CLIMATE CHANGE, GREEN NEW DEAL & OUR DOMESTIC ENERGY FUTURE

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Let’s Look At Climate Change
We Have Been Warming…There Is No Denying!
CLIMATE CHANGE

NO-RAIN
RAIN
LOW JOB GROWTH
BAD WEB SITE
EARTHQUAKES
SYRIA
BAD FISH
BENGHAZI
THE CUBS

THE EXCUSE FOR EVERYTHING
Don’t Want To pick On Anyone...But!

Al Gore: Jets, limousines, 100' houseboat, 22 room mansion...

"Americans should buy cars and other products that have the least impact environmentally"
What do we know??

Most Agree:
1. Global temps up almost 2 degrees F since 1900
2. CO2 up since 1900

Causes??

Mostly Due to Humans and Fossil Fuels

VS

Largely due to Natural Causes

Climatechange.ProCon.org
The Climate System Is Complex

- The climate system includes the:
  - Atmosphere
  - Hydrosphere
  - Geosphere
  - Biosphere
  - Cryosphere (Ice & Snow)
Natural Factors Influencing Earth’s Climate

Extraterrestrial
- Solar Output
- Earth-Sun Geometry
- Interstellar Dust

Earth’s Internal
- Volcanic Eruption
- Mountain Building
- Continental Drift
- Atmospheric Chemistry

Atmosphere-Ocean Heat Exchange
How Is Climate Change Measured

• Some Techniques Used
  
  Short Term (10’s to 100’s of Years)
  – Growth of tree rings
  – Pollen contained in sediment and coral reefs
  – Atmospheric Measurements
  – Ocean Temps
  
  Longer Terms (1,000’s to Millions of Years)
  – Drill cores in glacial ice
  – Seafloor Sediments
  – O-18 (warm) in ancient sea shells

Which Tells Us The Most About Climate Change?
Many Now Believe These Two Critters Are Critical To Understanding Climate Change

Foram shells

Warm Water = High O^{18}
Cold Water = Low O^{18}

Diatoms

Eats Up CO_{2}
Produces O_{2}
Back To Our Story..Natural Causes of Climate Change

• Several explanations have been formulated to explain climate change, including:
  • Exposed Land Surface Changes
  • Variations in Earth’s orbit—eccentricity, obliquity, and precession
  • Volcanic activity
  • Changes in the Sun’s output associated with sunspots
Changing Land Surface Elevation

More Land At Higher Elevations (Mts)—Cooler Earth??  Mount Everest!
Orbit & Tilt Changes

VARIATION IN EARTH'S ORBIT CYCLE ABOUT 100,000 YEARS
Effect of Volcanic Activity on Solar Radiation
Sun Spots??

A.

B.
More Sun Spots Over A Long Time = Warmer Earth??
UN Intergovernmental Panel on Climate change
IPCC Reports 2007 & 2014 & 2018

Predict Global Temps will Increase Another Almost 2 Degrees by…..2050—30 Years!
Some say much sooner.... 12 Years!
Questions??

• How Long Has It Been Warming?
• How Do We Know?
• Have We Had Global Warmed Before?
• How Warm Did It Get?
• What Came After Global Warming?
• How Do We Measure Global Change?
• Causes...Humans?
• What Do We Do?
It has Gotten Very…Very Political

What Does Science Say??
We All Know There Is Change..Right?

• Temps Changes Over Time
• O$_2$ Changes Over Time
• CO$_2$ changes Over Time
• Species Change Over Time
• Volcanos Change Over Time
• Glaciers Change Over Time
• Our Orbit Changes Over Time
• The Sun Changes Over Time
• The Earth Changes Over Time
Doesn’t Really Mind Change!
Not Big On Change!
These Places Know About Change:

New Orleans
Flooding

Fukushima
Earthquakes

Hawaii
Volcanos
Climate Tracking Is Often Centered Around…. GLACIERS

“The Earth’s Natural Thermometers!!”
Let’s Look At The Ice & Mud….

Deep Sediment Drilling & Core Analysis

Ice Cores tell us the Temps!
Higher $O_{18} = \text{Warmer Temps}$

Forams-CaCO$_3$!
What Has Happened Over Time?

Guess What...Forams Suggest Global Temperatures Have Actually “Changed Throughout Time!”

Snowball Earth-700 MYA! Lasted 80 Million Years!
Ice Cores tell us the Real Temps!
Higher $O_{18} = \text{Warmer Temps}$

$O_{18}$ From Ice and Sea Shells

So What Has Happened in 12,000 Years?
5-6 Giant Ice Ages!
Followed By Major Global Warming!
Glaciers Come and Go...

