

# **Chill** in the Living Room

Dwelling in a Post *PEAK* World

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A Survival Guide for Homeowners



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***John Van Doren***



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For information contact the Author  
at [vandoren@wispertel.net](mailto:vandoren@wispertel.net)

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Dwelling in a Post *PEAK* World  
A Survivor Guide for Homeowners

John Van Doren

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*This book is dedicated to my children and grandchildren  
who will bear the greatest burden as we make the painful  
transition from a fossil fuel dependent world to a more  
sustainable future*

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Note: Page numbers do not apply to SAMPLE version of the book

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**Author's Note to Readers:**

*Chill in the Living Room* can be read from cover to cover like any other book or viewed as two books to be read and used separately. One “book” provides the context for the challenges that homeowners will be facing in a post peak world, and the other provides a “handbook” of strategies. So another way to read this book, is to first read through the sections that provide context and use the balance of the book as a resource to prepare your home for a post peak world.

If you decide on the *two book* approach, this is what I recommend. Start by reading the Introduction, Chapter 1, and the introductory sections of Chapters 4, 8, 9, 10, 11, and 12. This material will provide the context and help you understand the historical forces, policies, economic theory, and technical advances that gave form to our residential built environment. It will also make you aware of the fragile, uncertain, and interdependent systems that we innocently rely on for electricity, natural gas, and water.

Chapter 3 is somewhat technical and provides the reader with a understanding of basic energy transfer principles. Think of this chapter as providing technical context. The balance of the book can be used as a reference to provide you with real-world strategies for transforming your home into a model of energy efficiency. A good place to start that transformation is with Chapter 5.



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## Introduction

*The current state of our green, sustainable building “movement” may amount to nothing more than rearranging the deck chairs on the Titanic*

The Sustainable Home Blog

*“Once you sit down and draw a little picture of the economy as a subset of the larger ecosystem, then you're halfway home as far as ecological economics is concerned. That's why people resist doing that. That means you would have to say “well, there are limits, we're not going to be able to grow forever”. That means the economy must have some optimal scale relative to the larger system. That means you don't grow beyond the optimum.*

*How do we stop growing? What do we do?*

*These are very threatening questions.”*

Dr. Herman Daly, Former World Bank economist and author of  
*Ecological Economics*

## Fantasy Economics

I'm an architect and engineer by training, so when I began the improbable journey of writing this book, I had no idea that the story would begin with a discussion of economic theory. Yet when one asks the question of *what is sustainable or not sustainable* relative to housing you are very quickly tossed into the stormy seas of “growth” and “limits”, and the conflict between neo-classical and ecological economics.

When it comes to our mainstream economic theory, it seems that we are not much removed from our ancestors who thought the earth was flat or at the center of the universe. The neo-classical economics currently taught in all of our major universities dominates both our world view and governmental policy making. Developed in a time of abundant natural resources, it assumes that non-renewable natural resources are infinite and ignores the environmental costs of their production and consumption. It is an economic theory that worships at the church of growth and blindly disregards it's own existence within a closed ecosystem. Much like the 16<sup>th</sup> century Catholic church that believed that the earth was the center of the universe, neo-classical economics believes it is the tail that wags the ecosystem.

Herman Daly, the father of ecological economics, likens the current situation to a chain-letter swindle or ponzi scheme in which *“The current beneficiaries of the swindle, those at the beginning of the chain, try hard to keep up the illusion among those doubters at the end who are beginning to wonder if there are really sufficient resources in the world for the game to continue very much longer.”* This ponzi scheme would eventually play itself out in the U.S. housing sector in the form of energy guzzling McMansions, sub-prime loans, and mind numbing suburban sprawl.

## The American Church of Growth

The concept of growth in America would be permanently enshrined in our national psyche when Thomas Jefferson penned the words “*life, liberty, and the pursuit of happiness*” into our declaration of independence. As the country migrated west, growth and development would take on a patina of virtue and goodness and become the religion of the land. Our pursuit of happiness would not always be as pure as the words of Jefferson, and our migration west would be equal parts courage, individual initiative, greed, and genocide. As we moved west we would both take and rape, arrogantly taking land from the native population and casually raping the environment of its natural resources.

The discovery of oil and the invention of the automobile would eventually morph our cities and towns into massive developments comprised of weak centers surrounded by a web of suburban wasteland anchored by multi-lane highways as each generation tapped into our balance sheet of natural resources in a mad pursuit of growth and prosperity. The *happiness* we sought in the rapid growth and development of our built environment would not be defined by Jefferson's *liberty*, but by long commutes, road rage, pathological consumption, crushing debt, and a epidemic of obesity and dependancy on anti-depressants.

The impact of neo-classical economics on housing would and continues to be profound and pervasive. This ponzi scheme wrapped in a three piece suit of respectability would provide the hidden intellectual foundation for growing home sizes, sub-urban sprawl, and countless “cost benefit” studies that would shape the regulations that formed the basis of our inadequate energy codes. However we are now approaching an ecological tipping point and the current generation will find themselves the recipient of the scheme's inevitable collapse.

## Ecosystems self-correct with Unbiased Indifference

Ecosystems are naturally self-correcting and treat all populations that overreach with equal and unbiased indifference. It matters not whether the population is human, animal, plant, insect or microbe, any population that exceeds its natural carrying capacity is either forced to reduce its numbers or its level of consumption. The 2002 *Limits to Growth* report estimates that human “growth and development” has already exceeded the earth's carrying capacity by more than 20% and it is evident that the earth's ecosystem has already begun the process of adjustment and rebalancing. The economic theory and policy decisions that brought us to our current state will be quietly trumped by the natural processes that we have ignored.

The signs and warnings of this natural rebalancing are everywhere. Climate change, rapid species extinction, fisheries collapse, depleted aquifers, collapsing bee colonies, loss of arable land, \$100+/barrel oil, and monthly heating costs that equal mortgage payments are all evidence of natural limits in action. As the world's largest per-capita consumer of natural resources, the U.S. has become the *poster nation* for ecological overreach and collapse. As a result we currently face an especially painful and traumatic transition to a more sustainable future.

