



# Presentation to Inventors' Forum



**Powering a Clean Tomorrow**

Sam Weaver, Chairman

April 19, 2008

# Invention Wisdom

- Creativity is allowing yourself to make mistakes. Art is knowing which ones to keep.-  
**Scott Adams.**
- The secret to creativity is knowing how to hide your sources.-**Albert Einstein.**
- Getting caught is the mother of invention-**Robert Berne.**
- Just because something doesn't do what you planned it to do doesn't mean it is worthless-**Thomas Edison.**
- Do you realize that if it hadn't been for Edison we would be watching TV by candle light?-**Al Boliska**
- Growth demands a temporary surrender of security.-**Gail Sheehy**
- Progress might have been OK once, but it has gone on too long-**Ogden Nash**
- Energy and persistence conquer all things-**Benjamin Franklin**
- The future is here, it is just not widely distributed yet-**William Gibson**
- **I have not failed, I have just found 10,000 ways that won't work-Thomas Edison**
- **Genius is 1% inspiration, 99% perspiration-Thomas Edison**

# Coming Attractions

- Experience of a Serial Entrepreneur
- **Steps from ideas to implementation**
- Current focus on energy.
- Companies under construction.



# Serial Summary

"You always pass failure on the way to success"-Mickey Rooney

## **Sold out 4 times:**

- **Corporation: Cash-good for all parties.**
- **Venture Capital Group: Discontinued-assets sold.**
- **Angel investor/secondary IPO: Discontinued-assets sold.**
- **Corporation: Cash and Stock: Good for all parties.**



# Secondary Benefits

“If at first you don’t succeed, find out if the loser gets anything” -Bill Lyon

- Neutron absorbers developed 1970-1972 remain the material of choice 35 years later. Reactors save about \$10 Billion annually with this product.
- Over dozen companies spun off from our operations.
- Eagle Picher sold our operations 2 years later for double the price paid to us.
- ART expanded our technologies to a 350 person operation over 20 years before selling to TYCO.
- BAM runs operations in Knoxville making aircraft brake pads and furnaces-100 people
- Employee wages were about \$100,000,000 and a total of about \$40,000,000 in taxes.



# Some things we did differently

“Opportunity is missed by most people because it is dressed like overalls and looks like work”  
Thomas Edison

- Ran production 24/7 to minimize equipment and facility costs.
- Ran R&D 24/7 to minimize time to market.
- Did development on production equipment to minimize scale up issues.
- No answering machines.
- Took care of employees
  - 100% of medical expenses-not just premiums
  - Allowed all overtime employees wanted
  - 4 hours annual leave each week of employment
  - Educational reimbursement





# A Serial Entrepreneur's Retirement

"If you don't know where you are going, you will end up somewhere else"

Yogi Berra

- Retired September 2, 2005
- Most of career in materials/energy sectors
- Had 25 year old energy concept on shelf
- Started Proton Power in Fall 2005
- 2005 Christmas entertainment was Stirling Engine demo.
- Started Cool Energy in March 2006.
- Started Eterne in 2006.
- Started Cool Solar in 2007.
- Started Red Diamond Ceramics in 2007.
- Started Sizzle in 2008.



# Steps from ideas to implementation

- Write up invention disclosure and have witnessed.
- Send to patent attorney if you have one to get on record.
- Thoroughly review literature, internet, patent office to find out if it is already in public domain.
- Determine whether you should patent or not.
- File patent if appropriate and you can afford to do so.



# Should you file a patent?

- **Yes**, if it is a composition patent that is easy to defend.
- **Yes**, if it is a component patent that can be easily identified.
- **Probably not**, if it is a process patent because you have to get in someone else's plant and prove they are using your process.
  
- **EXAMPLES**
- Neutron absorbers, we never did patent and it took competition 10 years to catch up with us with B4C, 30 years in the case of Al2O3-B4C.

# How good is your idea?

- Ultimately the market place will determine the answer.
- Clever, interesting ideas are everywhere. We get approached several times a week on some new ideas.
- If you have a good idea, write a **business plan** around the concept. If it won't work on paper it sure won't work in practice.

# Ideas on getting the invention to market

- **Business Plan is a must start**
- Produce product yourself if at all possible-greatest reward and most control
- Second choice-find a business to buy the invention
- Third choice-find a business to license the invention
- Fourth choice- Angel investor for early stage investing
- Fifth choice- Venture Capital groups-will lose control



# Producing product yourself

- Do you have the resources to fund the plan?
- Can you afford to lose everything and start over?
- On average 80% of income is earned after age 45.
- Almost anyone can learn the business aspects.
- Good accountants and attorneys will reduce the painful experiences.
- There will be things you know, things you know you don't know, things you don't know you don't know, and events over which you have no control.
- It is very hard work.
- But, you are capable of doing it if you can afford it.

# Find a business to buy your invention

- Best solution in many ways-a smaller reward but without any of the problems.
- Will have to be a business already in the field.
- Will probably have to be a large well established business.

# Find a business to license the invention

- Could include all size businesses.
- **Startups** with long development cycles would welcome secondary products with rapid market penetration.
- **Established companies** in related field would have an interest.
- **Large companies** would have interest if profitability would add 10% to bottom line.
- Companies earn, on average, 3% profit on sales.
- Royalty expectations should be in line with this reality.



