Energy R&D Investments: Past and Future

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Presentation Organization

- Historical “Epochs” and Drivers of Energy R&D Investment 1973-present:
  - Observations and Implications for Future Energy R&D Investments to Address Climate Change
For More than 40 Years, Investments in Research and Development Have Been Seen As a Good Investment Capable of Generating a Reasonable Return.
The Venture Capital Community Also Appears to Believe that High Technology Is an Investment Capable of Yielding Reasonable Returns

![Graph showing investments in different sectors from 1980 to 2000.](image-url)
Energy R&D in Selected Industrialized Countries, 1974-2004

The graph shows the evolution of energy R&D expenditures in selected industrialized countries from 1974 to 2004, measured in millions of US dollars in 2004. The countries included are Canada, Denmark, Finland, France, Germany, Italy, Japan, Netherlands, Norway, Spain, Sweden, Switzerland, UK, and US.
U.S. Public and Private Energy R&D Since 1974

Presidential “Crisis Declarations” on U.S. Energy Security

- **President Richard Nixon, November 7, 1973**
  - “Let us set as our national goal, in the spirit of Apollo with the determination of the Manhattan Project, that by the end of this decade we will have developed the potential to meet our own energy needs without depending on any foreign energy sources.”

- **President Gerald Ford, State of the Union Address January 15, 1975**
  - “I am recommending a plan to make us invulnerable to cutoffs of foreign oil. It will require sacrifices, but it—and this is most important—it will work. I have set the following national energy goals to assure that our future is as secure and as productive as our past:
    - First, we must reduce oil imports by 1 million barrels per day by the end of this year and by 2 million barrels per day by the end of 1977.
    - Second, we must end vulnerability to economic disruption by foreign suppliers by 1985.”

- **President Jimmy Carter, “Crisis of Confidence” speech, July 15, 1979**
  - “Beginning this moment, this Nation will never again use more foreign oil than we did in 1977 -- never. From now on, every new addition to our demand for energy will be met from our own production and our own conservation.”
Real Oil Prices and U.S. Government Energy R&D Investment

$ per barrel


$ billions

0.00 1.00 2.00 3.00 4.00 5.00 6.00 7.00 8.00 9.00

Saudi Light Crude

Refiner Acquisition Cost of Imported Crude Oil (IRAC)

Government Energy R&D Investment
Major Disruptions to Global Oil Supplies: 1970-2005

- Arab Oil Embargo
- Iran Revolution
- Iran/Iraq War
- Gulf War
- OPEC Production
- Hurricanes Rita and Katrina in US Gulf Coast
Petroleum’s Share of Electricity Production: 1972-2005
Growth of the SPR

- Crude Oil Held in SPR (MMb)
- Days of US Petroleum Consumption Held in SPR
“Epochs” of Public Energy R&D Investment since 1974

- **1973-80**: Energy Crises and R&D Escalation
- **1980-91**: Privatization & Deregulation
- **1989-91**: Breakup of the Soviet Union
- **1991-2001**: Post-Cold War Retrenchment
- **2001-pres.**: New Era of Vulnerability & Opportunity

**Important Events**

- Ronald Reagan elected US President, Nov. ‘80
- Thatcher elected in UK, May ‘79
- Chernobyl nuclear accident, April ‘86
- 3-Mile Island nuclear accident, March ‘79
- Nixon announces ‘Project Independence’, Jan. ‘74
- Iran invades Kuwait, Aug. ‘90
- Berlin Wall Falls, Nov. ‘89
- UK dismantles state electricity monopoly; deregulation begins, July ‘88
- Framework Convention on Climate Change opened at Rio Earth Summit, June ‘92
- Iraq invades Kuwait, Aug. ‘90
- US Retail gasoline Prices hit historic High of $3.10, Sept. ‘05
- Kyoto Protocol opened, Dec. ‘97
- Terrorist Attacks on US, Sept. 11, 2001
- US invades Afghanistan, Oct. ‘01
- US-led invasion Of Iraq, Mar. ‘03
- US Crude Futures at $75.35, April 21, 2006
- 1974-75: OPEC Oil Shock
- 1973-'74 OPEC Oil Shock

**Additional Notes**

- Crude Oil at ~$68 ($2004)
- Soviet Union collapses; Yeltsin elected Russian President, June ‘91
- Chernobyl nuclear accident, April ‘86
- Berlin Wall Falls, Nov. ‘89
- 3-Mile Island nuclear accident, March ‘79
- Uranium Production began in the US in the 1870s (though most of the US energy needs were met by coal at that time)
- 1970: World’s first commercial geothermal power plant opened at the Olkaria Geothermal Field, Kenya
- 1974: US retail gasoline price spikes to $1.43/gallon
- 1979: Oil Crisis and 3-Mile Island nuclear accident
- 1980: Largest single year increase in oil prices

**Graph Details**

- Y-axis: Billions, US $2004 (PPP)
- X-axis: Years, 1974-2006

**Additional Details**

- Battelle
- Pacific Northwest National Laboratory
- JGCRI
- True University of Maryland
- Operated by Battelle for the U.S. Department of Energy
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- '73-'74 OPEC Oil Shock
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Crude Oil at ~$68 ($2004)

U.S. Crude Futures at $75.35
April 21, 2006

billions, $ US 2004 (PPP)
Observations re:
Energy R&D Investment History

- Energy R&D investments have evolved significantly over the past thirty years. Initial investment upswing was motivated by crisis environment of 1970s.

- The development of a broader portfolio of response options (e.g., strategic reserves, futures markets) played a role in reducing the attractiveness of energy R&D as a policy tool and investment vehicle.

- Energy R&D investment levels have been strongly correlated with energy prices.

- Will climate change provide an impetus for a new era of energy R&D investment?
Thank you!