

Rutan Background Includes Energy Efficiency

Now building a 34-acre PV solar energy farm.

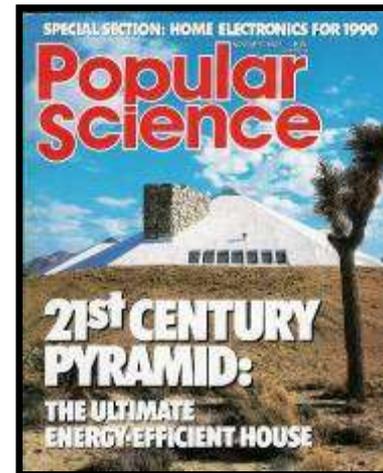


Solar elect system on VariEze - 1976

My Desert Pyramid House
“Ultimate energy-efficient house” (Pop Sci Nov 1989).
Primary car was zero-emissions EV-1, 1997 to 2004.



Loss of my EV-1 Electric car in 2004.
General Motors crushed them all



RAF gets solar water heat

1978



Out future for electric powered flight is now highly likely, not just a passing fad.

Practical continuous endurance solar flight is now demonstrated. Zephyr UAV just flew 2 weeks, 336hr. Solar Impulse flew manned 26-hour mission recently. Next gen performance improvements will see a high volume of electric aircraft for many applications.

The Design Challenge:

While impractical for most aircraft, special purpose applications will be the initial justification.

The availability of this new propulsion system is a very attractive challenge for a designer to develop an all-new aircraft optimized around the new propulsion hardware.....A designer's dream.

**Electric powered manned aircraft.
Applications are limited now, but will
likely increase in the future**

- Tiny battery energy storage makes current electric airplanes impractical. However their flexibility and promised simplicity still attracts the hunt for applications.
- Energy storage efficiency improvements will drive the acceptance of future applications (or cheaper extension cords).

**Initial (today's) applications
for an electric lightplane:**

Self-launching sailplane.

Solo operation for launch. Reduces off-field landing risk. Likely multiple motors with folding or retracting props.

Propulsion backup for single-engine aircraft.

Two snap-on leading edge pods. Power for approach and go-around. The 'comfort' of a twin. Instant power for high density altitude takeoffs.

Aerobatic show-plane – likely four-motor, reversing props.

High control power for low, or no q flight. Hover at any attitude. Backward flight. Run 4 for no torque effect, reverse 2 for high torque effects. Extreme acceleration, angular rates, etc.

Urban transporter.

For short-range commutes around ground congestion.

Launch-recovery: catch/catapult, wall snag, pendulum, steep runway, hover, etc

A practical aircraft for Dynamic Soaring.

Allows efficient launch into DS conditions.

Allows recovery after DS.

Why Electric Aircraft? (1)

- History shows new propulsion technology is the main reason we have large advances in aircraft.
 - Turbojet/turbofan example – low utility at first (range, cost, reliability & fuel availability). Special purpose initially, then expanded to be the norm for transportation and warplanes.

Why Electric Aircraft? (2)