Finding a path to a steady-state and sustainable world economy that finds a balance within the earth's ecosystem is well beyond the scope of this book. My contribution will be infinitely more modest. This book merely attempts to outline the inevitable limits that will be imposed on our way of dwelling and offers survival strategies for the millions of homeowners that will be coping

with limited natural resources and with an uncertain and fragile water, sewage, and energy infrastructure.

Within the residential sector, a kind of quasi-sustainability can be attained by a combination of net zero energy remodeling strategies, conservation, and deploying renewable substitutes for non-renewable sources of heating and cooling. This book is meant to be a guide in that direction.



*“Future generations are always free to make themselves miserable or content with whatever we give them. We do not owe the future their happiness, but we do owe them an intact resource base.”*

Dr. Herman Daly

*“We don't inherit the Earth from our ancestors; we borrow it from our children.”*

Antoine de Saint-Exupery

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## Chapter 1 Dwelling in a Post PEAK World

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***“...our current path of “development” threatens our very survival.”***

*Continual postponement of a serious worldwide initiation of the renewable energy transition is a precarious gamble, potentially jeopardizing our ability to launch it at all as the clock to accomplish it in economically attractive ways winds down.*

International Solar Energy Society [ISES], White Paper, 2006

*Macroeconomic theory in our text books conveniently behaves as if the ecosystem does not exist all the while consuming products and services from the ecosystem which fuels economic growth.*

Mark Anielski, author of *The Economics of Happiness, Building Genuine Wealth*

The green building movement is already big business and we may have reached a tipping point in 2007, where more than 50% of the key decision makers in the world of building have reached the conclusion that the movement has legs and that a decades long bull market for all things green is an opportunity worth pursuing. What is the source of this apparent demand for these new green products and buildings? Is it global warming, rising energy costs, insurance claims from sick building syndrome, or the urge to “do good”. I think it's all of these reasons and more, but “going green” is still more fashion than necessity, and collectively, it has yet to enter our consciousness that there are limits to growth in a closed ecosystem and that our current path of “development” threatens our very survival.

That's all about to change. The ecosystem has been sending us warning signals (air and water pollution, species extinction, fisheries collapse, aquifer depletion, climate change, etc.) for decades, but because these signals didn't have a direct and immediate individual impact on the majority of the world's inhabitants, we have continued on a path of unsustainable global development modeled after the American standard of consumption. As we push up against the geological limits of peak oil, peak natural gas, peak coal, and peak uranium, the cheap energy that's been driving development since the beginning of the industrial revolution will no longer be either cheap or abundant and we will come face to face with our own unsustainable reality. No combination of known technologies will even come close to filling the gap left by these declining non-renewable energy sources and it will take decades for us to fully comprehend the natural limits to growth demanded of our ecosystem and transition to a steady-state and sustainable economy.

We are at a crossroads. One path leads to ecological overshoot and a sudden, uncontrollable, and catastrophic decline in food production, population, and industrial capacity. The second path leads to a condition of ecological and economic stability that is sustainable far into the

future. Among many other factors, this second path will require a dramatic increase in the efficiency with which materials and energy are used in our commercial and residential buildings.

As we enter this period of sustained crisis and begin the journey down the path of ecological stability, it will quickly become evident that the only reasonable standard for building design will be one of net zero energy consumption. Because we lack information, initially this will be part science and part intuition based on the passive heating and cooling lessons of the past. Eventually we will come to know the embodied energy of every building material and component and make many decisions based on the EROIE (energy return on investment of the energy embodied) of building products like insulation, low-e glazing, concrete, lumber, PV panels, and wind turbines. Houses will become smaller and change shape as energy trumps fashion and becomes the primary design factor. A whole new industry will emerge to help homeowners convert over 100-million thinly insulated, and poorly constructed homes into some semblance of energy efficiency. Pattern's of development and zoning laws will change as the age of the automobile comes to a close. Populations will shift and migrate as the end of cheap air-conditioning makes living in many parts of the country less desirable. Home landscaping will change from ornamental to edible, and grey water irrigation will become commonplace as the energy costs to move and purify water change our attitudes about this precious natural resource. Local materials will dominate construction and the age of imported italian granite countertops will have come to an end.

We might look back from the perspective of the next century and call this the Sustainable Society Revolution. A revolution wherein we deconstruct, modify, and replace much of what we thought and built during the industrial revolution. In a very real sense, this revolution has already started and we are just seeing the first signs. This book is just one of those initial signs.

We are in a race for our very survival and yet the vast majority of the earth's population have yet to hear the starting gun. However, there are three unavoidable reality checks coming our way that will enter our collective consciousness in a rush, put us into a state of prolonged crisis, and launch us headfirst into a new and uncharted future.



### **Three Unavoidable Reality Checks**

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*O you gods!  
Why do you make us love your goodly gifts,  
And snatch them straight away?*

William Shakespeare

*"People cannot stand too much reality"*

Carl Jung

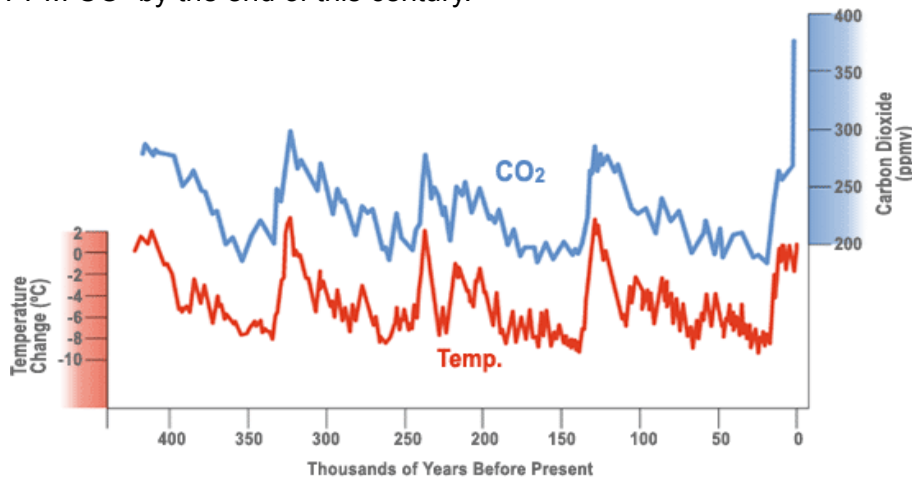
## Reality Check #1 - Global Warming

*"...buildings in the U.S. are the largest energy consuming and greenhouse gas emitting sector."*

Architecture 2030

Based on the United Nations 2004 Report on Climate Change, there is now very little doubt that human carbon emissions are dramatically changing the climate and that the effects will be devastating to millions of people around the world.

