

Predicting the Future:
The World in 2017

Based on a Statistically Valid Sample
of 2GreenEnergy Respondents

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This report is another in our ongoing series in which we seek to provide an understanding of the most important trends that face civilization today – inferring the answers from the input of survey respondents. The report is based on a poll conducted in May of 2012, in which we attempt to answer the question: What does the future hold? What are the most likely top-level energy-related events that will occur in the next five years? As always, I'd like to offer my sincere thanks to each of the participants.

Respondents were provided with the following set of different propositions, and then asked to rate their level of agreement with each.

- In the United States, a new administration will make deep cuts in the powers of the Environmental Protection Agency and the Department of Energy, peeling back decades of regulation.
- Extreme weather conditions will convince even the global climate change deniers/skeptics that the theory is essentially correct and that it represents a compelling reason for the international community to take the actions necessary to avert catastrophe.
- Peak oil will cause a spike in gasoline prices, greatly accelerating the adoption rate for electric transportation.
- A deep global recession, rooted in the financial mistakes we're seeing in our current news, will cause a great reduction in the demand for energy, reducing the imperative to change our energy policies.
- The cost of photovoltaics will fall to the point at which the proposition to homeowners and commercial/industrial businesses becomes attractive, even without subsidies.
- Instability in the Middle East will escalate into war, causing a major interruption in the supply of oil, and massive shortages at the pump.
- Battery technology will improve to the point that the basic consumer proposition associated with electric transportation (i.e., price and range) will be appealing to the mainstream.
- Other nations will follow the precedent set by Germany, Japan, and Italy, and nuclear power will start to be phased out on an ever-broadening basis.
- Some technology currently considered science fiction (e.g., cold fusion) will receive a surprising up-tick in legitimacy, sparking hopes for abundant, clean, and inexpensive energy.

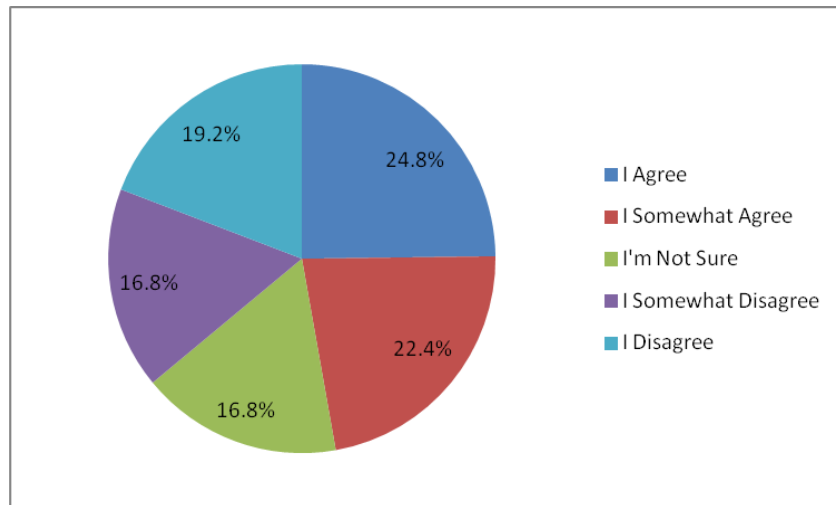
Finally, respondents were asked to enter a free form response that summarizes their vision of the most likely future that mankind faces over the coming five years.

The pages that follow provide a tabulation of some of the results, and an analysis of their possible meaning.

Results

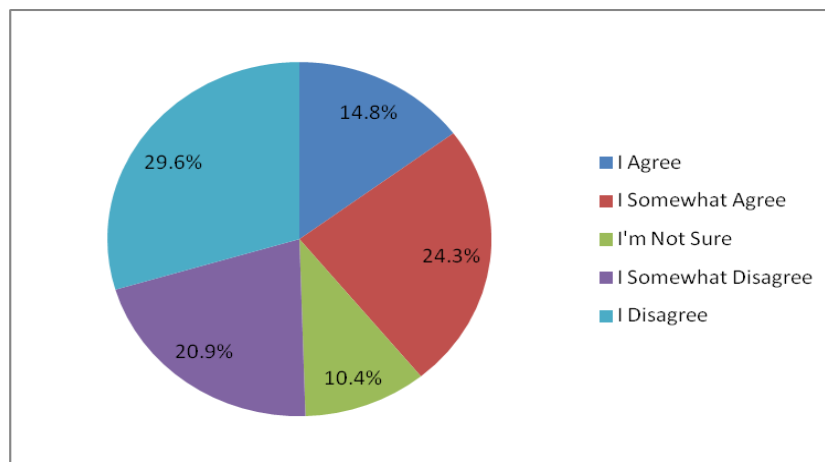
Here, we present a brief tabulation of each of the questions from which clear, quantitative data can be taken:

