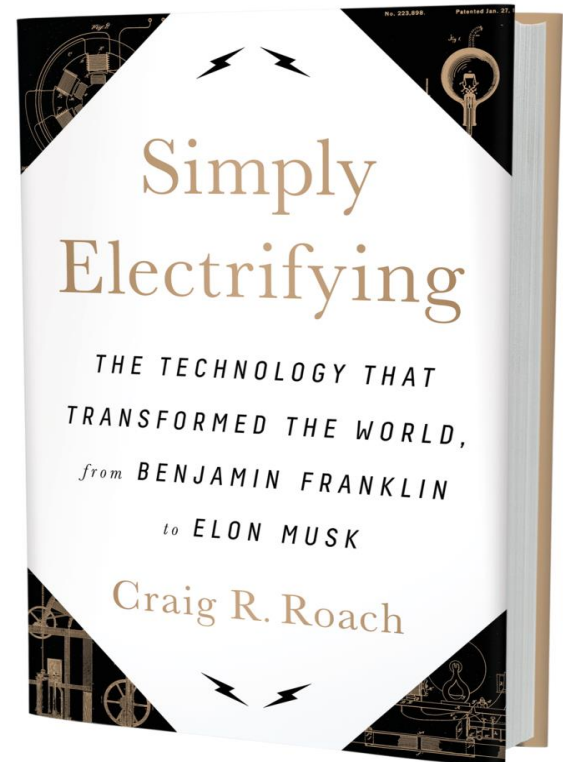


Lessons Learned from 50 Years of Energy Crisis and Change

Presented by Craig R. Roach, Ph.D.,
Author of *Simply Electrifying: The
Technology that Transformed the
World, from Benjamin Franklin to
Elon Musk.* <https://craigroach.com>



A Stroll Down Energy Memory Lane

1. The Arab Oil Embargo in the Mid-1970s – Oil as a Weapon
2. The Rise and Fall of Nuclear Power – the Peril of Being “Official Technology”
3. The Shale Gas (and Oil) Revolution – Persistence Pays
4. Global Climate Change – Progressive Agenda, Conservative Tools

