

The Water “End Game”

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- Hunter-Gatherer - “Nature Provided”
- Agriculture - Controlled Nature (Plants/Animals), enabled civilization
- Industrial - Mechanized Agriculture [1800-97% Farmers,Now-2%]
- IT/BIO/Nano - Automating Industry/Agriculture [1950-60%,Now-11%, heading to 2%]
- Virtual - Robotization of IT/Bio/Nano/ Industry/Agriculture [TBD]
- Technology MATTERS** - For Both Good and ill.....

Humans Have “Taken Over” and Vastly Shortened “Evolution”

- Human Engendered ‘Evolution’ ~E7 times “Natural”

Of the Planet

- Global Warming, Pollution, Deforestation, Species Extinction, Ground Cover changes, Ocean Acidification
- Huge “Public Works” (e.g. 3 Gorges Dam)

Of the Human Species

- Genomic Design and Repair
- “Mind Children” (Moravec)

Products/Life Forms

- Cross Species Molecular Breeding
- “Directed Evolution” (Maxygen etc.)

IPCC Estimates.....

- Based upon “SOLID” Science
- By 2100;
 - 5-6 degrees C
 - A meter to 2.6 meter Ocean Rise

How Far Off are the Climate/Warming Estimates?

- Projected arrival of ice-free Summers in the Arctic Ocean has shifted, in a few years [based upon “ground truth”, what is actually happening] from 2100 to 2040 to 2014.....
 - Greater than projected worst case CO2 rise rate, Oceans warming faster, Ocean Acidification 10X faster

With the Positive Feedbacks..

- By 2100, Possibly:
 - 12-14 degrees C
 - At those Temperatures, beyond 2100 [~ 2130ish?] all the Ice melts, some 75 Meter Ocean Rise, directly affect over 2 Billion people.
 - Alteration of the Ocean Circulators, H2S production in Anoxic Oceans, Toxic atmosphere and Ozone layer Depletion [Losing area of Oceans equal to state of Texas each year now to anoxic conditions]

Positive Feedbacks not included in Current Warming Estimates

- Fossil Methane [22X CO2] Release[s] [Tundra/Ocean]
- Tundra Soil and Ocean CO2 Releases
- Reduced Ocean CO2 uptake [Temp increase, Acidification, Algae Reductions]
- Further Albedo changes
- Further Water Evaporation
- Ocean Circul./O2 changes, H2S Prod.

The “Great Dying” [The Permian [90%] Extinction- 250 MY ago] triggered [as was Venusian Warming] by massive Volcanic CO2 release. Anthropogenic CO2 release[100X largest volcanic rate] is substituting for the Volcanic input, triggering the positive feedback mechanisms

Offshore/nearshore Methane
“Burps” [from ocean warming]
expected to incite undersea
landslides and create Tidal
Waves with mortality up to order
of 20 million [each].....

Rational[s] for “Going Green”

- Escalating Price of Petroleum
- “Warming” [floods, storms, disease, ocean levels, droughts, species extinctions, tidal waves, Ocean Acidification, Ocean Circulation, H₂S]
- National Security/Geo-Politics [Middle East and all that]
- Economics/ Balance of Payments [over half of ~ \$600B PLUS trade deficit is Oil]
- Personal Economics/ “Independence”

AND, there is the very rapid
Glacial Melting, Many of the
worlds major rivers [e.g.
Mekong, Yangtze, Indus, Ganges
Brahmaputra, etc.] are Glacier
fed. These are drying up, will
seriously/adversely affect some
1/6th of the planets humans
SOON.