# Angel Investors

- Angel investors usually limited to \$100-500K.
- Will usually accept a minority position.
- Should be prepared to offer seat on the board.
- Reduces risk, reduces reward.

# Venture Investors

- Venture Capital investors rarely invest in early stage but some do.
- A typical Venture Capital group will review about 400 business plans a month and maybe pick one.
- Venture capital investments are typically much larger, up to about \$10 Million.
- For the high risk they expect high reward, 10-100 times their investment.
- Will replace the staff CFO in first 6 months, CEO in first 12 months.

# Things Inventor Group Might Consider

- Put up a web site with non-proprietary list of inventions.
- Work with Incubators to get information on inventions out to businesses.
- Publicize success stories to increase exposure for rest of Inventors.



# Central Theme is Energy

*"The future ain't what it used to be"---Yogi Berra*

- Energy is an issue that has plagued the country for 35 years with no resolution.
- Security of energy supply.
- Increasing cost of carbon fuels.
- We are consuming our hydrocarbons at a million times the rate they are being created.
- 2 billion people on the planet don't have access to electricity.
- Strong evidence of serious climate change.



# It may be the single largest business opportunity in history

"Nobody goes there anymore because it's so crowded"-Yogi Berra

- The world expects to spend \$15 Trillion for new energy over the next 22 years.
- Investments in 2007 in renewable energy was over \$148.4 Billion.
- Solar energy investments are increasing at rate of 40-50%/year.
- Average and median revenue growth rate of public solar companies: 150%
- U.S. per capita energy has stabilized at 12 kW.
- To bring the world to this level would take a 10-fold increase in energy usage.
- World energy demand will double by 2050 even with:
  - Energy efficiency at double the current level.
  - Not accounting for helping the people in the poorest countries.



# Renewable Energy Development Opportunities

“Entrepreneurs and their small enterprises are responsible for almost all of the economic growth in the United States”-Ronald Reagan

Fastest growing industries.

High tech, manufacturing technologies.

Emphasis will be on clean technologies.

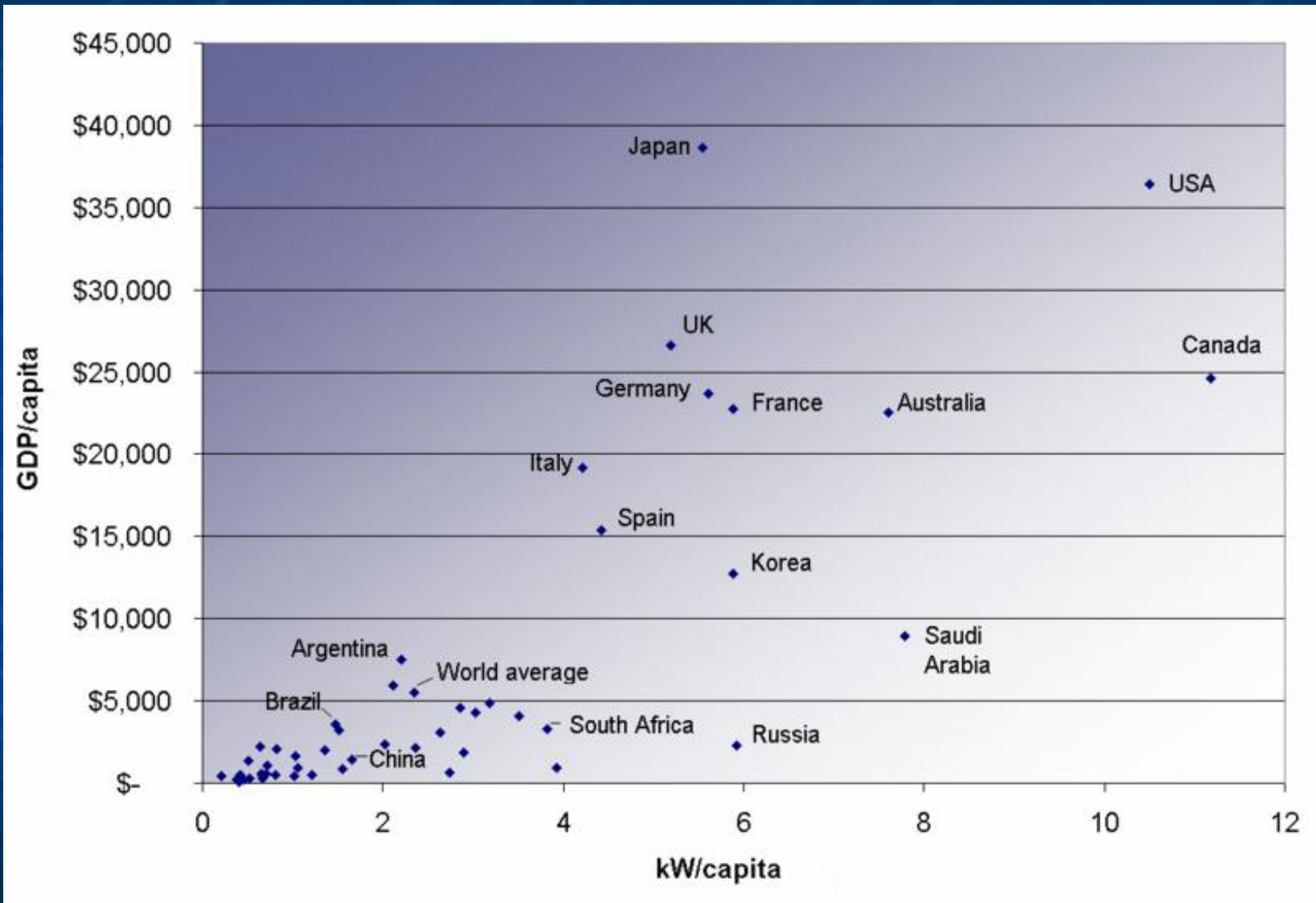
Need for serious new breakthrough technologies.