#1: In the United States, a new administration will make deep cuts in the powers of the Environmental Protection Agency and the Department of Energy, peeling back decades of regulation.



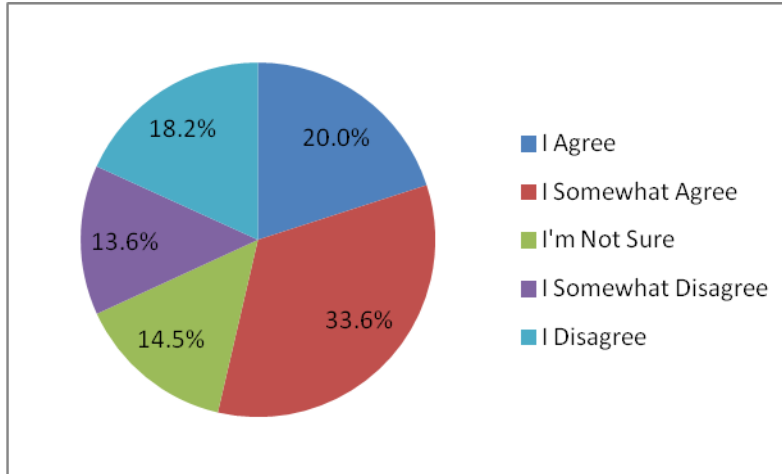
Average Level of Agreement: 3.17

#2: Extreme weather conditions will convince even the global climate change deniers/skeptics that the theory is essentially correct and that it represents a compelling reason for the international community to take the actions necessary to avert catastrophe.



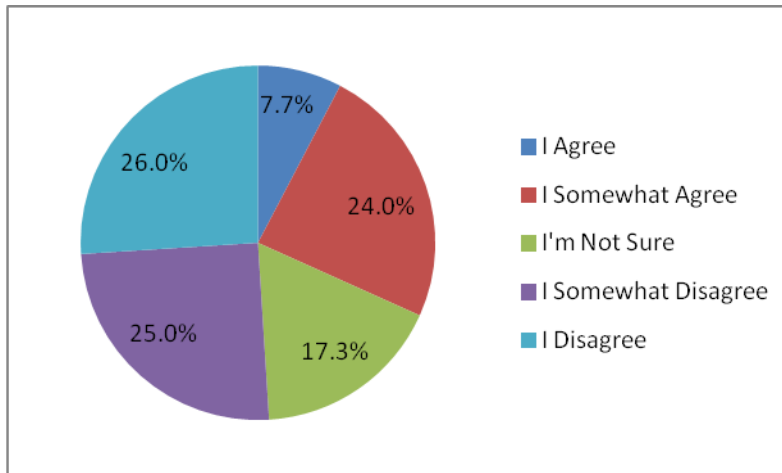
Average Level of Agreement: 2.74

#3: Peak oil will cause a spike in gasoline prices, greatly accelerating the adoption rate for electric transportation.



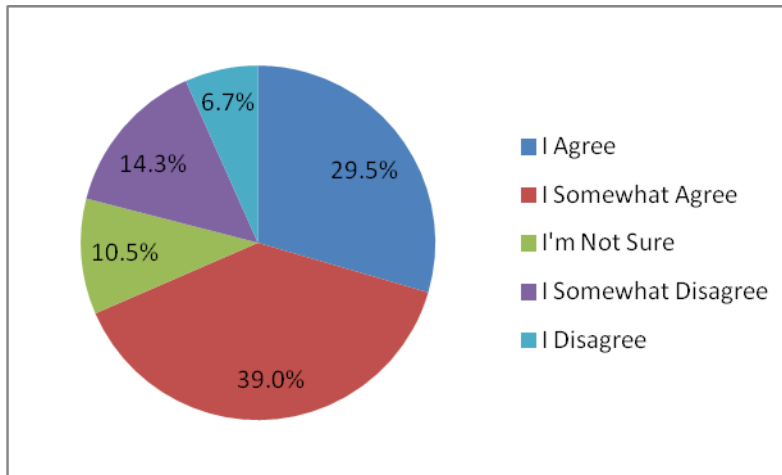
Average Level of Agreement: 3.23

#4: A deep global recession, rooted in the financial mistakes we're seeing in our current news, will cause a great reduction in the demand for energy, reducing the imperative to change our energy policies.