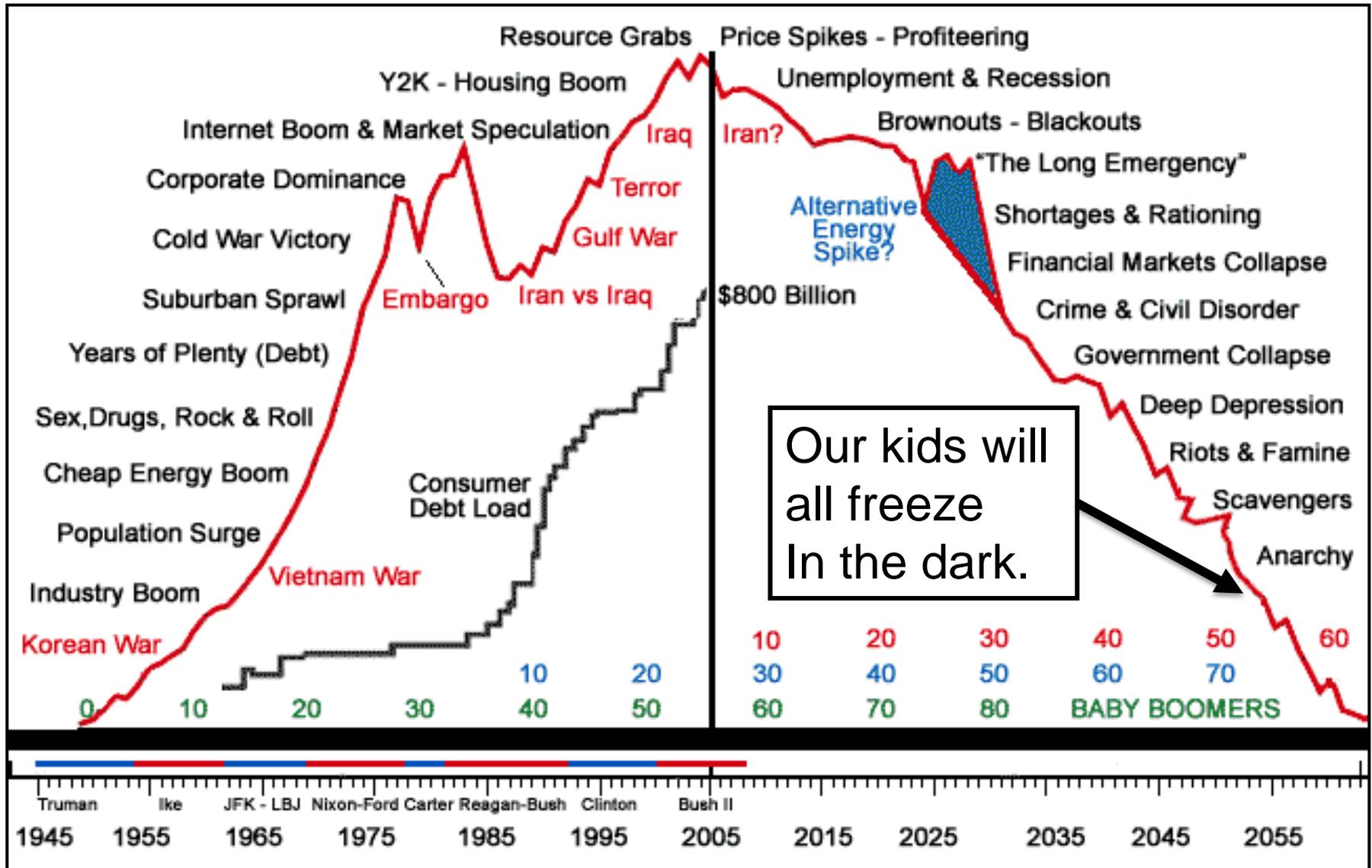
- For a “Green Planet”? **No.**
 - A green planet results from a CO₂-fertilized atmosphere, not a CO₂-starved atmosphere.
 - We became close to catastrophe several million years ago, with atmospheric CO₂ low enough to threaten all but sea life (<150 ppm kills plant life).
 - When CO₂ was 5 to 20 times current the planet was nearly all green, pole to pole. Diversification enhanced, deserts were few.