Will provide the fastest growing employment sector over next several years.





# Relationship of Energy to Wealth



Source: IEA 2006

# World Energy Needs

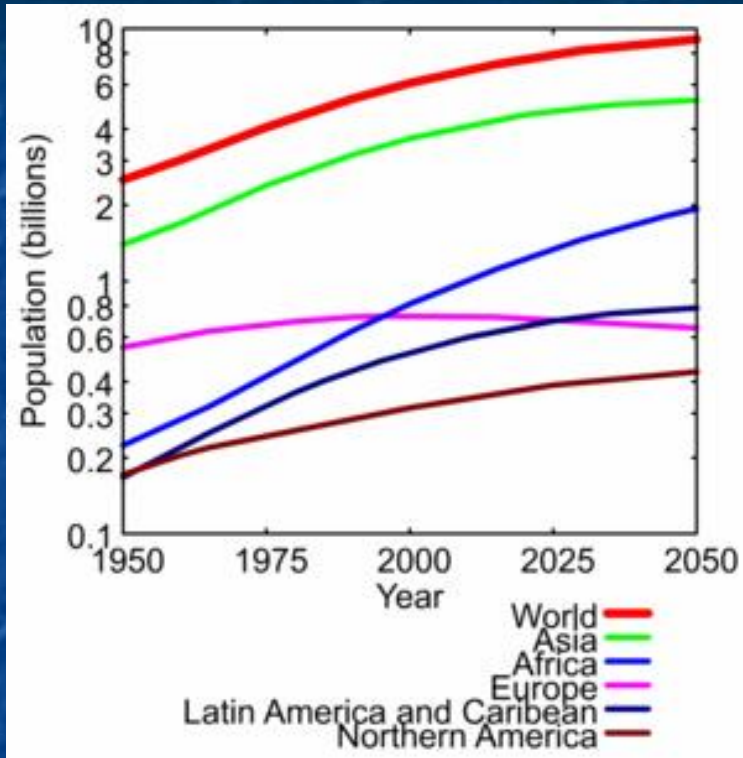
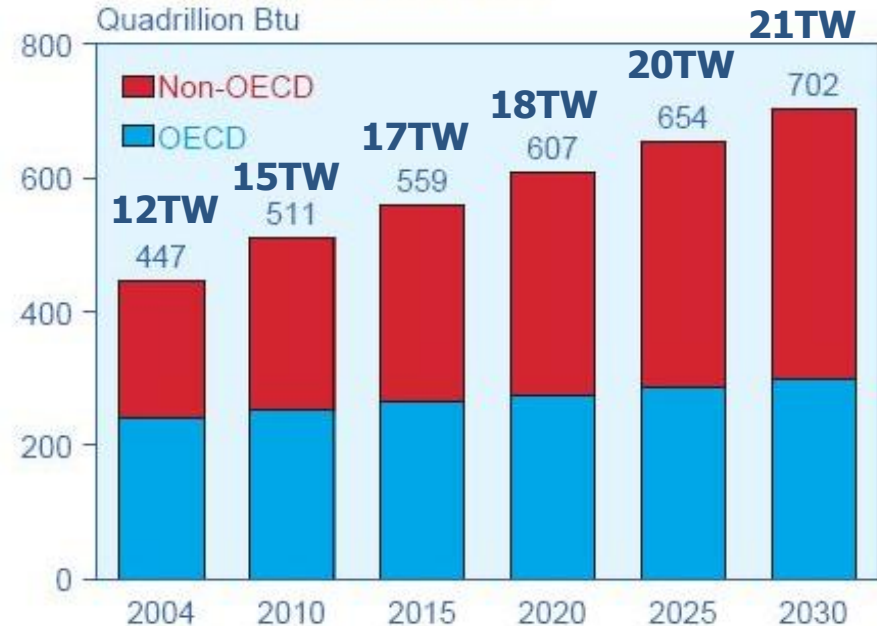