1. The Arab Oil Embargo in the Mid-1970s – Oil as a Weapon

Long Lines at Gas Stations

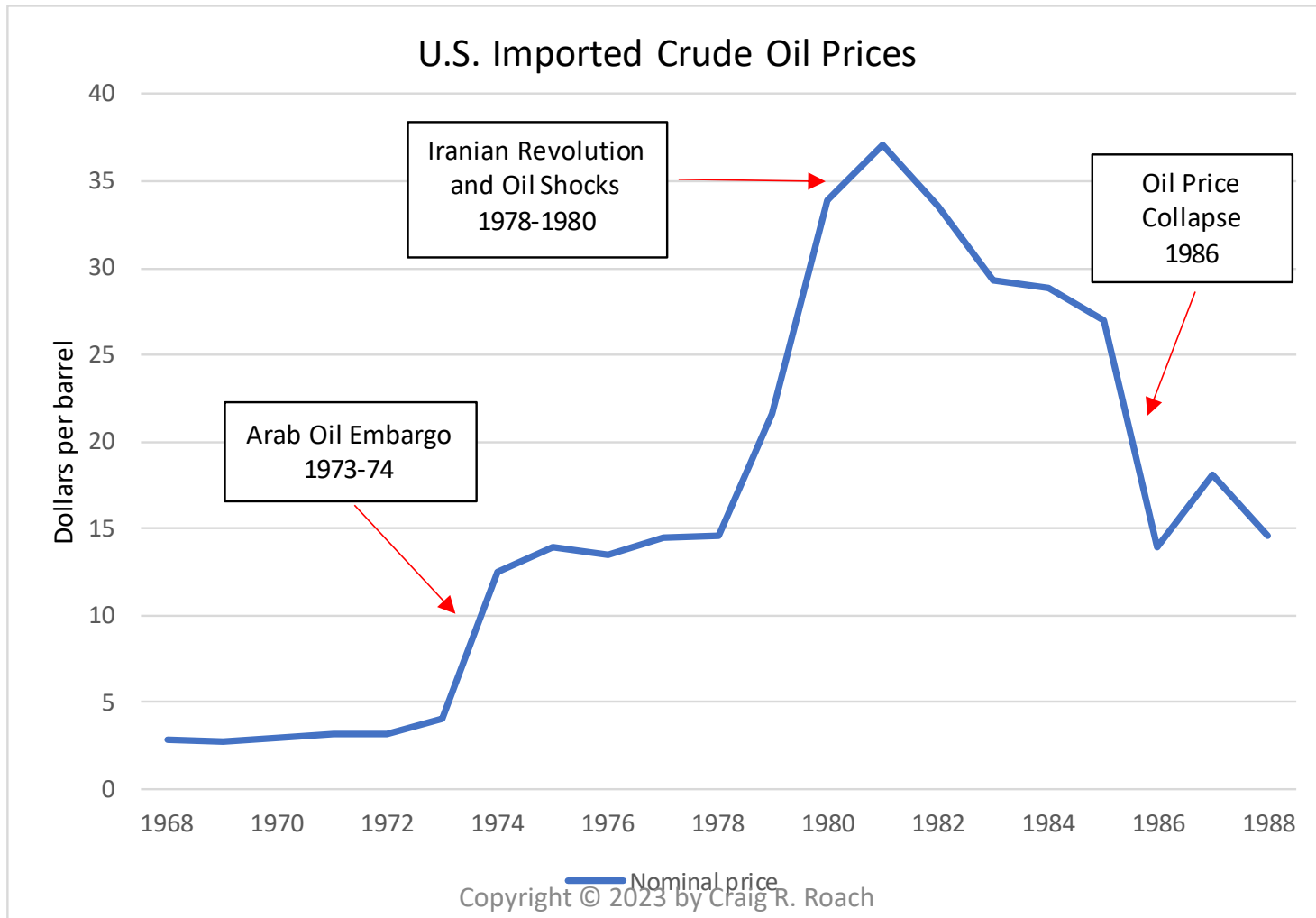


War!

“JUST MOMENTS BEFORE 2:00 P.M. on October 6, 1973—on what, by that year's calendar, was Yom Kippur, the holiest of Jewish holidays—222 Egyptian jets roared into the sky. Their targets were Israeli command posts and positions on the eastern bank of the Suez Canal and in the Sinai. Minutes later, more than 3,000 field guns opened fire along the entire front. At almost exactly the same time, Syrian aircraft launched an attack on Israel's northern border, followed immediately by a barrage from 700 pieces of artillery. Thus began the October War, the fourth of the Arab-Israeli wars—the most destructive and intense of all of them, and the one with the most far-reaching consequences. The armaments on both sides of the conflict had been supplied by the superpowers, the United States and the Soviet Union.”¹

Daniel Yergin

Oil Price Shocks



2. The Rise and Fall of Nuclear Power – the Peril of Being “Official Technology”

High Expectations: Einstein



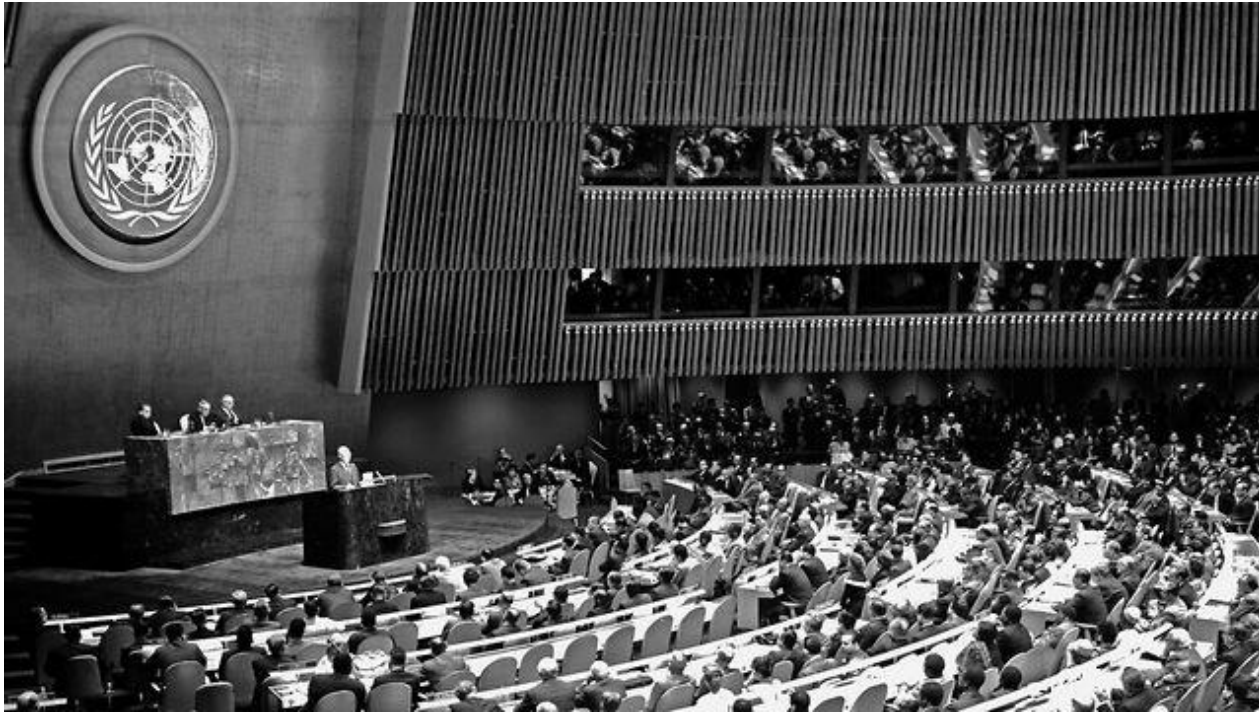
In 2022, nuclear power accounted for 18.2% of total U.S. electricity generation.¹