[Conventional] Energy Outlook

- Peak cheap Oil was ‘08 at some 87 M Bbl/Day, now pumping below 80 and Demand rising, esp. in Asia, Costs will greatly escalate
- Peak cheap Uranium [unless we go Breeder/Thorium] is ~ 2025
- Peak cheap natural gas is 2030ish
- Peak cheap Coal is 2050 ish.....Coal CO₂ Sequestration will price coal above the major renewables

Current Worldwide Energy Usage

- Petroleum - 140 Exojoules
- Natural Gas - 85
- Coal - 90
- Biomass - 55 [**Potential to 4,000+**]
- Nuclear Fission - 28
- Hydroelectric - 9
- Geothermal - 2 [**potential to 5,000**]
- Solar - .2 [**Potential to 4,000+**]
- Others [Wind, etc.] - ~7 [Potential to ~5,000]

From Bioengineering.....

- Engineered Microbes which utilize CO₂, sunlight and waste water to produce [projected] 20,000 gals of fuel/ acre-year, with Economics competitive with Petroleum at some \$50/bbl. [Petroleum now ~ \$100/bbl]
- “Joule Biotechnologies” , Nascent Technology, A potential MAJOR transportation fuels breakthrough.

Suggested Green Energy Best Bets/“Ways Forward”

- **Seawater Ag/Halophytes, Aquaculture/Algae/ Cyanobacteria, Cellulosic Biofuels, genomic bio to replace Petroleum for transportation**
- **Drilled Geothermal, Biomass, Solar Thermal and Nano Plastic PV [with thermal storage/T-PV extraction, Hybrid vehicle Distributed Elec. storage or Sterling M-G for Solar night time] and Wind to replace coal**
- **Emerging Wildcard - LENR**

The Ecosystem appears to be “Crashing”

- Fresh Water Shortages
- Species Extinctions, Emergence of Fragile Mono-culture Biomes
- CO₂ etc. induced “Climate Change”
- “Pollution” of all manner
- Deforestation
- Losses of Topsoil & Wildlife Habitat
- Overall, Humans Practicing “Anti-Terraforming”

“Prevention of collapse of the Ecosystem has now become the overwhelming issue”

European Commission on Key Technologies for Europe,2005

Just a goodly portion of the Sahara capable of providing [using halophytes, seawater Irrig.] sufficient Biomass to replace ALL of the Fossil Carbon, provide petrochemical feedstock and all the requisite food whilst returning some of the 68% of the fresh water now used for Conventional Agric. to direct human use. Overall – “Solves” land, water, food, energy & warming...

Water/Food

- Current food production based on Fresh Water Plants
- We are “running out” of Fresh Water
- The Ecosystem is “Crashing”, the “code word” is “Sustainability”

[Engendered by Population Growth,~ 40% too many of us for the Ecosystem to support NOW, if/as ROW attains U.S. Consumption rate will need 3 more planets...]

- Resulting in “PEAK EVERYTHING”.....
- A “Solution” is to switch to Halophytes [“Salt Plants”], produce food on wastelands using saline/salt water, 22 nations working this, ‘Solves” Land, water, food, energy, minerals and climate change.

Malthus 101-These innate Ecosystem Restrictions/ shortfalls will necessarily shift world Econometrics from a [population, economy, standard of living] GROWTH Mantra to one of “sustainability” with possibly population control instituted along the way – Changes EVERYTHING

“Water Scarcity is now the single greatest threat to Human Health, The Environment and the Global Food Supply”

Some 97% of the water on the Planet is Saline/Salt water, The thesis of this brief is that a MAJOR solution option set for “Water” is to utilize Saline/ Salt Water.....

- Via Halophytes for Food/Fodder/Energy
- Via Advanced Energy, [Serious] Desalinization

Where the Fresh Water Goes

- 68% for fresh water plant Agriculture
- 15% Industrial
- 15% household

We COULD, via Genomics, careful engineering, corrosion solutions to enable seawater cooling, Policy/Law, changes in life styles/ diet, pollution abatement ETC. reduce MUCH the fresh water requirements for humans, perhaps by over 50%? Much of this meeting is devoted to Populating these solution spaces.....