Why Electric Aircraft? (3)

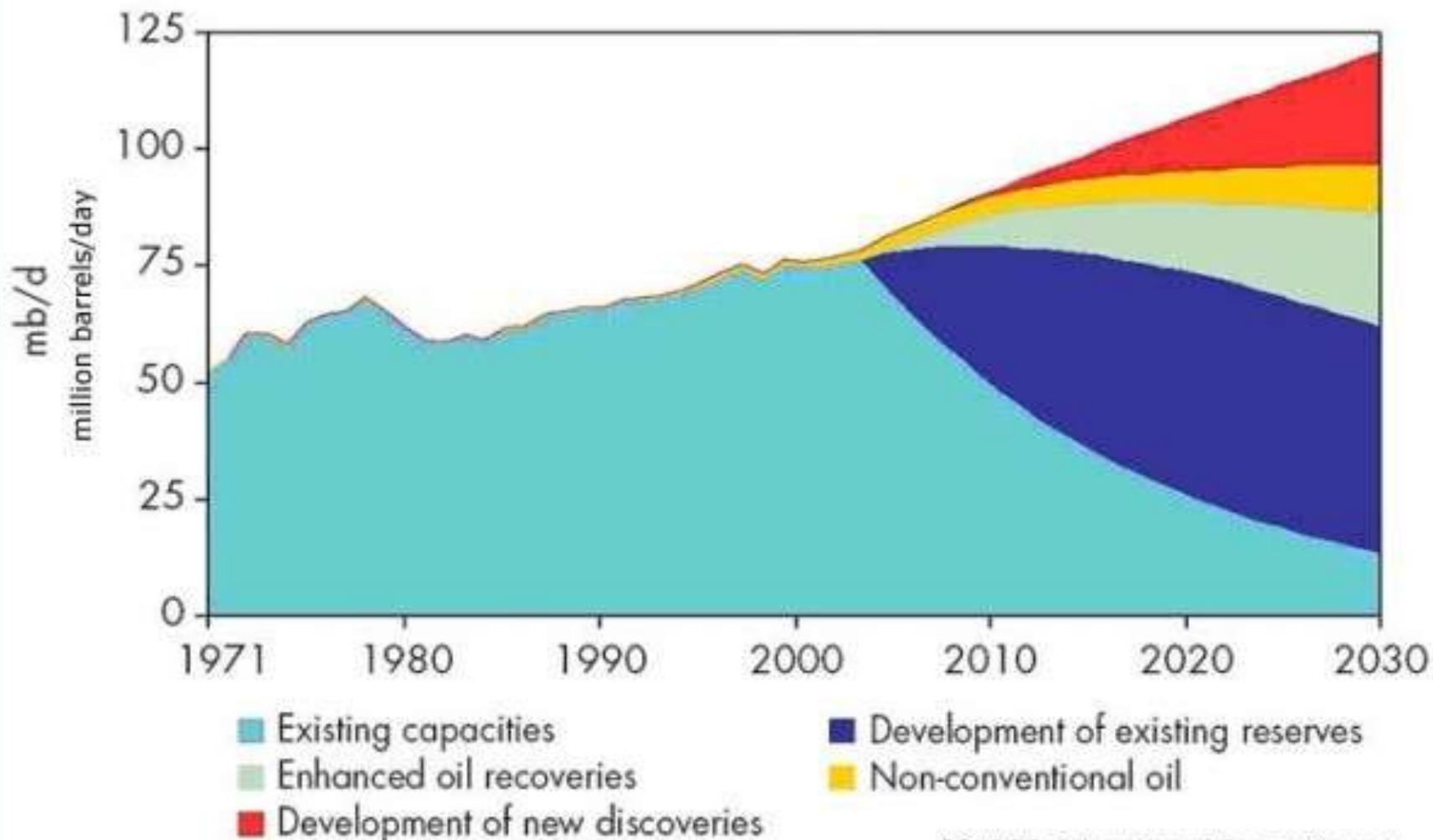
- For “Oil Energy Independence” or “Peak Oil” reasons? **No.**
 - “Peak Lithium” for batteries - demand will soon increase cost, long before oil shortages occur.
 - “Peak Neodymium” (rare earth for motor magnets) – China has 95% of the resource and has already started limiting exports. Appears more critical than Oil Independence.

What is "Peak Oil"?

First, the scare chart.