Einstein's Miracle Year (1905) Created High Expectations.
Impeccable scientific pedigree – $E=MC^2$

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1. United States Department of Energy, Energy Information Administration.

High Expectations: Eisenhower



“The United States pledges before you. . .to devote its entire heart and mind to find the way by which the miraculous inventiveness of man shall not be dedicated to his death, but consecrated to his life.”¹

President Dwight Eisenhower at the United Nations General Assembly, 1953

Still, Primarily Driven by Geopolitical Concerns

Nuclear Navy – Admiral Rickover Effect



Cold War economic competition – capitalism is more prosperous than communism.



Possible Missteps for an “Official Technology”

- Rickover was a success but for a different goal – fueling a submarine.
- Scaling up is hard to do and can be expensive – up to 50% construction cost subsidy for 13 plants.¹
- Cannot beat the competition (coal) by being low cost, low risk, high reliability – by one estimate, 45% of 253 plants ordered were eventually cancelled.²
- No new plants completed from 1978 until recently – 45 years to Georgia Power’s Vogtle Unit in 2023.
- Three well-publicized accidents did not help
 - 1979 Three Mile Island in Pennsylvania, United States
 - 1986 Chernobyl in Soviet Ukraine
 - 2011 Fukushima in Japan

Use nuclear’s missteps as checklist for all technology. What can go wrong? Are we going too fast? Are we subsidizing too much? Have we kept the door open to alternatives?

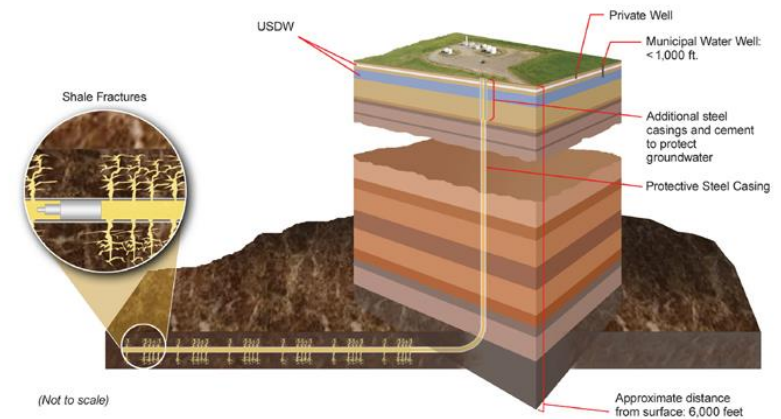
3. The Shale Gas (and Oil) Revolution – Persistence Pays

George P. Mitchell

“Few businesspeople have done as much to change the world as George Mitchell.”¹

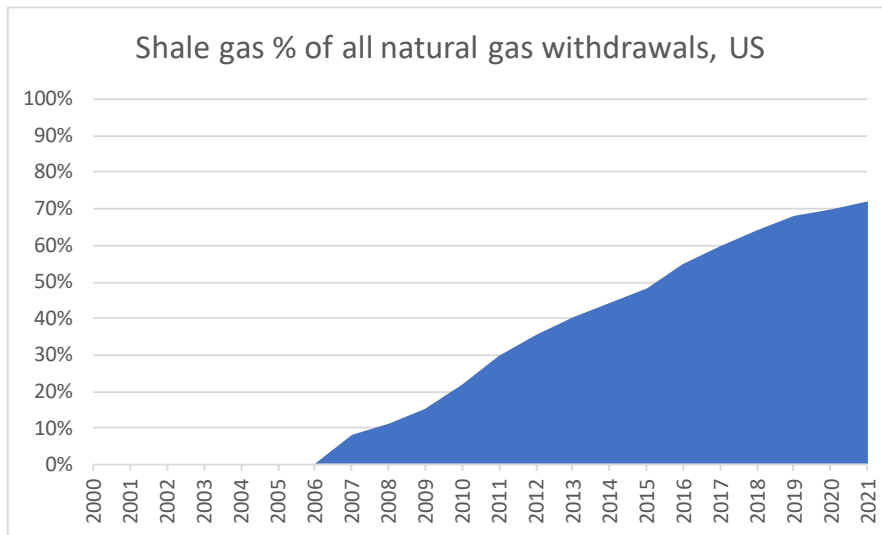
A Revolution in Technology

- Hydraulic Fracturing – Mitchell Energy
- Horizontal Drilling – Devon Energy
- Advanced Seismic Mapping