Global Cooling And Warming!!

Just 8,000 yrs ago!
Chicago, Buffalo,
New York Under Ice Sheet

Retreated 4,000 miles in 8,000 years!
Rate of 0.5 miles per year...in pulses!
Or 5 Miles Per Decade Average!
• Just 18,000 years ago, the Earth was in an ice age where continental glaciers reached as far south as the Ohio River Valley over North America.

• Over Europe, the northern region and higher terrain were covered in thick sheet as well.

• The glacial advance/retreat occurred about 10 times over a 2 million year period.
Antarctic dinosaurs

Researchers working at separate sites found remains of two distinct dinosaurs more than a thousand miles apart on Antarctica.

Source: Chronicle research

Antarctica Has Changed Throughout Time!

Cryolophosaurus ellioti “frozen crested lizard”

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“NASA – Antarctic Ice Sheet Is Growing”
A new NASA study says that an increase in Antarctic snow accumulation that began 10,000 years ago is currently adding enough ice to the continent to outweigh the increased losses from its thinning glaciers. The research challenges the conclusions of other studies, including the Intergovernmental Panel on Climate Change’s (IPCC) 2013 report, which says that Antarctica is overall losing land ice.

https://www.nasa.gov/feature/goddard/nasa-study-mass-gains-of-antarctic-ice-sheet-greater-than-losses
Ohh.. Glaciers and Diatoms

Melting Glaciers—Full Of Silica From Rocks

Silica Released to Oceans
Algal Blooms.. Lots of Diatoms
Diatoms suck up 40% of CO₂
Produces 20%-30% of O₂ !!!!
Producing Oxygen On Earth

Takes in C0₂ produces O₂

20%-30% Atm Oxygen from Diatoms! Actually Needed Glacial Melting in Past!
Human Influences

**Al Gore: Jets, limousines, 100' houseboat, 22 room mansion**

“Americans should buy cars and other products that have the least impact environmentally.”

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**Annual CO₂ Contribution of an Average American**

- 17,000 pounds of CO₂ by using 1,100 kilowatt-hours of electricity per month
- 8,800 pounds of CO₂ by using 6,300 cubic feet of natural gas per month
- 1,000 pounds of CO₂ by creating 4.5 pounds of trash per day
- 8,900 pounds of CO₂ by driving 160 miles per week
- 1,000 pounds of CO₂ by flying 1,900 miles per year
Shhh...We Think it Has A Lot To Do With Volcanos!!
Cold Earth = Massive Glaciers--5 Global Mass Extinctions Followed By Warm Earth = Explosion of Life!!

Not One Warming Period Has Caused in an Overall Loss of Species All Warming Periods Resulted In Dramatically More New Species!
Going From a Colder Earth to A Warmer Earth...Change Happens

Lowered 125 m = 4500 inches
4500/18000 = 0.25 in/yr!!

Today only 0.12 in/yr!!!!
Two Scenarios Of Change For Global Warming

Worse Earth vs Better Earth

“Once again, there is no conclusive evidence of climate change. From Fairbanks, Alaska, this is Joe Matthews reporting.”
Global Warming

- Possible Effects – Global warming could have some positive and negative effects
  - Positive Effects – A global climate change could have positive effects in areas that are currently considered hostile
  - Areas currently too cold for farming could warm up enough to produce good crops
  - Amounts of rain could increase in desert areas enough to create forests
  - Extremely hot areas could become cooler with more moderate temperatures
The Global Energy Dilemma

Countries by Population Size

China

India

United States

Philippines

Japan

Mexico

Brazil

Pakistan

Nigeria

Bangladesh

Russia

Energy

Food

Water

Africa

Americas

Asia

Europe

Oceania

Florida Gas Utility

TXNG
**Global Energy Reality**

- U.S = 100 Q-BTUs
  80% FF, 8% Nuclear, 12% Renewables
- World = 500 Quads
  20% U.S., 17% China (2x), 16% Europe
- 2030….600 Quads!!!

Who will produce it?
How will they produce it?
What will it cost??
Abundance-Energy Security

- 100+ years of secure natural gas resource

Game Changer!!
New Technologies

NYMEX Natural Gas Futures
Close (Front Month)

Today
$3 ??
$2.609

Nat Gas Prices

The Wolfberry!