Figure 1. World Marketed Energy Consumption by Region, 2004-2030



Most Likely Human Population in 2050 is 10-11 billion

1TW = 1100 1GW nuclear plants  
= 1400 1GW coal plants

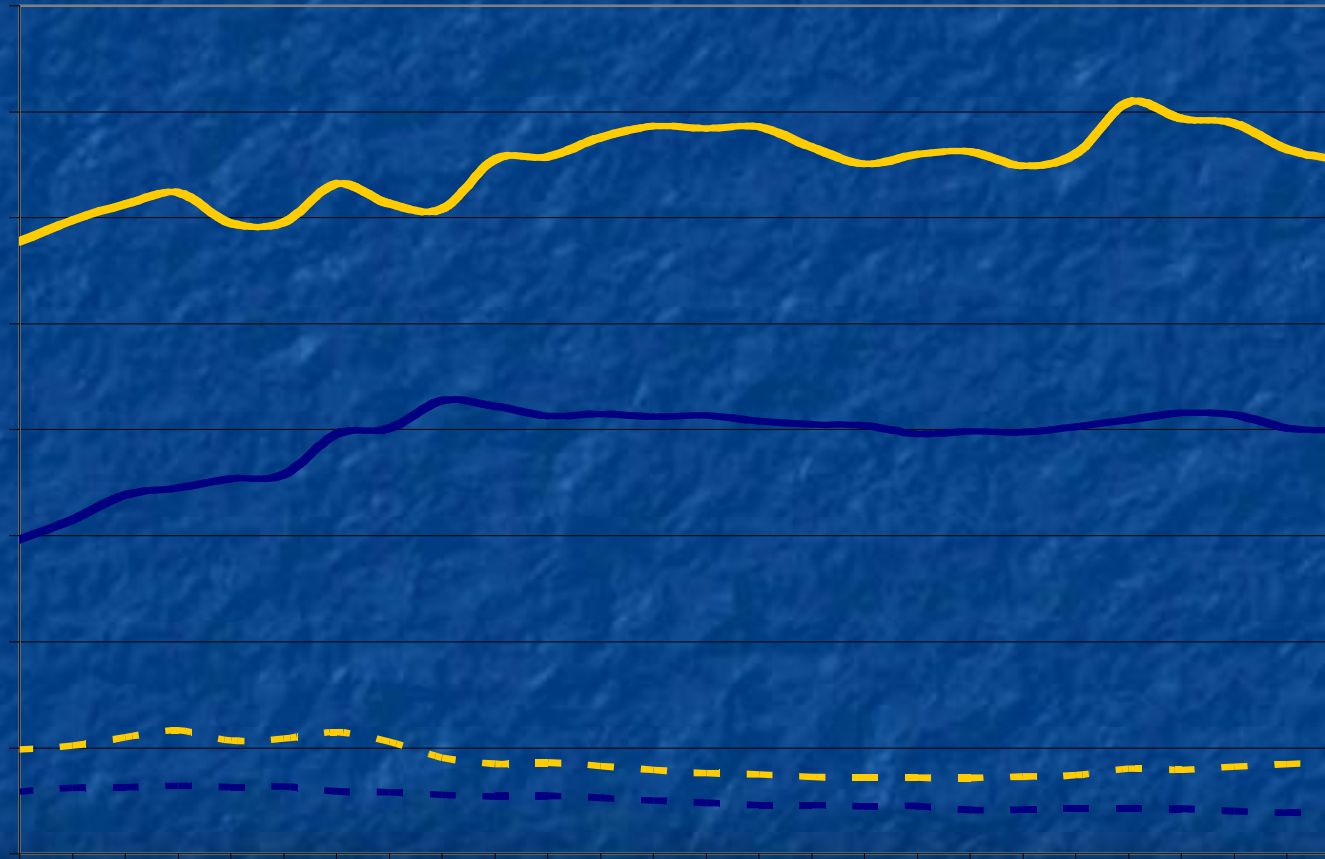
By 2030 we will need **7TW** of additional power generation (50% increase)

By 2050 we will need **15TW** of additional power generation (115% increase)

Total 2050 Power Requirements will be **30TW** = 5,000 1GW power plants (2 new power plants each week) AND 1.5 billion cars (3x current) AND 2 billion buildings

