath, Lake, Malheur and Harney counties**
  - **Base Load Generation still stalled – 400 MW potential**
- **Biofuels:**
  - **1 million gallons biodeisel (produced here)**
  - **80 million gallons ethanol (produced in Midwest)**
- **Biomass (wood, pulping liquor, methane from landfills, sewage treatment and manure):**
  - **79 trillion BTU (in 2003).**
  - **1,300,000 MWh (500 from cow manure!)**
- **Ocean Wave:**
  - **Significant resource**
  - **OSU Wave Energy Lab**
- **Small Hydro**
- **Portland second only to Houston in number of energy related employees per capita (12,000)**
- **The flip side -- 12 Large-scale Coal Plants are being proposed in the Northwest right now**

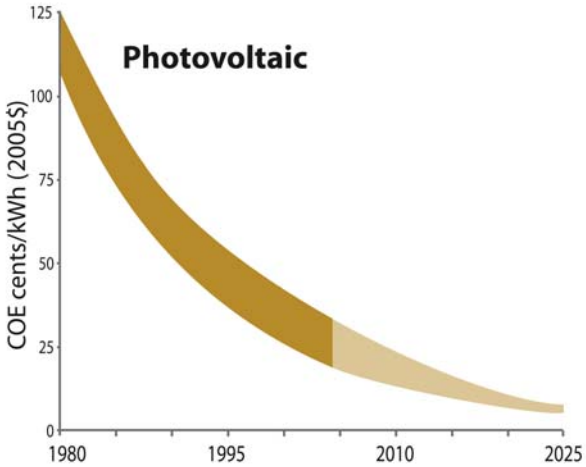
Cost Per Kilowatt-hour of Wind-powered Electricity in the United States, 1982-2001

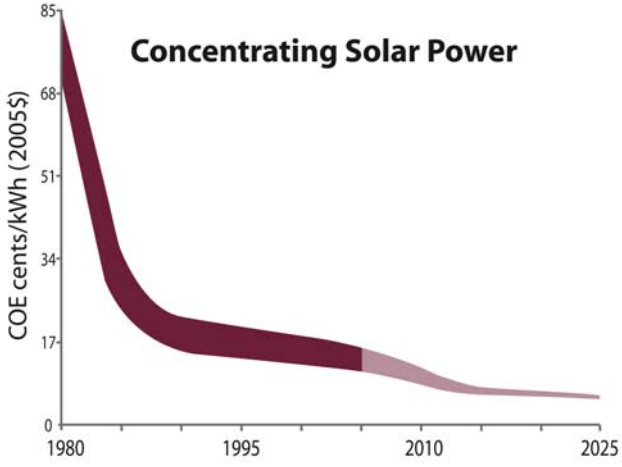


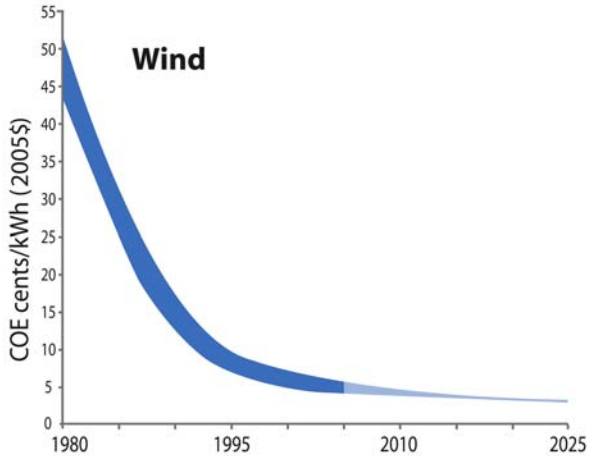
Source: NREL

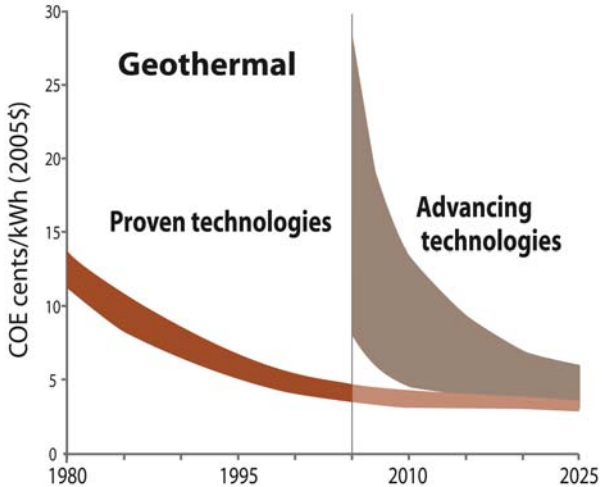
Renewable Energy Cost Trends

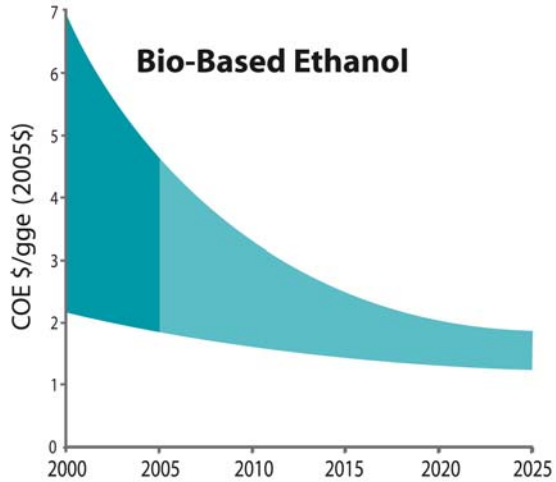
Levelized cost of energy in constant 2005$[1]











Source: NREL Energy Analysis Office (www.nrel.gov/analysis/docs/cost_curves_2005.ppt)

[1]These graphs are reflections of historical cost trends NOT precise annual historical data. DRAFT November 2005

“You Shouldn’t Use an Old Map to Explore New Territory.”

-- Albert Einstein