AMERICAN ENERGY INDEPENDENCE

A POLICY REVIEW: 1973-2012

By Richard Bornemann

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Achieving American Energy Independence Through the Development of Energy Dense Fuels

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INTRODUCTION

The 2012 Presidential campaign brought to life a phrase that most Americans probably hadn't heard or taken seriously since the 1970s: energy independence. In proposing that we achieve "North American Energy Independence" by 2020, Governor Mitt Romney put forward what was probably the most serious, specific and production-based energy plan that we've seen since the 1980 election. That's when candidate Ronald Reagan rejected "sharing scarcity" as a solution to any energy or economic problem.

Romney went well beyond the usual "let-the-free-market-decide" bromides, and actually targeted the laws, regulations, policies, and agencies that have suppressed and distorted US energy markets since the 1970s.

Naturally, academicians and media critics sneered. They pointed out that the last time that the US itself was physically energy independent – in terms of zero net oil imports – was around 1950. True enough, but that misses the point. Energy independence need not mean zero net imports – we could get *that* by placing high import tariffs on petroleum products, or, at the greatest extreme, by simple banning them. Of course, either path would be ruinous – and completely unnecessary to achieving the sort of independence that gets the US economy going where it needs to go.

What can and should be achieved is independence from any actor's ability to "weaponize" oil to push ideological or foreign policy aims, or to sustain anybody's cartelized pricing power. The goal is to enjoy supply that is secure and stable, *and* at long-term prices that are *pounded* significantly and *predictably* lower through new US production technologies and policies.

Critics disagreed here too, claiming that OPEC members, in a global pricing market, would match US production increases by their own production cuts, to hold prices high. That claim ignores problems in those countries, especially the vast social welfare and subsidy obligations that most single-resource oil states have assumed in order to keep social peace with restive populations. Those countries need to widely spread lots of money and benefits to deflate opposition.

The US is experiencing a *confined* oil and gas production revolution – on non-federal lands. New technology is doing its part, and it's improving all the time. It's the *policy* part of the picture on vast federal lands (both on and off-shore) that some administrations and Congressional majorities have turned into incoherent and destructive messes – going back to the 1970s. If all the "spigots" were opened for all real energy-dense fuels – liquid and gas hydrocarbons, coal, and advanced nuclear technologies – then we could enjoy what we had not long ago, and build the energy basis for some wonderful and broadly uplifting waves of economic growth.

America's Golden Age: What It Meant

Cheap and secure energy built America, and not during some imagined pre-industrial idyll. The country's single-greatest period of expanding wealth and living standards happened during 1945-1973. This was America's "golden age," and it was buttressed by a supply of cheap and (deceptively) secure oil.

Indeed, oil was so abundant and cheap in the post-war period that the US did not become a net importer, as noted, until after 1950 – five years after we'd won World War II with zero net imports. Imports grew rapidly enough in the decade after that to persuade the security-minded Eisenhower administration to impose the 1959 Mandatory Oil Import Program (rescinded in 1973), even though net imports had reached only 16 percent of US consumption. Ironically, it was the energy security impetus of Eisenhower's program that spurred the 1960 formation of the OPEC cartel – an always waxing and waning threat to energy security, that's loomed over every American's life since 1973.

During the golden age, average real GDP growth was around 4 percent annually; productivity zoomed at an average annual rate of about 3 percent, and real wages (starting in 1947) ballooned some 81 percent over the entire period. It's hard to imagine now how transformative it all was for people who lived through it; whole libraries could be filled with one perspective or another on how it was created, or what it brought us.

Cynics saw a deadening ennui in suburban life. Novelist John Updike wrote his early *Rabbit* novels about a conflicted striver of the time, and, more recently, we saw the depressing movie reunion of Leonardo DiCaprio & Kate Winslet in "Revolutionary Road." Their film told us that middle class arrival turned people into alienated suburbanites, and denied their inner needs to study art in Paris.

Optimists recognized the strides in medicine, agriculture, communications, materials, transportation, energy, electronics, and knowledge dissemination, and the general efficiencies that made resource conservation possible in the first place – fewer acres and less water into more wheat, corn and beans; fewer trees into more lumber; less iron ore and energy into more steel, etc.

What cannot be denied is that America's energy-powered golden age was a revolution that nearly perfected the twin phenomena of wealth creation: labor *savings* advances across the board, and enough general growth and real income expansion to sustain more-than-commensurate labor *creation* opportunities across the board.

Our golden age saw the birth of leisure as an actual "industry," and an economic freedom that allowed ever-greater numbers of Americans to actually consider "enjoyment," "challenge," and "fulfillment" as criteria in life and work decisions. Choices that are almost universally taken for granted today were, in relatively recent times, reserved for elite pockets along the Washington-Boston corridor, and around places like Willamette and Grosse Pointe.

Nowhere else in all of human history – over thousands of years – had this ever been possible before. And, it was the entrepreneurial discovery and *deployment* of reliably cheap energy that sustained most of it by powering the economic growth that provided the most people ever with the economic freedom to try to stake out their own lives.