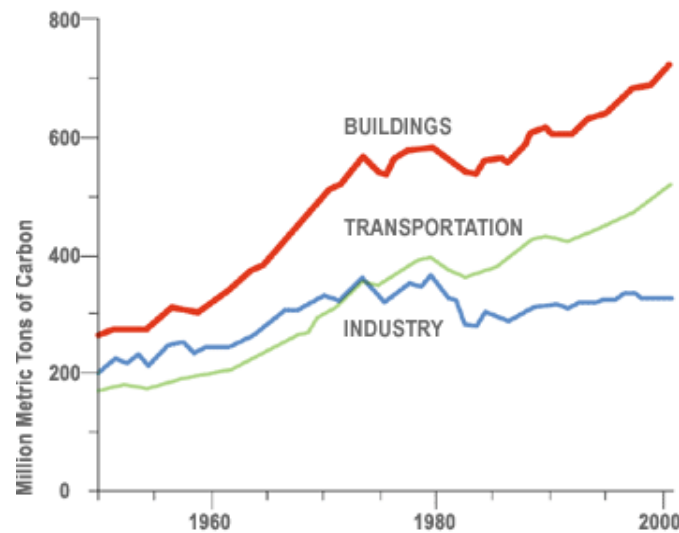
Perhaps the most compelling argument for a human cause to global warming is the carbon dioxide [CO<sup>2</sup>] record embedded in our polar ice packs. By taking core samples of ice and measuring gases trapped within the ice, scientists are able to chart CO<sup>2</sup> levels and average global temperatures going back 450,000 years. This data shows us that for hundreds of thousands of years, natural causes have caused fluctuations in global temperatures and CO<sup>2</sup> levels that are consistent with each of our known ice ages. What is both compelling and disturbing is that CO<sup>2</sup> levels for the last 450,000 years have never risen above 300 PPM (parts per million). However, in last few decades they have risen to 378 PPM, and some scientists believe that if the current rate of fossil fuel consumption continues, we could reach levels as high as 840 PPM CO<sup>2</sup> by the end of this century.



Source: NASA

But what about housing? What contribution do our homes contribute to this problem? As the following graph illustrates, *"combining the annual energy required to operate residential, commercial, and industrial buildings along with the embodied energy of building materials like carpet, tile, glass, and concrete exposes buildings as the largest energy consuming and greenhouse gas emitting sector"*<sup>1</sup>. With about 120 million housing units in the U.S., our homes are both a huge climate change problem and a huge opportunity.

<sup>1</sup> Architecture2030



### Home Size Trends Contribute to the Problem

*In 1946, the average house was 1100 SF, and housed 5 people*

*In 1996, the average house was 2200 SF, and housed 2.6 people*

*An increase of four times the area per person  
in 50 years!*

*In 2007, the average house size has grown to a super sized 2400 SF!*

Thanks in part to an “Inconvenient Truth” global warming has already penetrated our collective consciousness, and for the 20% of the population that is still in denial, it is already “too much reality”. American is responsible for about 25% of the world's green house gases [GHG] that contribute to global warming. Buildings in America account for about 42% of that total and according to the U.S. Energy Information Administration, our homes contribute about half of that total or 21% of this country's GHG emissions. But that's just part of the story, because of the sprawling suburban pattern of WHERE we build our homes, our automobile lifestyle compounds the problem. According to the Energy Information Agency, in 2001, 107.4 million households logged 2.3 trillion miles commuting, shopping, and schlepping the kids to school, consuming 113.1 billion gallons of gasoline and diesel fuel in the process.

The prospect of Global Warming alone should be enough to justify building to a zero energy standard and reconfiguring our pattern of suburban sprawl. Unfortunately, global warming is a slow moving, water torture kind of crisis that our policy makers can safely ignore until Disney World Orlando is an underwater attraction. The tipping point in our national consciousness and serious action from our policy makers will come first from the coming production peak and declining supply of our two primary non-renewable fossil fuels.

**Reality Check #2 - Peak Oil**



*The time when we could count on cheap oil... is clearly ending.*

David O'Reilly, Chairman, Chevron, 2005

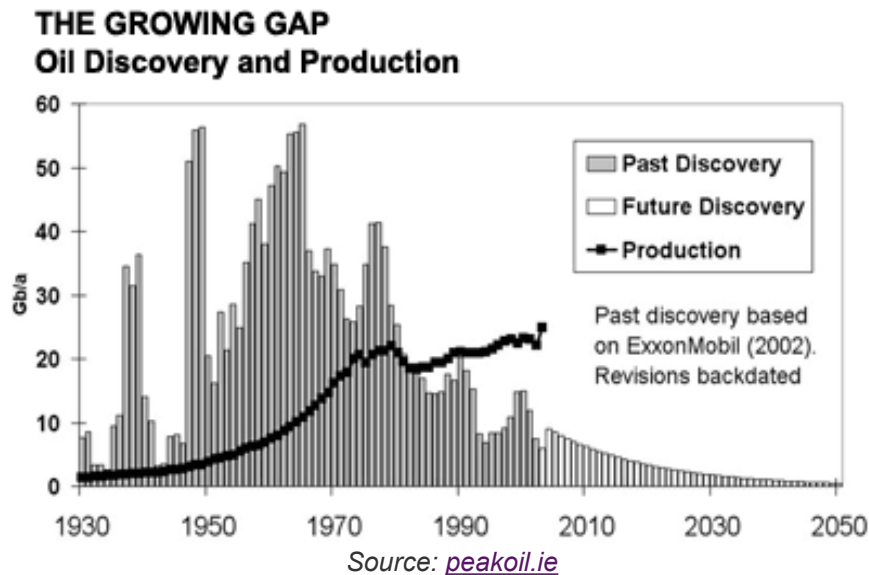
*The battle is over, the oil peakists have won. Current US energy policy and the administration's oil strategy in Iraq and Iran are deluded.*

James Schlesinger, former US Defense Secretary and CIA Director, 2007

*The oil boom is over and will not return. All of us must get used to a different lifestyle.*

King Abdullah of Saudi Arabia, 2007

Unlike Global Warming, Peak Oil has yet to enter our collective consciousness, in fact most people don't even know what it means. Peak Oil is the year when the peak of the world's (crude oil) production rate is reached. After this date, the rate of production will enter a long, painful and terminal decline. Peak oil in the United States was reached in 1970 and in North America in 1985. At present, there is a growing consensus that global Peak Oil has either already occurred (as early as 2006) or will happen sometime between now and 2010. Does that mean that production will fall off a cliff and there won't be any oil? No, but it does mean that demand will very shortly exceed supply and that there will be shortages, rationing, and major U.S. and global economic upheaval combined with a cascading array of painful changes to our "cheap and plentiful oil" lifestyles.