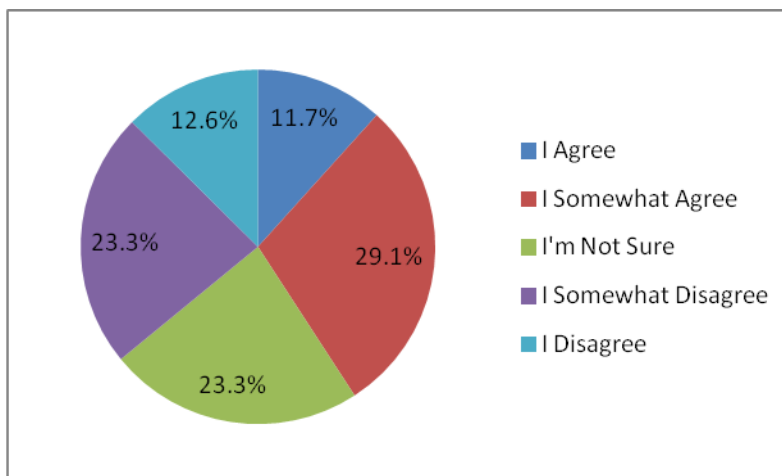
Average Level of Agreement: 2.62

#5: The cost of photovoltaics will fall to the point at which the proposition to homeowners and commercial/industrial businesses becomes attractive, even without subsidies.



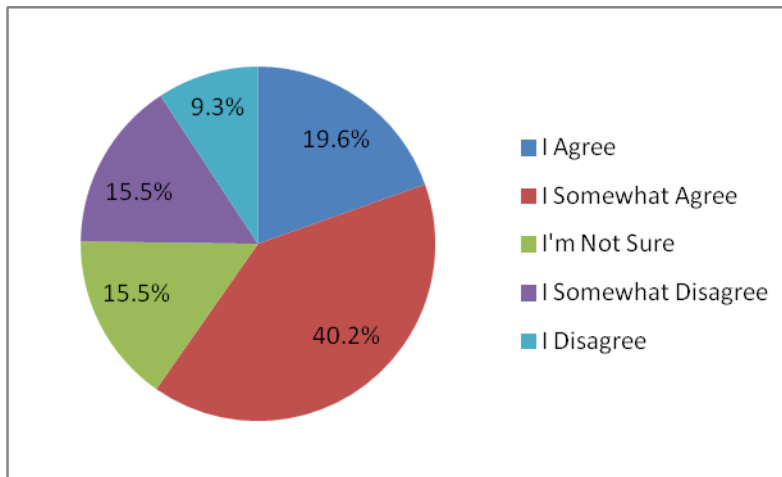
Average Level of Agreement: 3.70

#6: Instability in the Middle East will escalate into war, causing a major interruption in the supply of oil, and massive shortages at the pump.



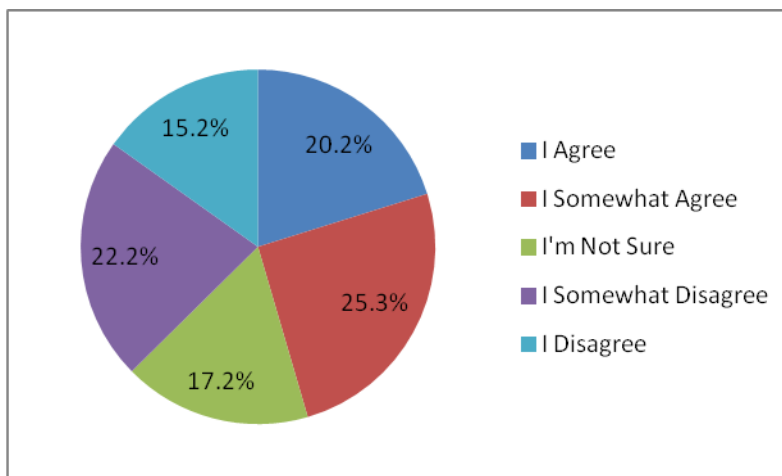
Average Level of Agreement: 3.04

#7: Battery technology will improve to the point that the basic consumer proposition associated with electric transportation (i.e., price and range) will be appealing to the mainstream.