# Fossil Resources Available

## Proven Reserves By Year



World Reserves:  
•Coal – 310 years  
•Oil – 40 years  
•NG – 65 years

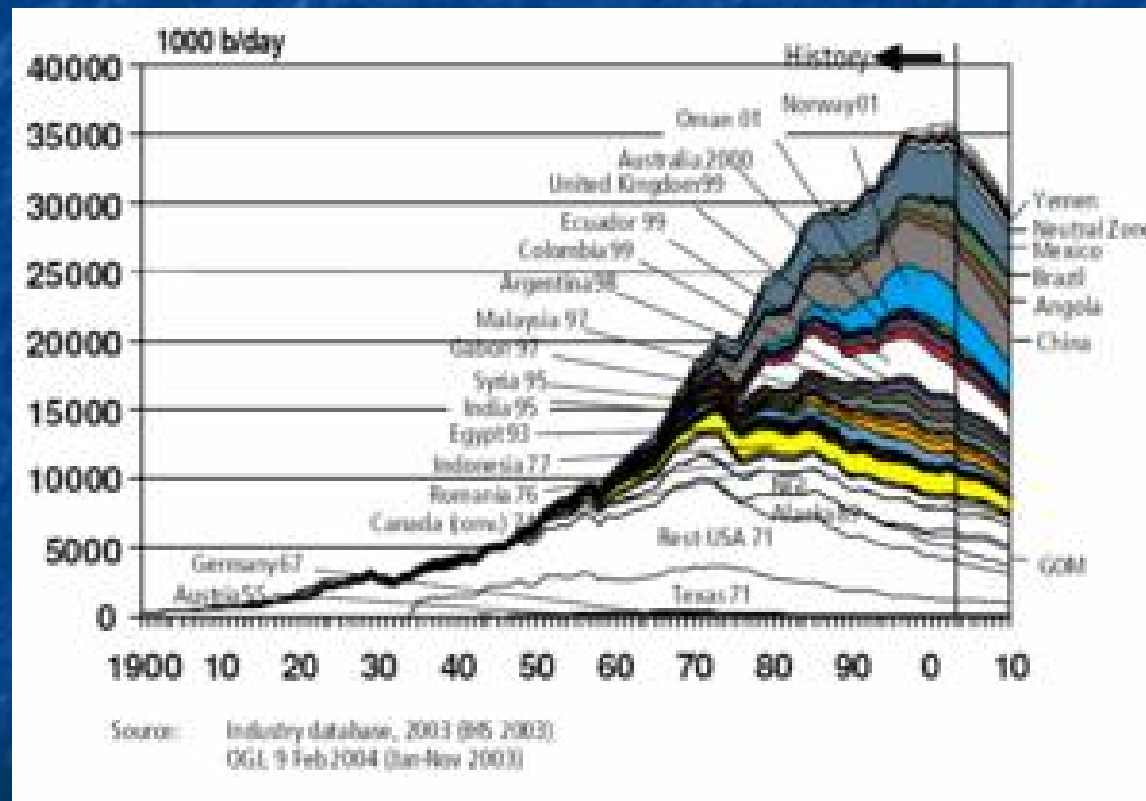
US Reserves:  
•Coal – 430 years  
•Oil – 3.9 years  
•NG – 8.6 years

— World Oil Reserves    - - US Oil Reserves    — World Natural Gas Reserves    - - US Natural Gas Reserves

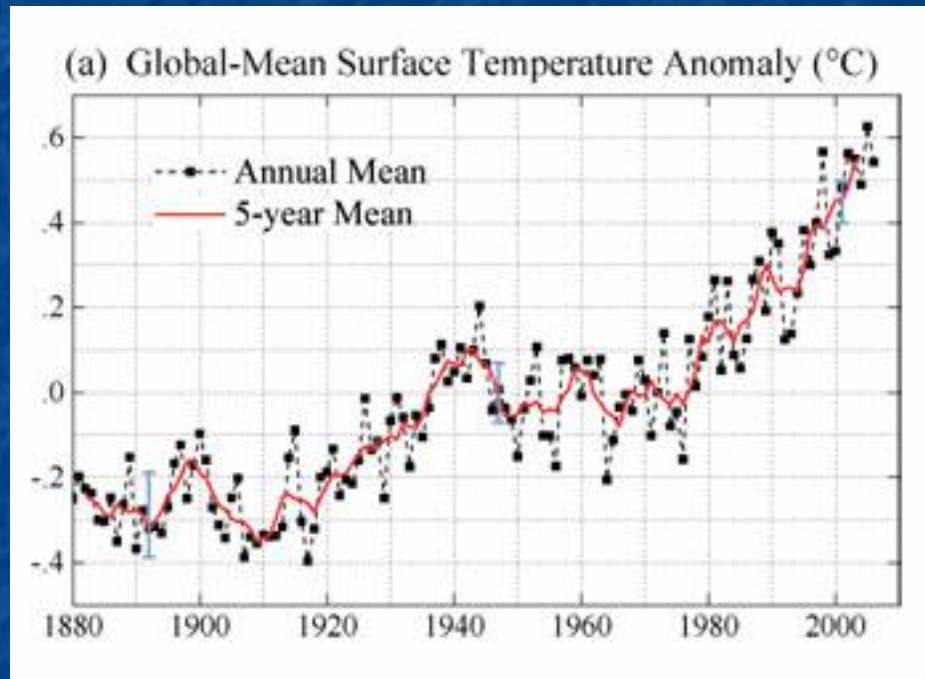
Source: BP  
Review of  
World Energy,  
June, 2006