*It's no secret anymore that for every **nine** barrels of oil we consume, we are only discovering **one**.*

*The British Petroleum Statistical Review of World Energy, 2006*

*...we don't have to run out of oil to start having severe problems with industrial civilization and its dependent systems. We only have to slip over the all-time production peak and begin a slide down the arc of steady depletion."*

*Howard Kunster, The Long Emergency, 2005*

*Such a peak would require sharp reductions in oil consumption, and the competition for increasingly scarce energy would drive up prices, possibly to unprecedented levels, causing severe economic damage. While these consequences would be felt globally, the United States, as the largest consumer of oil and one of the nations most heavily dependent on oil for transportation, may be especially vulnerable.*

*GAO Report on Peak Oil, 2007*

*The U.S. food system consumes **ten times more energy** than it produces in food energy. This disparity is made possible by nonrenewable fossil fuel stocks.*

*Dale Allen Pfeiffer, Eating Fossil Fuels, 2003*

*Waiting until world oil production peaks before taking a crash program action would leave the world with a significant liquid fuel deficit for more than two decades.*

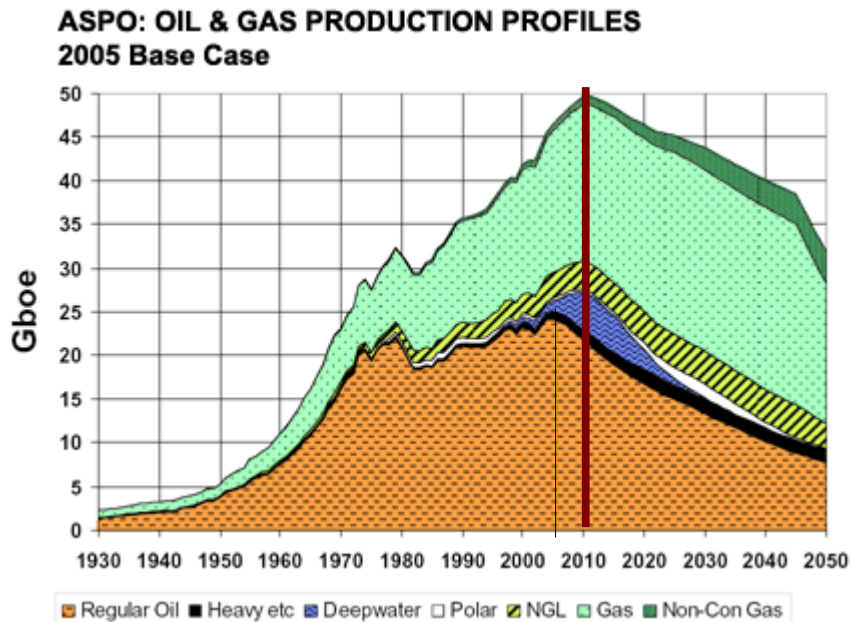
*U.S. Department of Energy, "Hirsch Report", 2005*

Oil production is in decline [past Peak] in 33 of the 48 largest oil producing countries

Chevron, 2005

The major oil-producing nations [OPEC] are inflating their oil reserves by as much as 300 billion barrels. These amount to hypothetical reserves that are 'not delineated, not accessible and not available for production.'

Sadad I. Al-Husseini, former executive at Aramco, Saudi Arabia's national oil company



Source: [peakoil.ie](http://peakoil.ie)

Based on research (see chart above) by the Association for the Study of Peak Oil (ASPO), the production of oil from conventional sources (*Regular Oil* in the above chart) peaked sometime in 2005 and production from all sources (deepwater, oil sands, arctic, etc.) will peak sometime around 2010<sup>2</sup>.

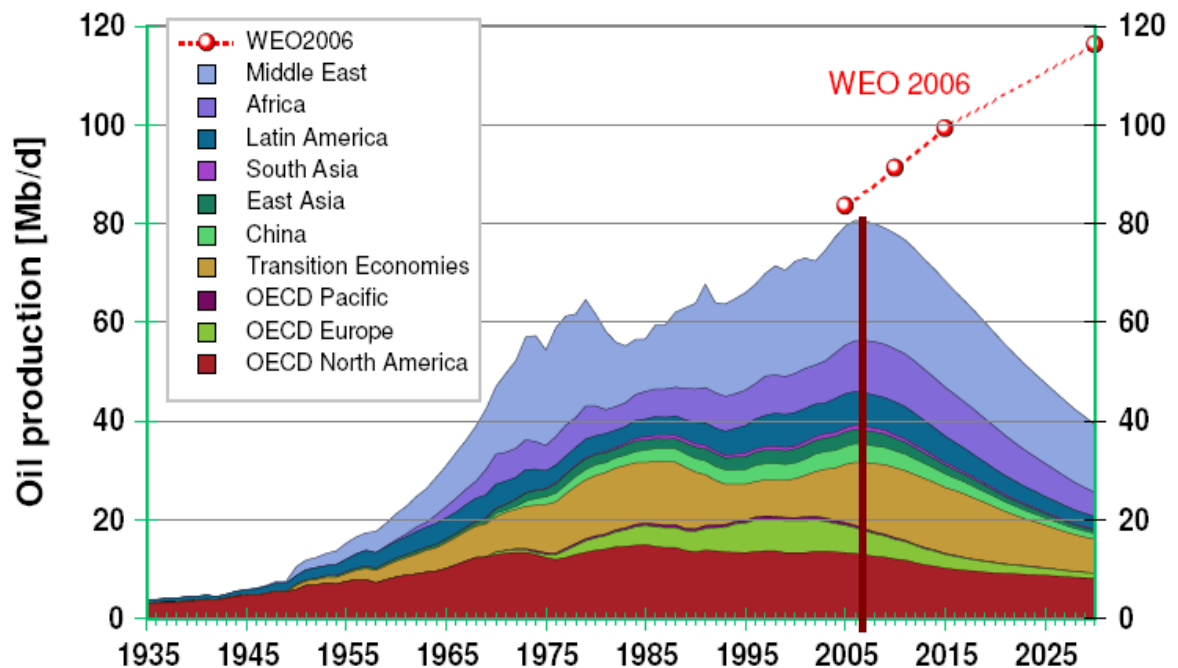
The most optimistic projection by Cambridge Energy Research Associates (CERA) takes the very dubious reported reserves of OPEC at face value and places the Peak Oil event around 2030. A February 2007 Peak Oil report funded by the U.S. Department of Energy provides the following catalog of predictions by professionals in the field:

2005	T. Boone Pickens, Oil & Gas Investor
2005	Dr. K. Deffeyes, retired Princeton professor & Shell Oil geologist
At Hand	E.T. Westervelt, U.S. Army Corps of Engineers, R&D Center

<sup>2</sup> This prediction of a 2010 peak was revised back to 2007 in early 2008

Now	S. Bakhtiari, Iranian National Oil Company
Close or past	R. Herrera, retired BP geologist
Very soon	Henry Groppe, Oil & Gas expert and businessman
by 2010	Stephan Wrobel, Investment Fund Manager
2010	Dr. Roger Bentley, University of Reading, U.K., formerly of Exxon
2010	Dr. Colin Campbell, retired Texaco, Amoco geologist
2010 +/- 1 yr	Chris Skrebowski, Editor of Petroleum Review

A more recent 2007 report by the Energy Watch Group in Germany states that “world oil production has already peaked [in 2006] and that production levels will fall by half as soon as 2030”.



Source: Energy Watch Group, 2007

*"Our view is that oil production will peak in the near future. We need to develop power train(s) for alternative energy sources," to "move beyond petroleum."*

*Katsuaki Watanabe, President of Toyota, June 2008*

Since only about 10% of our housing stock is heated directly by oil or propane (a derivative or byproduct of the oil refining process), the initial impact of Peak Oil on our residential lifestyles will be on our one car, one person commutes, and in a dramatic slowing of suburban sprawl.

As the “peak” becomes evident and higher prices and shortages are experienced, we can expect:

- A major increase in walking, bicycling, carpooling, telecommuting, the use of public transportation and the beginning of the end to suburban sprawl and strip malls
- Renewable energy applications and energy conservation measures to accelerate dramatically marking the beginning of a decades long bull market for companies that provide those goods and services
- Globalization to morph into *localization* as 10,000 mile supply lines become less and less economic
- Some people and governments to behave badly
- “Victory gardens” in the front and back yards of suburbia
- 10 to 30 years of energy and food shortages resulting in global political and social unrest while we make the painful transition to a new steady-state economic, energy, and political order

Unlike Global Warming, Peak Oil will be an “in your face” crisis, and impossible to ignore or deny. It will also mark the beginning of a painful path to what will hopefully lead us to a healthier, sustainable future.



### **Reality Check #3 - Peak Natural Gas**



*“It seems obvious to most viewers the future [U.S. natural gas] production will decline in a cliff in the near future...”*

Jean Laherrere, ASPO Berlin, 2004

*“Conventional, easy-to-get natural gas in the U.S. has already peaked and natural gas from all sources will peak in North America around 2010 and globally between 2030 and 2035.”*

Dr. Michael Smith, Energy Files Ltd., 2004

*“...the underlying problem of falling U.S. natural gas production is similar to the [problem of the] 1970's when oil production was on the decline regardless of the number of rigs drilling.”*

Raymond James Consulting

*“North America is moving to a period in its history in which it will no longer be self-reliant in meeting its growing natural gas needs; production from traditional U.S. and Canadian basins has plateaued.*

*Traditional North American producing areas will provide 75% of long-term U.S. gas needs, but will be unable to meet projected demand”*

National Petroleum Council, September 2003

*“The U.S. is in the midst of a historic transition from dependence on North American natural gas supplies to one of dependence on megaproject [arctic pipeline] investments and global [LNG] markets. The one certainty in this new environment is that the era of inexpensive natural gas in the United States is coming to a close.”*

Center for Energy Efficiency and Renewable Technologies - 2003

As if Peak Oil were not enough “reality”, we also have to get our heads around Peak Natural Gas. When oil production in the lower 48 peaked and OPEC was formed in 1970's, we rapidly became a net importer of oil and no longer enjoyed energy security relative to oil. However, the energy supply panic of the 1970's did not include natural gas and up until now we've enjoyed relatively low gas prices, coupled with a false sense of security. That is all about to change and history is about to repeat with gas rather than oil as the chief protagonist.

Unfortunately, natural gas is a different animal from oil. Oil is a nice viscous, not very volatile liquid that can be easily shipped around the world and processed locally into to gas, diesel, plastics, and other products. Natural gas however is not very portable in a global sense. In order for us to import natural gas from the Middle East for example, it must be refrigerated to minus 260 degrees Fahrenheit to convert it to Liquid Natural Gas (LNG) and shipped in very expensive container ships. Because the global and North American LNG infrastructure (ships and docking facilities) is relatively undeveloped, the impact of Peak Natural Gas is currently confined and defined locally by our North American network of pipelines.

As we approach peak gas in America we are in a race to buy time. Domestic production has peaked and we rely on a declining supply for 20% of our natural gas needs. We are betting natural gas supply future on imports from the highly competitive Liquid Natural Gas (LNG) global market and a gas pipeline to the arctic. Both of these options will require a significant amount of time and tens of billions of dollars in capital investment.