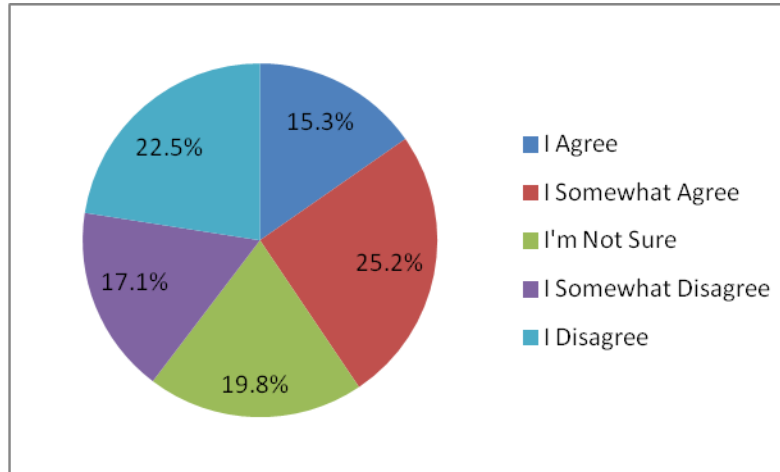
Average Level of Agreement: 3.46

#8: Other nations will follow the precedent set by Germany, Japan, and Italy, and nuclear power will start to be phased out on an ever-broadening basis.



Average Level of Agreement: 3.13

#9: Some technology currently considered science fiction (e.g., cold fusion) will receive a surprising up-tick in legitimacy, sparking hopes for abundant, clean, and inexpensive energy.



Average Level of Agreement: 2.73

Analysis

Some fantastically interesting results come from reading the participants' answers to the open-ended question re: their vision of the most likely future that mankind faces over the coming five years. Rather than offer a tabulation, I thought I'd simply indicate the main "buckets" into which these responses fall, and provide a few examples of each:

Inflation

- Rampant inflation in the western world.
- Oil, coal, and gas will steadily become more expensive at a mean rate of ~20%/year.
- As history has taught us we should enter into inflationary times sooner than later, which will stall the clean-tech industry even more. What little investment dollars are available now will move to more secure higher return securities.
- Whether one calls it "peak" oil or not, oil will continue to be more expensive year after year – no going backwards. Like a leaky faucet, this continuous increase in the extraction of what would otherwise be discretionary capital will make the other important issues of the day even more financially difficult.

Great New Innovations

- There will be great advances in battery/condenser electricity storage to make solar more practical and allow the better use of the grid. As well electric transport will take over-perhaps with hydrogen producing electric for long ranges.
- Solar will become more affordable so that individuals may produce and store their energy needs.
- Major advances in rechargeable battery technology
- I have already seen some pretty significant (about double the kw/hr) battery improvements in technical papers so I see that as being soon to come.
- Solar energy will be the total source of power in all forms. Solar PV, CPV, wind power, wave energy and all renewables with good storage at low cost.
- Within two to five years, homeowners should be able to walk into local hardware stores like Home Depot and purchase modular solar panels with micro inverters which can be installed by local electricians in less than half a day. Solar energy installation cost can be recovered in less than 5-7 years.
- Solar will drop below \$0.04/kWh within 5 years and below \$0.03/kWh within 10 years. Electric buses will prove out Qualcomm's wireless charging and induction rails will be added to the carpool lanes in San Diego and L.A.
- I am much more optimistic that renewables are reaching a tipping point on purely economic terms. We are in the early days still, and there is a lot of room to improve costs to the point where people widely adopt renewable energy and move toward more electric driven cars and the like.
- I'd bet my money for a continued surge of solar energy (PV, CSP, solar heating), making electricity a cheaper and cleaner option for more and more applications. The challenge for the power sector will be to transform from a producer of kilowatt-hours, to a supplier of kilowatts when they are needed for balancing supply of intermittent sources and hopefully a more flexible demand side. Concepts such as energy storage, improved transmission capacity and DSM will be crucial.
- I believe that solar will prosper in spite of the incoming tide. Cannot stop the attractiveness of having one's own power source on your own property; it gives one a sense of satisfaction in doing something that is good for all.