But, “Peak Oil” is a myth: A chart not intended to scare.



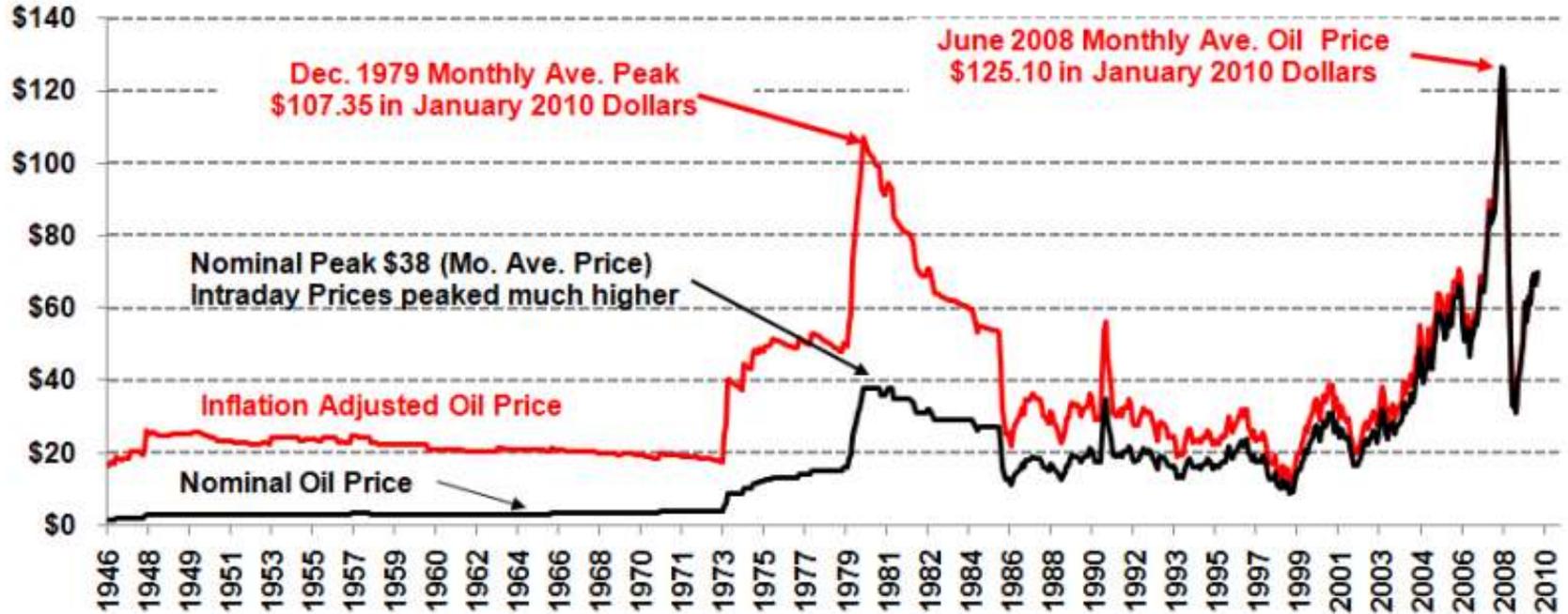
SOURCE: International Energy Agency

However, predictions for “Peak” Oil, Lithium and Neodymium are all wrong.

- Oil reserves have been calculated for 90 years and each decade the prediction of ‘years remaining’ has **increased**.
- The alarmists always leave something out – the creativity of the human mind; the ability to find better ways to find and mine the resource or to find alternatives.
- None of earth’s resources will be critical in the future as long as creative minds are free.

Inflation Adjusted Monthly CRUDE OIL PRICES (1946-Present) In January 2010 Dollars

© www.InflationData.com
Updated 3/11/2010



Source of Data:

Oil Prices- www.ioga.com/Special/crudeoil_Hist.htm

CPI-U Inflation index- www.bls.gov

Questions?