Conventional/Historical “Wisdom” -
Seawater/Saline incursions/occurrence
Detrimental-to-Disasterous for
Agriculture

Unconventional - **Saline/Salt water Agriculture a Viable-to-Desirable Alternative to Conventional Agriculture**

Advantages of Seawater AG

- **97% of all water is seawater, will not “Run Out”**
- **Seawater Contains:**
 - **wide variety of important minerals**
 - **~ 80% of Nutrients required for Agriculture [need to add Nitrogen, Phosphorus and Iron]**
- **In proximity to a number of Dry/Desert Areas**

Irrigation Influences Upon Rainfall

- **“Irrigation can Represent an Enormous Perturbation of the Regional Atmospheric Water and Heat Balance”**
- **Cool, Wet Surface increases low level Atmospheric Instabilities, incites “Storms”**
- **Various Studies Indicate -**
 - **18%-25% precipitation Increase [from only .4 acre meter Irrigation]**
 - **Irrigation increased Rainfall by 91%**
 - **Irrigation and Vegetation changes are clear dominating factors with direct influence upon atmospheric water content**

Alternative Seawater AG Employment Approaches

- **Desalinization [in General, too expensive for Agriculture]**
- **Cold/deeper Ocean water to [via heat exchangers] precipitate moisture from the atmosphere**
- **Seawater Greenhouses [involve vaporization/re-precipitation]**
- **Direct Plant Seawater Irrigation**

Halophyte [Salt-Plant] Utilization [Per Yensen]

- **Patents issued for Halophyte Crop[s] [Genetics, Genomics]**
- **10,000+ “Natural” Halophyte Plants, 250 of these are potential “Staple” crops**
- **Research ongoing on/for Halophilic [Salt-LOVING] Halophytes, The more salt the faster the growth...**
- **Huge areas worldwide are already salt-affected [1 B Hectares] and another Billion Hectares overlie Saline Aquifers.**
- **Over 100 halophyte plants now in “trials” for “Commercial” applications**

[Sample] Countries with Saline AG projects

- China
 - Mexico
 - Eritria
 - India
 - Pakistan
 - Israel
 - Libya
 - Jordan
 - Tunisia
 - Current Status,Prototype
Farms/Experiments for
FOOD
- Egypt
 - Iran
 - Morocco
 - U.S.
 - Saudi Arabia
 - Syria
 - UAE
 - Kuwait
 - Australia
 - Sudan

For centuries, on the Indian Subcontinent, there has been a very successful Saline/ Brackish water Agriculture for Food and Fodder. Halophyte farming has been conducted for many years without noticeable salt buildup....

Chinese Seawater AG Reporting

- Genetically Modified [grown on “Beaches” using Seawater]:
 - Tomato
 - Eggplant
 - Pepper
 - Wheat
 - Rice
 - Rapeseed

The Potential[s] for enhanced [Halophyte] Plant Growth via Nano/Bio Technology thought to be Large,60% improvements thus far,“Only Beginning”
- An Example Requisite Capability - Nitrogen Fixation [utilization/extraction from the air]

On-going Research Areas

- **Enhanced Plant growth rates and enhanced “Salt-Loving”**
- **Reduced water/nutrient Requirements**
- **Irrigation Efficiency Improvements**
- **Plant /Lifeform tailoring for specific Bio-Conversion/Refining Processes**
- **‘Safe’/’Contained’ Saline/Seawater Irrigation Practices,Avoid-to-Obviate Fresh Aquifer Contamination**

Thus far, Using Halophyte/ seawater AG on Deserts/ wastelands could return some 68% of the Fresh water to direct Human Use, “Solve”, Land, Water, Food, Energy, Climate

Next – The other MAJOR “Alternative Approach, Frontier Energetics for Desalinization.....