Social Unrest

- Major loss of individual freedom coupled with a takeover by a “benign” dictator.
- Major rioting in the streets of 5 or more major cities in the U.S.
- The gap between the rich and the poor will continue to widen. It will take 10-12 more years of this before something close to revolution (major rioting) comes to the U.S. We will not see another period of sustained strong growth in the U.S. until several years after that happens.
- I think there will be more wars about energy.
- Forrest Gump said, “Stupid is as stupid does.” Fiat currency will destroy America soon. Riots and socialism will lead to the civilization collapsing.

Limited oil will cause problems

- Due to limitations in oil production and increasingly expensive production techniques, the economy will cycle between anemic growth followed by high oil prices which will stifle growth and perhaps/probably cause recessions.
- If the Presidency goes to the GOP, I think the recessions will become worse than they otherwise would be, but neither party will be able to stimulate “growth” as we have known it in the past.
- If the European financial woes become severe, this will trigger a world financial meltdown similar to 07-08, and there is significant chance of a black swan event in the financial markets (mainly derivatives) since no meaningful regulations have been put in place to prevent it.
- Under the GOP, there will be less incentive for efficiency and alternatives, and this will lead to less resilience in our economy.

No Response to Global Climate Change, Fossil Fuel Dependence

- Under either party there will be no response to climate change, except to try and endure the increasing rate of natural disasters, and perhaps one of them will overwhelm our response capability similar to the Katrina response.

- I believe that the ignorance and intransigence of American voters and the idiots we put in office will make it impossible to mount any serious efforts to deal with limiting the use of fossil fuels and dealing with other looming problems like a warming planet, greater pollution, and coming shortages in global supplies of food, water and medical care. I don't see good times ahead in the next five years. As a people, we deal only with short term, ineffective solutions to long term problems.
- Without a social revolution of some considerable scale, the planetary ecological destruction will continue and it will be realized that we have reached certain global warming tipping points and that without a world-wide urgent effort, our species is on track for extinction. Without action, within 5 years, we will be able to predict our fate. With serious urgent action at war-time speed across the planet with youth and elders alike working on assembly lines to meet our survival needs, we would have a chance at survival with no guarantee. We are in trouble folks. We must wake up quickly. The history of our future must be made NOW.
- I think it will take more than five years for people in the U.S. to see the error of their ways.
- Leadership will do nothing while saying all the right words. Both parties are elitist and consequently don't think systems. They imagine that they will mechanistically "control" what's about to happen; more to the point, that they will remain in control of society. They regard the greater population of Americans as expendable. All of this will take place in the context of a deep depression in the developed countries because the financial elites will continue to consolidate wealth rather than invest in a sustainable economic system.
- Leadership is needed to guide civilization to a new future and I do not see that happening much anywhere as of yet.
- I'm not American however I believe the US public are about to have a major wake up call regarding a number of US policies, both domestic and foreign, particularly when it comes to energy. Being a world super power only to back out of or simply ignore international needs regarding energy, is simply a double standard. The US administration has and continues to betray the American people with its lack of foresight and responsibility regarding its approach to sustainability. In short, your survey by definition is the tip of the iceberg. The US is like a parent that says to their children, "do as I say not as I do."
- Within your five year perspective I wouldn't expect more than business as usual. In the US, the drag on political, economic and technical change from anti-science, evangelical movements and big business interests will continue to constrain essential moves to a more sustainable (survivable?) future. Structural and economic implosion in Europe will have shock waves lasting longer than 5 years, inhibiting the generally positive actions started there. The Middle East will continue to be volatile, unpredictable and introspective, where concern for climate stability will come low on

their list of priorities. Let's hope China, without the time constraint of achieving a democratic consensus, gets the message, sees the economic benefits of global domination in 'green' technologies, and cleans up its industrial legacy.