The best case is that we will complete these investments in time to buy a short reprieve. This reprieve will come at the cost of much higher prices, as we rapidly become a global gas importer and compete and bid against Europe and Asia for OPEC and Russian natural gas supplies. In the process of competing on the global market, we will lose any semblance of energy security relative to gas and only buy time as we approach the global peak of natural gas supply sometime around 2030. The more likely and worst case is that we will NOT complete the necessary investments in time, resulting in shortages, power outages, huge price increases, and an abrupt loss of energy security. Our inconvenient “reality” is that we may be facing shortages by the end of this decade or sooner.

*Counting on Canadian imports to quell rising gas prices is a non-starter ... production is now falling at 3%/year and export capacity will fall to zero within the next two decades.*

David Hughes, Canadian geologist, testimony before the Colorado Public Utilities Commission, July 2008

*A few years ago people looked at LNG as a solution to North America’s gas needs. But today we see that there is less LNG around than people expected, and there is more competition for that LNG from markets that are willing to pay more than the United States.*

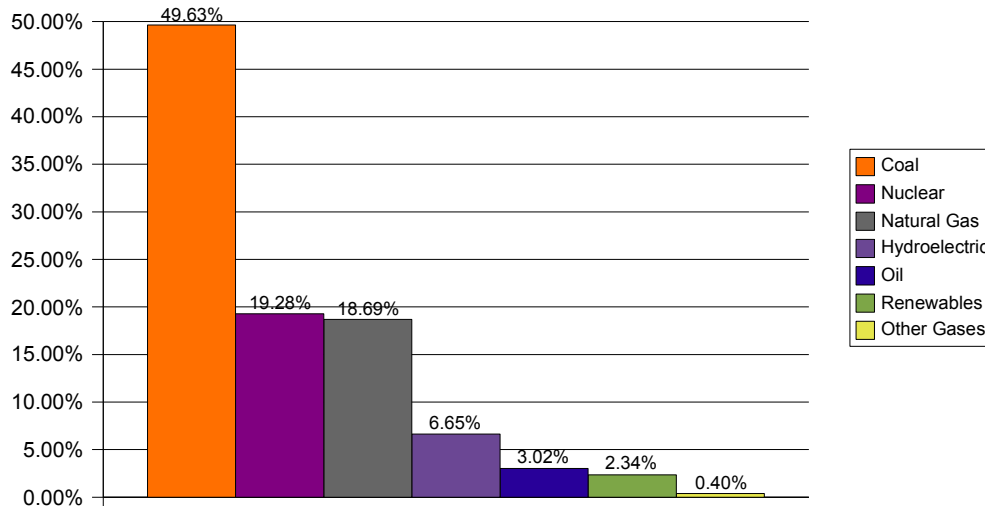
Nikos Tsafos, analyst with PFC Energy



## How will Peak Oil and Natural Gas Effect the Energy Flow to Our Homes?

So how bad is this new Peak Oil and Gas energy reality? How does energy flow into our homes? Let's first take a look at electrical generation in the U.S. Unfortunately, just about every power plant built after 1980 was designed to run on natural gas, so we've spent the past 25 years adding to the problem.

Electrical Generation by Energy Source

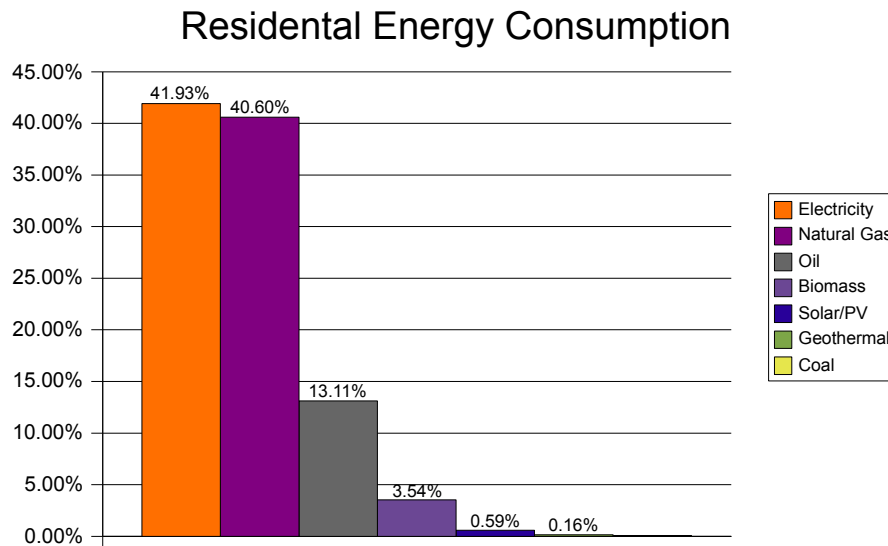


Source: U.S. Energy Information Agency 2005

The good news is that thanks to venerable coal, Peak Oil and Peak Natural Gas only impact about 22% of our current electrical generating capacity. The bad news is that that shortfall is more than enough to cause brownouts, blackouts, and rationing, especially during the summer when air conditioning loads add considerable “peak” demand. If you're thinking coal will save us, according to the Energy Watch Group, world wide coal production is scheduled to peak around 2025, and that “Peak Coal” date will probably move forward as we convert coal to a synthetic diesel fuel [coal to liquid] in an attempt to make up for fuel shortages caused by peak oil.

As we painfully replace a 20% plus shortfall over the coming two decades, expect phenomenal growth in coal, solar, wind, and geothermal power plants. Nuclear growth however will be minimal due to the decommissioning of older plants and the occurrence of Peak Uranium around 2025.

The following chart shows the relative residential energy consumption by energy source. Since over 55% of total homes and some 70% of new homes are heated by natural gas, and many of these homes also use natural gas for hot water heating and cooking, shortages caused by Peak Natural Gas are going to be especially painful.



Source: U.S. Energy Information Agency 2006



## Navigating Our Way to a more Sustainable Future

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Most of us are blissfully unaware of the fragile inter-dependent systems that support our housing infrastructure. We take for granted the flip of a light switch, the turning of a faucet, the casual flush of a toilet, and the comforting roar of a basement gas furnace. However, all of that convenience depends on hundreds of thousands of miles of aging gas, water, and sewer pipelines inter-connected to a fragile and undercapitalized national electrical grid fed by fossil fuels that are approaching a point of peak supply and declining production.