Gasoline Prices!!!!
Permian Basin: Multiple Targets of Opportunity

Multiple Identified Horizontal Targets & Stacked Vertical Pays

3,900'-5,700'
- Clearfork
- Upper Spraberry
- Lower Spraberry
- Dean

5,000'-7,500'
- Upper Wolfcamp
- Middle Wolfcamp
- Lower Wolfcamp

6,000'-8,000'
- Canyon
- Penn Shale

7,000'-8,300'
- Cline
- Strawn
- Atoka
- Barnett
- Woodford

9,000'-9,500'
- > 30

9,500'-10,000'
- Fusselman

Additional potential future targets
Lots and Lots of Oil-Sweet Crude!!

USGA estimates 20 Billion Barrels

Companies estimate 60 Billion Barrels!!

1/3 of U.S. Production by 2018??

Just to Name a few!!!

Almost $6B!!!

Shell

Marathon

Pioneer Natural Resources

Florida Gas Utility

TXNG
2019: We Still Import Energy!

Importing Oil
No Nat Gas!

“Green Technologies”
Rare Earth Elements

Importing 9-10 million bbls/day
Mostly Heavy Crude for Diesel!

China...97%

Batteries, Magnets, Control Rods, Lasers
Rare Earth = Problems!!

Air, Water and Land Environmental Disaster!!

1 Ton of Mining of Rare Earths Produces:
- 1 Ton Radioactive Waste Liquids
- 10,000 $M^3$ Waste Gas (S, HF etc)
- 2,000 Tons of Mine Tailings

Source: EWI.ORG, 2016

Google: China, Rare Earths, Leukemia!!
Air Pollution Haze from China-Climate Change?
Wind Generators

2000 lbs of Rare Earth Materials per Wind Turbine!!
45 Wind Turbines = 45 Tons of REMs From China!!

The U.S. has about 60,000 “Clean Energy” Wind Turbines
Source: American Wind Association
That’s 58,000 Tons of RE and 58,000 Tons of Radioactive Waste!!
Need 583,000 Wind turbines for Total US Energy Needs!!
Great concept—Use batteries and electric motors
Average Electric Car has >10 pounds of Rare Earth Materials
The Economist, 2010

1 Million E-Cars = 10 Million lbs of REMs Needed
Natural Gas

VS Rare Earth's From China

“May be Hazardous To your Health If You Work in China”
7,000 Batteries!!

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Children as young as seven used for mining cobalt in Africa for batteries, says Amnesty International, Jan 2016
Needs Electricity!

About 2 Million on World Roads - Project 100 M by 2030
50% of World’s Electricity Comes From???
Our Real Energy Dilemma

3 Laws of Energy (Thermodynamics)—The Good, The Bad & The Ugly
There is No Free Energy—Always a Price
With Any Energy Use -There is Always Waste/Pollution
Oh...And You Must Use Energy!

The 4 F’s of Our Energy-Pick Your Poison!

Foreign Oil

Fukashima

Fracking

“Freaking” Rare Earths!!
Global Sellers-Buyers

What will the U.S. be by 2030?
Who’s against U.S. Nat Gas & Oil Exports?

Others??
Russian Nord Stream 2
Second Pipeline To Germany
New LNG Export Deal with Poland

20 Year Deal
2.7 Bcf/year
15% of Poland’s Needs
From New Port Arthur Facility
Starting 2023
“Living In The Fast Lane”!
How we Use Nat Gas

CNG
Transportation Fuel
LNG

Back-Up Fuel-Renewables

Base Fuel-Electricity

Ultra Clean Hydrogen Source

Clean Air-Clean Fuel For Texas!!
An Energy Strategy—
“It isn’t Rocket Science”

- Produce All Of Our Net Energy Needs By 2025
- Export More Nat Gas, Oil & Refined Products
- Sell Energy to Our Friends--$$
- Use $$ to: Invest in Energy Infrastructure
- And Develop Cleaner Technologies & Solutions
- Secure A Sustainable, Cleaner Energy Future

LESS!
MORE!!
Future??
The Key is Energy Education

Texas Natural Gas Foundation—TXNG.ORG

Working with UT Stem Center for Teacher Education
Local ISD’s, Industry and Public Input
Promote “Fair and Balanced” Energy Education in Texas
Lesson Plans and Exercises
Free Use in Texas Grades 8-12

Wind
Nat Gas
Solar
Cleaner FF
Hydroelectric
Cleaner Coal
Biofuels
Nuclear
Hydrogen
Will Texas School Districts Adopt?
What Is Really Green?
2 Books to Read!!
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