- Economics (including short sighted self interest and greed) will continue to trump science, technology, the environment and any sense of needing to do the right thing until enough shocks are felt by the world that we change our ways... for a time.
- Energy policy will likely muddle along in Obama's second term, and after that we will see a republican administration do even less. There will be no help coming from the regulatory side of the house.

Countries Other Than the US Will Develop CleanTech

- Within the decade, the Middle East OPEC countries (with their abundant solar resources) will implement and prove out disruptive renewables based, 24/7 electric generation technologies, that will jolt the conventional US fossil based electric production model. The Middle East countries (in concert with the China, Japan and India) will soon thereafter start exporting affordable non-fossil, off-the shelf, renewables based electric power technologies for off grid use by individual homes, and thus strand US existing utility companies. The handwriting is on the wall.
- There will not be enough money or technology for there to be huge change in the next 5 years. Change is happening but it will be much slower than many wish or believe.
- We will not see serious and effective commitment to reduced CO2 emissions until after we've seen several years of strong economic growth.

Nuclear

- Although, I don't consider nuclear power to be the root of all evil, I just feel it needs to be handled more like the military handles nuclear power and less like politicians handle nuclear power. It is dangerous to the extreme, but it has the ability to work, and work well, in places where most other sources of power won't due to environmental issues.
- Humans have extremely short term memory – witness current USA politics. It is likely we will forget the lessons of Fukushima, et al. That, plus newer technologies, plus the extreme pressure for non-fossil fuel sources, might push us back into the nuclear option.

Environmental Disasters

- Since the climate has been “squealing” for several years already, an abrupt warming is imminent, very likely within the next five years. While this will cause catastrophic droughts and floods in the U.S.
- We are headed to environmental disasters in the next few years that will force most people to make changes. Changes in their lives that they hope will save them from the worst affects of climate change. After Pearl Harbor, the American people did an about face in a very short period of time. We can and must do it again.

The Common Person Will Be Hurt Worse Than the Rich/Elite

- The outlying regions and members in the lower economic circles will be increasingly abandoned, while wealth and power attempt to protect their own interests.

Recession Means Lower Demand

- I suspect that demand destruction will act against investment in needed infrastructure, which will lead to wild oscillations in fossil energy prices and supply.

Big Oil Must Profit

- Only when big oil maneuvers themselves into equivalent monopoly (and profitability) positions with renewables will we find their resistance to renewables changing to some shade of enthusiasm.
- There is far too much infrastructure that depends on cheap fossil energy and that great effort will be given towards maintaining the status quo.
- We will not see the fuel of the future, however, until these existing companies can extract as much fossil fuel based energy as they reasonably can and market within the existing infrastructure.
- Solar, wind, tidal, etc. could possibly become competitive with other energy sources but they have no financial backing from the existing energy companies. I believe a major reason why there is no financial support is that these alternative energy sources involve only an initial capital investment profit with limited O&M revenue down the line. There are no profits to be made on fuel commodity unless these companies can find a way to monopolize the sun, wind and oceans.

Kindness

- Kindness does exist in the world however, and the power of love is ultimately stronger than the dark side.

Population

- We will bumble along with too many people on the planet and temporarily save ourselves when we unlock new energy sources as yet just a dream. But the dream will be short-lived if we do not address overpopulation and the consequent food and water shortages that will simply not go away with 7 billion mouths to feed. Unpalatable as it may seem, we have to start reducing our numbers through education and a responsible attitude to the breeding cycle of ‘homo erectus’. A solution to our energy needs is not a solution at all. When we get past 10 billion of us it will be game over anyway. And that assumes we don’t destroy the habitat to the extent that even the bees disappear in the meantime. We are so stuck in the ‘more energy’ mode, that we fail to see that we are breeding ourselves into oblivion.
- With the population of the planet ever expanding, it’s increasingly harder to feed its greed for the planets mineral wealth.

Many Opportunities Exist

- Crisis here in Europe creates opportunity. A destroyed Europe impossibly burdened with debt was revived after 1945 by the U.S. vision of a brighter future – known as the Marshall Plan. By creating long-term guaranteed demand, the Marshall Plan gave Europeans the confidence to rebuild. Germans call what followed ‘the economic miracle’.