Given this new energy reality, homes built to our current energy code or even to an Energy Star or <sup>3</sup> for homes standard, our efforts at energy efficiency amount to nothing more than rearranging the deck chairs on the Titanic. The slow moving energy train wreck we face demands that we build and retrofit homes to a <sup>4</sup>.

This book is devoted to helping homeowner's prepare for the coming crisis of a post peak

<sup>3</sup> Leadership in Energy and Environmental Design [LEED] is a green building standard for commercial and residential buildings developed by the U.S. Green Building Council

<sup>4</sup> Zero energy homes are homes that are sufficiently energy efficient to be completely powered on-site by wind, solar, hydro or geothermal energy sources.

world by providing the necessary knowledge and survival strategies to render their homes as energy self-sufficient, secure, and independent as possible.



*We've invented the system that has given us this rise in life; now we begin the descent. We'll either have to invent our way out of it, or go back to the way it was before.*

Byron King, Agora Financial Symposium, Vancouver BC, 2007

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## Chapter 2 Home Energy Losses and Primary Uses

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*Understanding your Home's Energy Baseline*

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## **Chapter 3 The *Energy Dance with the External Environment***

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*Heat Transfer 101 and the Role of the “Envelope”*

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## Chapter 4 Rethinking the American Home

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### ***We may drive a Prius, but we live in a Hummer***

*Human use of many essential resources and generation of many kinds of pollutants have already surpassed rates that are physically sustainable. Without significant reductions in material and energy flows, there will be in the coming decades an uncontrolled decline in per capita food output, energy use, and industrial production.*

*This decline is not inevitable. To avoid it two changes are necessary.*

*The first is a comprehensive revision of policies and practices that perpetuate growth in material consumption and in population.*

*The second is a **rapid, drastic increase in the efficiency** with which materials and energy are used.*

*Donella Meadows, Dancing Toward the Future, 1992*

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## Chapter 5 Plugging the Leaks

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### ***Avoiding an Energy Loss “Death by a Thousand Cuts”***

*Air leaks in new homes account for about 1/3 of heating and cooling costs and in older homes, leaks can often account for more than half of heating and cooling costs.*

The Sustainable Home Blog

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## Chapter 6 Windows and Doors

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### ***The need for a new paradigm - creating an “off switch” for windows***

*Approximately 1/3 of the heat loss or gain in a home today is through the windows.*

LEED for Homes – Pilot Rating System

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## Chapter 7 Heating and Cooling

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### *Preparing for the coming Chill*

*The inventions of central heating and air conditioning coupled with cheap and apparently abundant fossil fuels would free building designers from considering the external environment and allow them to use brute force heating and cooling solutions to overcome building designs totally inadequate for their local climates.*

The Sustainable Home Blog, 2007

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## Chapter 8 Catching Up with Slovenia

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### ***Why the U.S. Ranks 28<sup>th</sup> in the World and How to Buy a Solar Hot Water Heater***

*In fact, the consensus is that there are no major technical barriers to the widespread application of solar energy to meet U.S. energy needs.*

Charles Mosher, Ohio Congressman, 1974

*Solar water heaters are one of the most commercialized renewable energy technologies in the world and yet on a per capita basis, U.S. implementation ranks 28<sup>th</sup> in the world behind relatively undeveloped countries like Albania and Slovenia.*

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## Chapter 9 The Fragile Magic of Electricity

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### ***Our fragile national grid, and how coal, natural gas, and uranium power our homes electrical needs***

*“Every power plant generates electromagnetic waves. From there they follow countless miles of high-voltage wave guides (commonly called “wires” or “lines”) at near the speed of light to numerous customer loads: heaters, motors, telephones, lights, antennas, radios, televisions, fiber-optic systems, the Internet, etc. We constantly “swim” through this sea of electromagnetic energy just as fishes swim through water. And, like water to fishes, this ethereal energy is vital to modern civilization.”*

Richard C. Duncan, *The Social Contract*, 2006

*“Whatever the statistics may finally show, it is probably the scenes on TV....thousands of New Yorkers walking home across bridges....five-star restaurants throwing out food....families in Cleveland and Detroit lining up for bottled water.... that best convey the blackout’s impact.”*

Media Commentary on August 2003 Northeast Blackout



Coal Fired Power Plant

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## Chapter 10 The Battle for Grid Independence

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### ***Achieving Grid Access & Energy Freedom***

*Solar [PV] is slowly going to begin to unwind the existing utility economics, to the point where utilities decide they have to get in or they risk losing their core business – exactly [like] the [PC and telcom] transformations we've lived through in the last 20 years.*

Travis Bradford, 2008, author of *Solar Revolution*

*The speed with which the solar electricity sector is increasing its market share in those economies that have committed themselves to promote this clean power source, coupled with the transformation of its customers from power recipients to power generators, represents a revolution comparable to that in the telecommunications market over the past decade.*

European Photovoltaic Industry Association

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## Chapter 11 The Gift of Water

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***Both the developed world and third world face the same hard limits***

*When the well is dry, we know the worth of water.*

Ben Franklin

*When I was taught economics, I was told that air and water were free goods. It is intuitively obvious to me [now] that on a planet of 6 or 7 billion people, that [is] no longer the case.*

Richard Sandor, founder of the Chicago Climate Exchange

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## An Epilogue of Hope

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*It has often been said that, if the human species fails to make a go of it here on the Earth, some other species will take over the running. In the sense of developing intelligence this is not correct. We have or soon will have, exhausted the necessary physical prerequisites so far as this planet is concerned. With coal gone, oil gone, high-grade metallic ores gone, no species however competent can make the long climb from primitive conditions to high-level technology.*

*This is a one-shot affair. If we fail, this planetary system fails so far as intelligence is concerned. The same will be true of other planetary systems.*

***On each of them there will be one chance, and one chance only.***

Sir Frederic Hoyle, British Astronomer, 1964

This is not the book I set out to write.

When I began this journey, I thought I would be writing a “handbook” on sustainable home design. A book about energy efficiency, indoor air quality, water conservation, and “green” material choices. I was well down that original path when I began to question the current course of the green building movement. It began with a few innocent questions. “What is the precise definition of *sustainable*?” “What level of energy efficiency in a home design meets this precise definition?” “How well do our current energy codes, Energy Star and the LEED guidelines meet that challenge?”