Steel casing lines the well and is cemented in place to prevent any communication up the wellbore as the fracturing job is pumped or the well is produced. Shallow formations holding fresh water that may be useful for farming or public consumption are separated from the fractured shale by thousands of feet of rock.

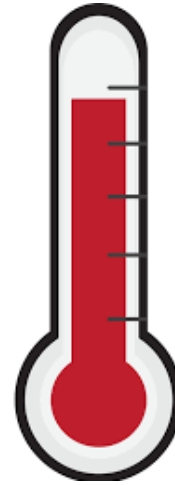
A Truly Revolutionary Impact



- From 0% of all U.S. natural gas withdrawals in 2000 to 72% in 2021.
- Peak price of \$13.31 per unit of natural gas in 2008 fell to as low as \$1.82 in 2012.
- The United States became a net **exporter** not importer.

4. Global Climate Change – Progressive Agenda, Conservative Tools

One Simple, Ambitious Goal



- “Linking global warming to a human cause is central because it implies there is a human cure: cutting carbon dioxide emissions from human activity. To specify the precise human cause, the IPCC [the Intergovernmental Panel on Climate Change] stands firm with the oft-stated claim that greenhouse gas emissions that keep carbon dioxide concentrations at or below 450 parts per million in the year 2100 would, in turn, keep temperature increases at about 2 degrees Celsius (3.6 degrees Fahrenheit).”¹
- To keep to this standard, greenhouse gas emissions related to human activity “would have to be cut by 40 percent to 70 percent by the year 2050 as compared to emissions in 2010. In additions even more aggressive emission control would be required by 2100—by that year emissions would have to be near zero or below.”²

Dozens of Complex, Broad Policies Offered to Meet that Goal



We can get a sense of the breadth of these policies from the financial incentives in President Biden's Inflation Reduction Act. Here I just list some of the policies in a document from the Bipartisan Policy Center.¹

- Extension of Biodiesel and Renewable Diesel Credit Incentives
- Extension of Second Generation Biofuel
- New Hydrogen Production Tax Credit
- New Advanced Manufacturing Tax Credit
- Nuclear Power Production Tax Credit
- Extension of Renewable Electricity Production Tax Credit
- Extension of Energy Investment Tax Credit
- New Clean Electricity Investment Tax Credit
- Advanced Energy Project Credit
- New Clean Fuel Production Credit
- New Sustainable Aviation Fuel (SAF) Credit
- Clean Vehicle Credit
- New Previously Owned Clean Vehicle Credit
- Carbon Capture and Sequestration Tax Credit
- Investment in Low-Carbon Materials and Buildings
- Biomass, Carbon Removal and Forest Management
- Credit for Residential Clean Energy
- Environmental and Climate Justice Block Grants
- DOE Loan Programs Office

1. Inflation Reduction Act (IRA) Summary: Energy and Climate Provisions, August 4, 2022.

An Alternative: A Carbon Tax

Why do economists prefer a carbon tax over tax subsidies?

“A carbon tax offers the most cost-effective lever to reduce carbon emissions at the scale and speed that is necessary. By correcting a well-known market failure, a carbon tax will send a powerful price signal that harnesses the invisible hand of the marketplace to steer economic actors towards a low-carbon future.”¹

Why do legislators prefer tax subsidies?

A carbon tax is seen as a penalty. A tax subsidy is seen as a reward.

Why do tax subsidies cost more?²

- They pay those who would have taken the action anyway.
- Must offer concessions to win political support.
- Miss the low cost and better performance of technologies not on the list.

Good place to start ?

The Baker Shultz Carbon Dividends Plan,
Climate Leadership Council (August 2021)

Carbon fee, carbon dividend, regulatory simplification, border adjustment.

1. Over 3500 economists signed. “Economists’ Statement on Carbon Dividends,” *The Wall Street Journal*, January 17, 2019. Copyright © 2023 by Craig R. Roach

2. “The IRA’s Green Energy Tax Credits Lose Their Punch Because They Try To Do Too Much,” *Tax Policy Center*, August 17, 2022.