Sample “Wastelands” Suitable for Halophyte Biomass production

- Western Australia
- Around the Arabian Sea/Persian Gulf
- Middle East
- The Sahara
- Southwest U.S. incl. West Texas
- Atacama in South America
- “Others” worldwide

There are three emerging Energetics approaches with the capacity to provide cost-effective Desalinization:

- Biomass/ Biofuels produced via Halophytes using seawater on Deserts/ wastelands
- Nano-plastic solar PV, 30 cents/watt
- LENR

LENR [Low Energy Nuclear Rx]

- Originally dubbed “Cold Fusion”, an experimental discovery with replication issues and no acceptable theory
- Now, over 2 decades of massive world-wide data collection/experiments indicate is “real”, Italian data – 15KW for 18 hours, Routinely
- Now, a viable Theory [Widom/Larsen]
- Not “Hot Fusion”, is electroweak interactions explicable via the “Standard Model” of Quantum Theory on Surfaces
- Theory being used to increase heat “quality” and practicality, no radioactivity safety issues, going COMMERCIAL in real time

The Water “End Game”

- Saline/ Salt Water AG for Food and Biomass [Fuels, Petrochemical Feedstock] on wastelands/ deserts, Solves Land, Water, Food, Energy, Climate
- Desalinization via Nano Tech and Energetics [seawater Biomass, Nano Plastic PV, LENR] for other than Food/ Energy
- Obviously, SERIOUS Water Conservation/ Recycling, ETC.....as required/ practiced, ‘convenient”, economical.

LENR WLT [J. Zawodny]

- WLT relies on the Weak Nuclear force which:
 - Produces a neutron via electron capture
 - Does not have a Coulomb barrier to overcome
- The theory combines QED, Condensed Matter, Nuclear, and Plasma Physics and also Chemistry
- $p + e^* \Rightarrow n + \bar{\nu}_e$ Inhibited by 0.78MeV
- e^* is a “heavy electron” allowed by QED - requires high electric fields ($\sim 10^{11}$ V/m or 10V/Å)
- High fields result from a breakdown of the Born-Oppenheimer Approximation via a coupling of Surface Plasmon Polaritons to a collective proton resonance in the metal hydride (in the IR).
- The result is an Ultra Low Momentum Neutron which is rapidly absorbed by nearby nuclei.

2nd Law “Warming”

The fundamental/major/most worrisome “limit to growth” is the capability of the planet to reject (radiate to space) heat. Production of “power” for human utilization produces, via the second law of thermodynamics, immense amounts of “waste heat”--we are only two-to-three orders of magnitude from a monotonic rise in surface temperature (required to radiate this waste heat) --an excellent measure of a society’s wealth is currently the power production per capita. As the ROW attains U.S. energy usage rates and population increases - This becomes a ‘Limit” [Chaisson]

2nd Law Warming Restrictions upon Atmospheric Warming “Solution Space[s]”

- Eventually and In General - no “new”/Additive “Waste Heat” Such as - Fossil fuels, Nucs [LENR,Fission or Fusion] , drilled Geothermal and Space Solar
[All these produce Additional Waste Heat]
- Left with Tidal and Terrestrial Solar via Biomass, Thermal, PV,Hydro,Wind and CO2 capture/ conversion to CO

Comments WRT “Radical Innovation”

“The battle

is within. It is a cultural one: between glorifying
the past or
marching toward the future, between
protecting
successes or cannibalizing them, between
averting risk or embracing it. The battle is
for the soul of the of the Industry [and the
Future of Humankind]”

The “Final” [Last Resort] Solution

- **Genomically modify the Biota [incl. humans] to “Take the Heat”**
 - Ongoing studies of “Extremophiles’, biologics in deep ocean vents, in deserts, in Yellowstone pools etc. plus the ongoing Bio Revolution [Genomics, Synthetic Biology] proffers the possibility of Designer Life forms [incl. Humanoids] capable of thriving in whatever evolves [Venus-like conditions is a “worst case” - ~ 400 degrees C if all the Ocean Methane/CO2 “Escapes”]