# Peak Oil in Countries except OPEC/Russia/Venezuela

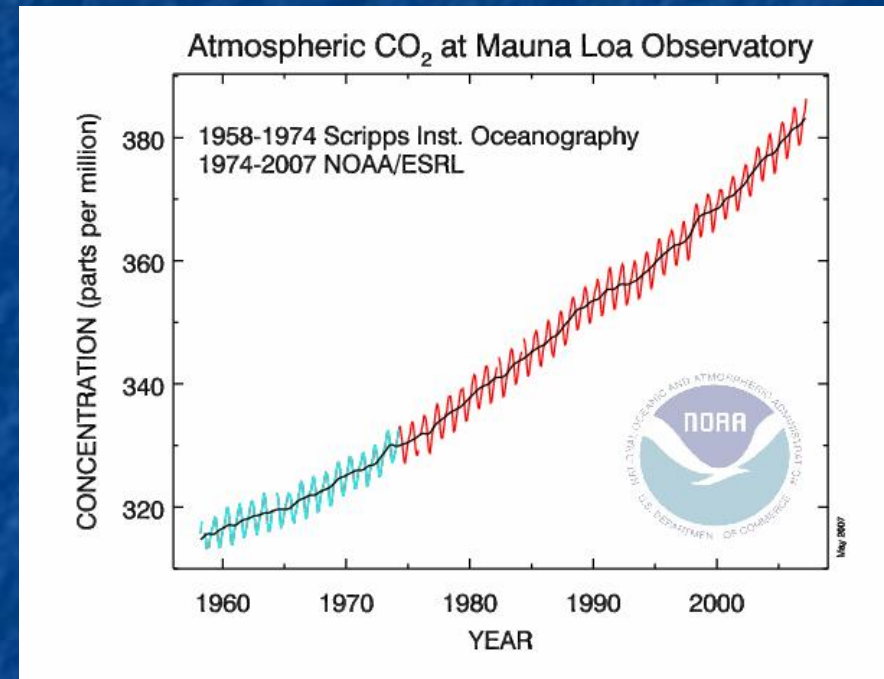


# Fossil Fuel Impacts



Average Temp Change  
Since 1960: +0.5 deg C

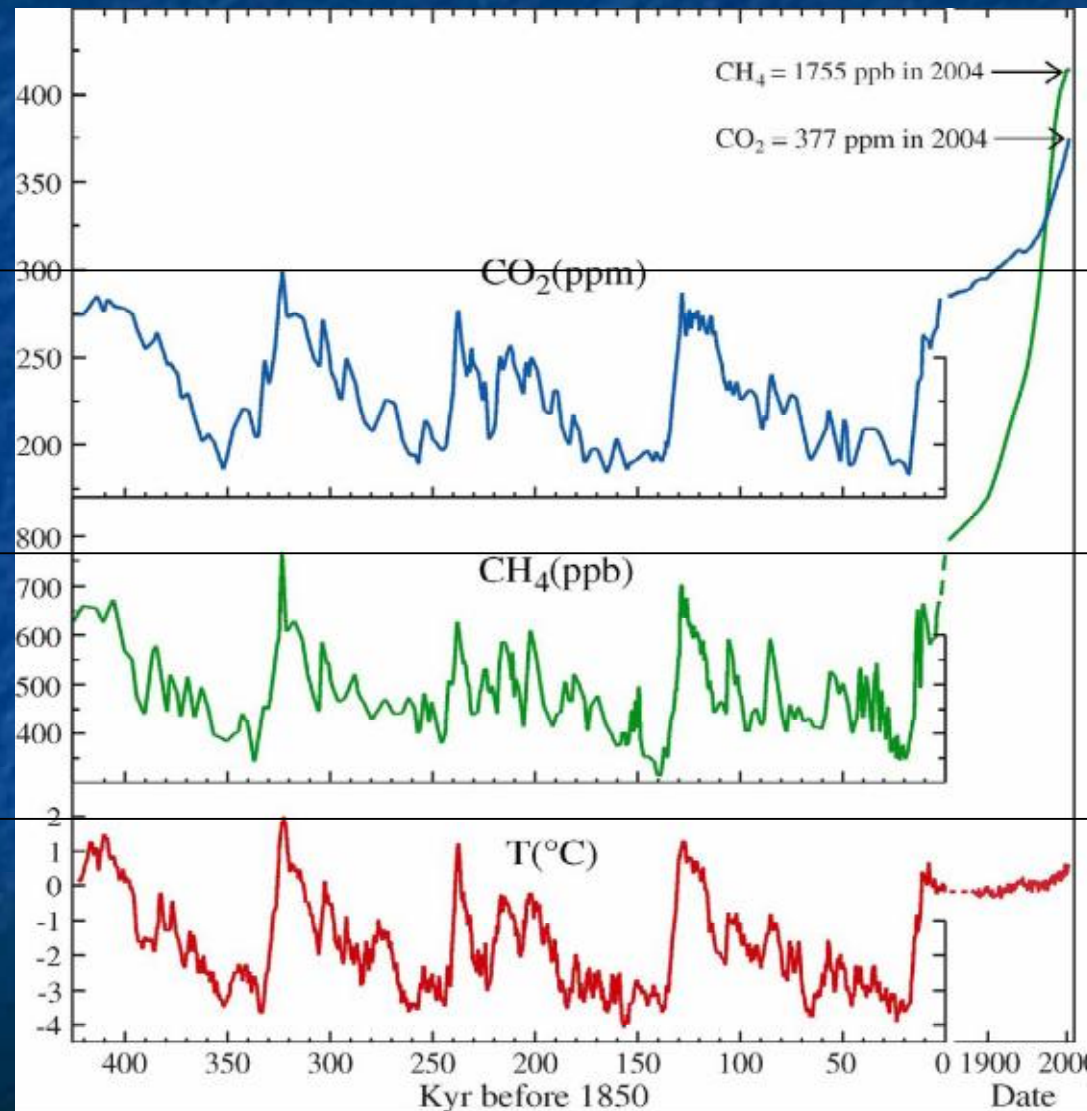
**2005 : Warmest Year in  
Recorded Human History**