Electric Vehicle Adoption Curve

- The electric vehicle will not be a major player in the transportation arena for many more years. Goods transport will continue to become more dominated with natural gas vehicles.
- EVs will have negligible impact on oil usage – for decades.
- As an owner of an electric vehicle, I have found that the vehicle serves 95% of my needs and costs 1/10th of what it was costing me in fuel and maintenance. Unfortunately adoption of EVs in the U.S. will be slow even if the gas prices steadily rise. People in this country ignore a problem and hope that it just goes away. The average person doesn’t want to know how much of their income is “burned” up on gas! The problem isn’t a “technical” one; it’s a “mindset.”
- After about 8 years, we will decide that it would have been nice to have more electrified transport, but there will be no money available to do it.

Natural Gas

- The biggest impact to date has been in the form of fuel switching – coal to cheap natural gas. The only downside of this trend has been that it has greatly hindered new (but more expensive) green power technologies.
- Near term is hybrid drive systems with gasoline or diesel engines, transitioning to compressed natural gas hybrids and increasing all electric ranges as battery technology advances.

Energy's Business Model Doesn't Reward Innovation

- Based on my thirty years in the energy business, the “innovation” we might see (i.e., that will register in the professional or public consciousness) in the next five years might include evolutionary improvements in gas turbine/generators and wind turbine/generators, and perhaps minor gains from some of the smart grid deployments in the way of efficiency and demand management based on price signals. But that's about it. The business models for the electricity industry do not reward innovation and the business models for the energy industries as a whole reward economic productivity on extraction and delivery. And since financial speculation has been injected on top of energy commodities, price volatility prevents everyone from serious long-term planning around new, more environmentally sound objectives.
- It's hard to justify investment when the cost of permitting and licensing a project takes so long and requires so much money.

My Belief

A number of survey respondents pointed out, five years is not too great a length of time. Yet I find it hard to believe that five full years from the date of this publication will go by without a radical and unpredictable event -- or perhaps a set of events -- that will shock and horrify the world, focusing global attention on the true issues of sustainability. After all, we see indicators all around us that point to a monumental point of collapse:

- The unprecedented pace at which we're destroying our natural resources
- Shortages in energy, water, and food
- The increasing rate of failure of individual nation-states
- An economic climate that seems to anticipate some sort of precipice
- The proliferation of nuclear technologies for energy as well as weapons
- The cavalier dismissal of these overarching global issues by the US electorate, as it continues to be so grossly misled by its leaders, pawns as they are of the huge corporate entities that put them into office

Having said all this, isn't it possible that such an event, if in fact it does occur, would force the world's people to a radical conclusion? Couldn't we get the message that it actually isn't too late to take the actions that would culminate in sustainable living for the world's population? Of course.

I'm reminded of a talk I heard at the University of California at Santa Barbara recently, in which the presenter responded to a question from a member of the audience who had expressed a deep level of cynicism. "I hear you," the speaker responded kindly. "But it appears you're a pessimist, which implies that you know how all this is going to turn out. Personally, I don't. I guess I'm what's called a 'meliorist.' I'm not confident in a good or bad ending, just in my belief that you and I can make a difference in that ending."

Wow. I hope we can all take a moment and let that sink in.

In any case, I want to conclude by thanking my ever-growing set of survey participants, and by making another plug for radical election reform here in the United States. Check out MoveToAmend.org, supporting a measure into the U.S. senate calling for a constitutional amendment that would limit the rights that corporations have to influence our elections. The amendment, referred to as "Saving American Democracy," would nullify the Supreme Court decision (*Citizens United vs. FEC*) which granted corporations unlimited rights to free speech (see video linked here). As sponsor Bernie Sanders (I-

VT) points out, if this measure does not go forward, it “means the end to American Democracy as we know it.”

Here’s an excerpt from Sanders’ speech:

In my view, a corporation is not a person. In my view, a corporation does not have first amendment rights, to spend as much money as it wants without disclosure, on a political campaign. In my view, corporations should not be able to go into their treasuries, spend millions and millions of dollars, on a campaign, in order to buy elections. I do not believe that that is what American democracy is supposed to be about. I do not believe that that is what the bravest of the brave, from our country, fighting for democracy, fought and died to preserve.

If anyone has a good argument counter to this, I’ll sure be impressed.

- Craig Shields
Editor, 2GreenEnergy.com