These questions would launch me in a new and unexpected direction.

I would discover The Club of Rome and their work with MIT on the Limits to Growth. Their initial 1972 findings, updated in 2002 would confirm that our current path of development had put us in very real danger of “overshoot and catastrophic collapse.” I would read the 1987 U.N. Brundtland commission's report on sustainable development and *Our Common Future* and understand that there were limits to our planet's carrying capacity, and that we were rapidly pushing up against or exceeding those limits. I would find Dr. Albert Bartlett's *Reflections on Sustainability, Population Growth and the Environment* and understand that even modest rates of growth over time become exponential and hopelessly unsustainable in a closed ecosystem with finite natural resources. I would learn from Dr. Bartlett that, “*Smart growth is an oxymoron.*” I would find the pioneering work of green economist Dr. Herman Daly, and discover that the neo-classical economics that guides policy and energy decisions around the world today is based on the fantasy that natural resources are free and infinite, and that the economic status quo is nothing more than an ecological ponzi scheme. I would read the work and findings of Dr. Colin Campbell and the Energy Watch Group and come to the depressing realization that the peak production and resulting decline in the supply of oil, natural gas, uranium, and coal would all happen prior to 2030.

This new knowledge was like a death, and I would find myself, like many before me, experiencing the five stages of grief. The first two stages were denial and anger, and I began looking for counter arguments that would refute these “doom-sayers”. I would only find more evidence to support their findings. The third stage was bargaining and I would contemplate ways my family and I could personally avoid the coming crisis. I would conclude that there is no place to hide, no safe haven from the future we face. The fourth stage was depression. I wept for my loved ones, especially my children and grandchildren whose lives would be so different and who would bear the greatest burden of this coming age. The final stage was acceptance. I would conclude that however difficult the next two or three decades, that we had options and works like *Winning the Oil End Game*, *The Solar Revolution*, and *the Oil Depletion Protocol* provide technical and policy strategies that point the way to a more hopeful future.

Finally I would conclude that we are left with the choice of only two future paths of development.

The “business as usual” path will lead us to tragically overshoot the earth's carrying capacity, resulting in economic collapse, and a dramatic reduction in the earth's population as we return to a pre-industrial revolution standard of living. The second path is this planet's “*last and only chance*” to wisely use our remaining fossil fuel resources to build a sustainable and renewable energy foundation for a new steady-state world economy. An economy and society with a stable population that falls within the limits of our planet's carrying capacity. I fear that the greater probability lies with the first path, but know we have both the knowledge and means to forge the second.

May we all find the “second way” and walk the path to a sustainable future.

John Van Doren - June 2008



*When most of us are presented with the ultimata of potential disaster, when we hear that we "must" choose some form of planned stability, when we face the "necessity" of a designed sustainable state, we are being bereaved, whether or not we fully realize it.*

*When cast upon our own resources in this way we feel, we intuit, a kind of cosmic loneliness that we could not have foreseen. We become orphans. We no longer see ourselves as children of a cosmic order or the beneficiaries of the historical process.*

*Limits to growth denies all that. It tells us, perhaps for the first time in our experience, that the only plan must be our own. With one stroke it strips us of the assurance offered by past forms of Providence and progress, and with another it thrusts into our reluctant hands the responsibility for the future.*

Vargish, 1980, Reflections on student reactions to the limits to growth

## About the Author

John Van Doren is an architect and engineer by training and practiced architecture in California during the early energy crisis days of the 1970's. In the early 1980's he made a career change and spent over two decades leading turnarounds and startups in the manufacturing sector. Burned-out and discouraged by the outsourcing and downsizing of corporate America, he returned to architecture and began writing a handbook on sustainable home design. In the process of writing that "handbook" he began to question the direction of the "green building movement" and determined that there was a vast difference between what we accepted as "green" and what was truly sustainable. He would eventually conclude that the imminent peaking and global decline in production of oil, natural gas, coal, and uranium would render much of what we do in "green building" is nothing more than rearranging the deck chairs on the Titanic.

From the ashes of his original handbook, *Chill in the Living Room* would be born. This book explores the historical forces, policies, economic theory, and technical advances that gave form to our residential built environment. It describes the fragile, uncertain, and dependent systems that homeowner's innocently rely on for electricity, natural gas, and water. In the end, it gives homeowners practical real-world strategies for converting their homes into some semblance of energy efficiency in preparation for a painful *post peak* transition to a more sustainable future.

John also authors the [Sustainable Home Blog](#) and designs energy efficient homes. He lives with his wife Debi, his dog Buddy, and two horses at 9,000 feet in the Colorado Rocky Mountains.



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## Sustainable Building Design

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### Advance praise for *CHILL in the Living Room* and the Author's work

*The time has come for our views to be acted upon. Your book and mine come at a very important point in history when we have the economic capacity and spare resources to dramatically improve our lives. I fear we will waste the opportunity and continue with the blinkered focus on narrowly defined economic outcomes. We need to bring the same level of rigor to protection of the environment and social provision. Your book and mine show how.*

Peter McManners, author of *Adapt and Thrive: The Sustainable Revolution*

*The growth culture of which you eloquently speak, rooted in the dominant social paradigm, is culturally transmitted and protected. Schnaiberg's "treadmill of production" clearly captures the interconnectedness of all to all within this system. Our vested interests stem from this paradigm and they are hard to extricate ourselves from.*

Chris R.

*My God....."the penny has dropped", ( a quote my grandmother used ... I understood it to mean...-now it's clear and evident- ?!?! ) I'm buying another home in Edmonton, Canada. I'll follow your lead on this very informative insight. I KNEW there had to be a different way!! This life around us has the undertones of the movie Matrix.....like we're living in a world of smoke and mirror's and wouldn't even know it!!*

Allan M.

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*Chill in the Living Room* explores the historical forces, policies, economic theory, and technical advances that gave form to our residential built environment. It describes the fragile, uncertain, and dependent systems that homeowner's innocently rely on for electricity, natural gas, and water. In the end, it gives homeowners practical real-world strategies for converting their homes into some semblance of energy efficiency in preparation for a painful "post peak" transition to a more sustainable future.

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