Average CO<sub>2</sub> Change  
Since 1960: +70ppm

**2006 : Highest Atmospheric  
CO<sub>2</sub> in Human History**

# Has This Happened Before?



CH<sub>4</sub> = 1755 ppb in 2004

CO<sub>2</sub> = 377 ppm in 2004

CO<sub>2</sub>(ppm)

CO<sub>2</sub> max  
300ppm  
400,000 years

CH<sub>4</sub>(ppb)

CH<sub>4</sub> max  
760ppb  
400,000 years

T(°C)

Temp max  
2 deg C higher  
than recent  
average  
400,000 years

Source: James Hansen, NASA Goddard



# Corporations under development

"I get up every morning both determined to change the world and have one heck of a good time. Sometimes this makes planning my day difficult"-E.B. White

- Eterne
- Sizzle
- Red Diamond Ceramics
- Proton Power
- Cool Energy
- Cool Solar

# Sizzle

- Bought 40 acres in Roane Regional Industrial Park on 2 sites.
- Developing 4800 sq. ft. house into office space-7 offices.
- Stand alone garage and pole barn to become 3000 sq. ft. R&D Center.
- Focus: Develop as an incubator park, hopefully with energy and materials focus.
- Hope to select site plan architect soon.

# Sizzle Advantages

- Close to ORNL/ Oak Ridge/Knoxville
- Close to I40/I75 split.
- Will offer an upscale campus-like setting with San Jose type architecture.
- Will offer support for entrepreneurs.
- University support in area.



# Sizzle Property



4/19/2008

Cool Energy, Inc.

# Sizzle (Smith) House



4/19/2008

Cool Energy, Inc.



# Sizzle Property



4/19/2008

Cool Energy, Inc.



# Sizzle Property



4/19/2008

Cool Energy, Inc.

# Red Diamond Ceramics

- Founded in August 2007
- Focus: Advanced materials technologies
- Products: Carbon bonded carbon fiber insulation.
  - High temperature furnace applications.
- Red Diamond: Aluminum oxide/aluminum diboride composite.
  - High Density ceramic composite for ceramic armor
  - Metal matrix composite for variety of applications
  - Low density ceramic composite for insulation and setter applications.
- Exploring Solar PV panel assembly.



# Proton Power

- Distributed hydrogen power generation.
- Hydrogen generated at site of use as needed.
- Hydrogen source renewable-not electrolysis.
- Carbon neutral power generation.



# Proton Power Status

- 17 kW Engine and dynamometer in Sizzle lab and set up.
- RFQ out for 5-10 and 60 kWe hydrogen engines.
- Patent pending on IP.
- Components and materials for hydrogen generator at Sizzle.
- Electrical Engineer and Electronics technician on staff to develop controls.
- Mechanical engineering professor with extensive engine experience as consultant.

# Cool Energy, Inc.

- Focus: Developing a solar thermal, combined heat and power system.
- Value proposition: 7-11 year payback, 2-3x better than PV.
- Tennessee corporation: March, 2006.
- Status: Debugging second prototype.
- R&D Operations- Boulder, CO.
- 9 full time employees, 3 regular part time.
- Financing: Friends & Family Angels.
- Revenue at \$250,000 run rate, \$500,000 if Cool Solar is included.
- Lot of interest expressed in the product when it is available.

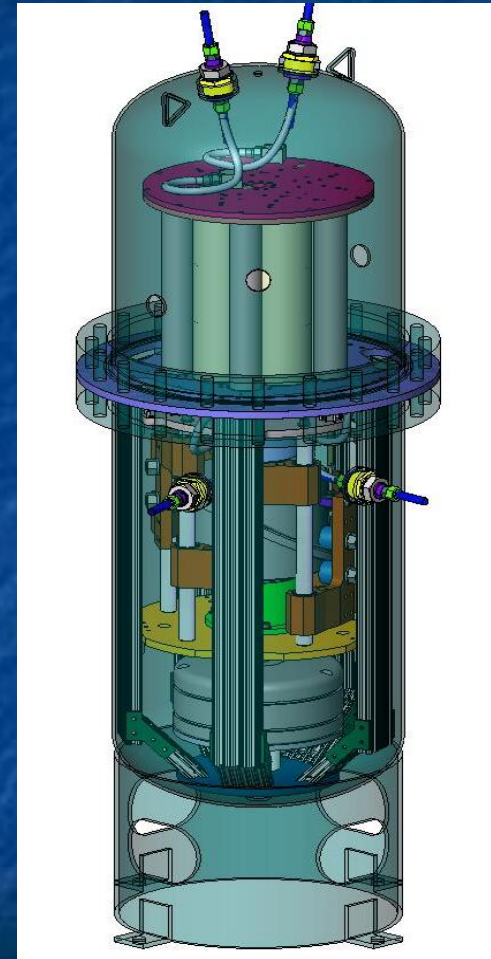
# Cool Energy System Advantages

- Relatively short payback times.
- Much more cost effective than PV.
- System should work with other low grade heat sources.
- Control system uses Intelligent Control Algorithms to maximize owner savings.



# Stirling Engine Detail

- 750W Output at 150 deg C
- 1100W Output at 225 deg C
- High efficiency due to material selection
- 5-cylinder design with barrel cam mechanism
- Wind turbine alternator/generator
- Uses standard inverter



# Market for Solar Thermal CHP System

- US Solar Electric Market is Currently \$1Billion, \$700 Million in End User Sales
- Growth Rate is 60% Annually
- Regions Ideal for Solar CHP are about 40% of US Population = \$310 Million Market with Solar Thermal
- Assuming 50% growth, and 10% market penetration in Year 5
- Sales will be in **\$77M** to **\$235M** range by Year 5



# Status of Solar Installation Business

- Cool Solar, Inc. incorporated in CO in July 2007
- Partner is Master Electrician with Extensive Commercial Experience
- Working on third installation, several orders pending
- Estimate Local PV Market at \$30M for 2008, with 60% to 100% annual growth rates
- Estimate First Year Revenues at **\$200,000** to **\$500,000**
- Estimate Fifth Year Revenues at **\$1.5 Million** to **\$3 Million**





# Opportunity Summary for Region

- Energy related projects have very high potential payoff for:
  - Investors
  - Job Creation
  - Good Wages
  - Ideal focus for Knoxville/Oak Ridge/Roane “Energy Valley”

# Sizzle Valley Summary

- **Sizzle**
  - Incubator space available for 7 offices, space for about 20 people.
  - Will build to suit for customers consistent with overall Sizzle plans.
- **Cool Energy**
  - Actively begun discussions with potential investors.
  - Interested in teaming with interested commercial parties.
- **Red Diamond Ceramics**
  - Not actively seeking investment but will consider partnering with interested parties.
- **Proton Power**
  - Not actively seeking investment but will consider partnering with interested parties.

# Summary of Solar Project Developer Concept

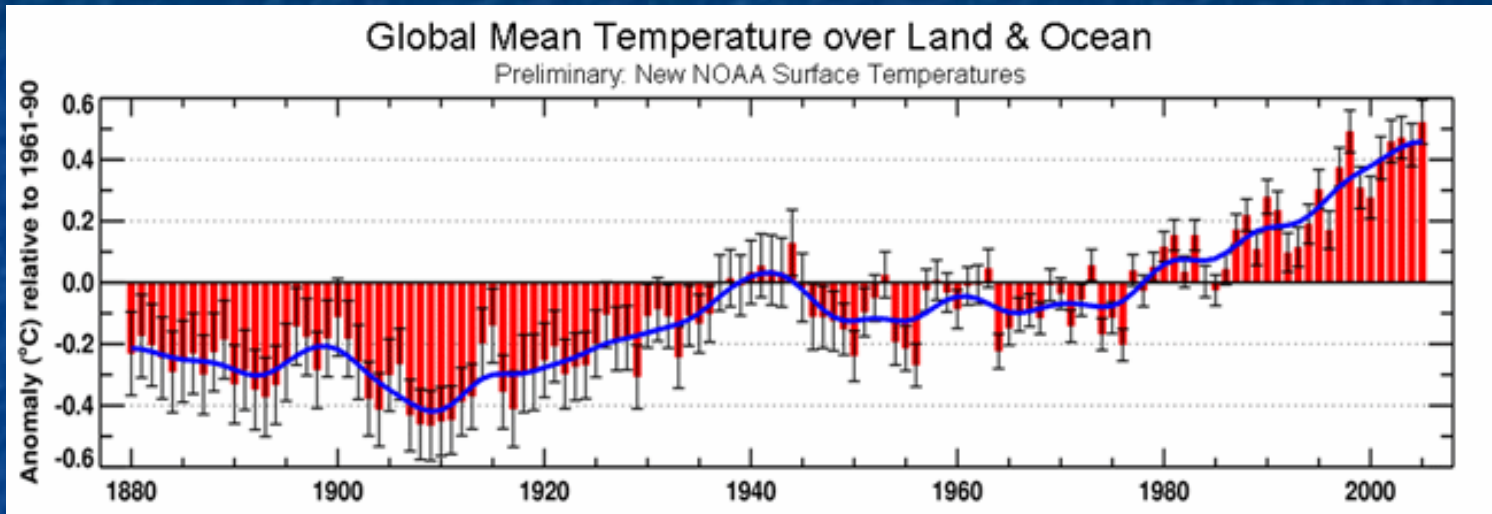
- Customer Wants Solar PV System on Home or Business, But Cannot Afford Out-of-Pocket Expense
- Cool Energy Designs and Installs System (or subcontracts same) to Utility Requirements
- Cool Energy Receives Utility Rebates for Customer Installation
- Cool Energy Owns PV Equipment and Sells Power Produced to Customer At Fixed Price, or Leases System to Homeowner
- Homeowner Receives On-Site, Carbon-Free Power for Minimal Up-Front Costs and Fixed Rate for 20 Years





# Another Look At Global Temps

125 years



1100 years