The challenge, after 40 almost-wasted years, is to finally restore an economic energy base for expanding America's *physical* economy and its capacity to raise real wages across all income classes. Energy is an issue that allows every politician to attach authenticity – as distinct from redistributionism – to his or her professed concerns about people who've been "left behind."

The 1970s - I

Even before OPEC's October 1973 embargo, there were rumblings of trouble. US inflation had accelerated as a bipartisan and international problem.

The Johnson Administration spent at home for the "Great Society" and the "War on Poverty." Dozens of programs were launched – including Medicare and Medicaid – while spending for foreign affairs, including the Vietnam War, also shot up significantly. We had what economists called the days of "Guns and Butter."

The Nixon Administration made inflation worse in three major ways. First, it imposed wage and price controls in August 1971. Secondly, it infuriated our international trading partners, especially foreign oil suppliers, by repudiating, also in 1971, the post-war Bretton Woods agreement that had loosely pegged the dollar to gold, and most (noncommunist) currencies to the dollar. The US "closed the gold window" in 1971, and allowed the dollar to depreciate.

Third, the Nixon Administration – looking ahead to its 1972 re-election campaign – convinced the Federal Reserve to "juice" the economy with new money (the "Quantitative Easing" of its day). The result was even more inflation.[1]

This was tough for everybody, including foreign oil producers. They were paid in depreciating dollars, which caused their having to pay higher prices for all types of imported foodstuffs, manufactured goods, and even "downstream" petroleum products, like gasoline and kerosene.[2]

In that light, the 1973 oil embargo might have been as much a rational trade maneuver, as it was a reaction to US foreign policy. Persian Gulf producers certainly benefited from recovering much of the purchasing power of their dollars from vastly higher oil prices.

But that didn't help the rest of us. We saw oil prices quadruple from around $3.00 a barrel to $12.00. Manufacturing was crippled; inflation soared; productivity and wage growth collapsed; and the stock market (1974-1975) had its worst year since the Great Depression.

Our creeping dependence on foreign oil had taken us from zero net imports in 1950, to around 35 percent by the end of 1973, when we consumed a total of 17 million barrels a day. The November 19, 1973 cover of *Newsweek* hollered, "Running Out of Everything!"

The 1970s - II

Then, Americans got a double punch. This time it was the 1979 Islamist revolution in Iran, and the start of the 1980-1988 Iran-Iraq War. World oil prices more than doubled immediately, from about $12.00 a barrel to

$28.00. The days of triple-digit gasoline prices had arrived, and they've never gone away.

Looking back at the 1970s, it seems almost quaint to recall net dependency levels of 16 or even 35 percent. Numbers like those today would allow us to claim great progress – maybe even effective "independence."

Through the presidencies of Nixon, Ford, and Carter (for whom energy independence was "the moral equivalent of war"), and extending through the administrations of Reagan, George H.W. Bush, Clinton, and George W. Bush – US foreign oil dependency intensified. We got rid of some truly bad anti-production policies and market distortions, but we also got some new ones that still persist.

Today's Department of Interior (DOI) and Environmental Protection Agency (EPA) are in classes by themselves when it comes to anti-growth energy policies. With some notable exceptions of late, e.g., nuclear energy, the last few years have seen a relentlessly intense campaign to block and burden truly economic energy sources, in order to artificially polish the comparative economics of inherently flawed and expensive Green technologies.

Still The 1970s

Net oil imports peaked at just over 60 percent of US consumption in 2005, and dropped to 45 percent (of average daily consumption of 18.8 million barrels a day) in 2011. The on-going recession and high oil prices have dampened demand, while domestic production – *on non-federal lands* – has exploded through new technology (more below). The interesting thing is the press attention that was accorded the 45 percent number from last year; one would think it a great national achievement, because it was lower than the peak dependency figure from 2005.

It's still 10 percentage points higher than it was during our national convulsion of 1973-74.[3]

But that it looks like great progress shows that the mindset of the 1970s still frames the energy policy debate for most Americans. And, today's mainstream media marches in near-daily lock step, with large swaths of academia and other grant and subsidy-seekers, to convince us that planetary "sustainability" relies on our using benign and "soft" paths to a low-energy economy. Utopia is denied us only because of "Big Oil" and "Big" everybody else, people who are protected by their "shadowy friends" in Congress. Yesterday's big conspirator was Halliburton (a services supplier that makes its money when its customers actually explore and drill). Today's dark evil is Wichita-based Koch Industries, which dares to fund conservative causes, while it produces everything from plywood to fertilizers.

Falling Short

It's actually easy to sympathize with some arguments against drives for energy independence. After all, every sort of boondoggle, mandate, bureaucracy and subsidy give-away launched since the 1970s was sold to the country with some mix of the words "independence" or "security" somewhere in its advertising.

President Nixon gave us a 55 mph speed limit, and, along with general price controls in 1971, his disruptive and supposedly "burden sharing" Emergency Petroleum Allocation Act of 1973.

The Nixon era's one significant success in bringing new domestic energy to market was securing, in late 1973, Congressional approval of the 800-mile Trans-Alaska Oil Pipeline, linking Prudhoe Bay on the North Slope to the Port of Valdez. (The North Slope saw its peak production in 1988 at 2 million barrels a day).

Ironically, approval for the pipeline was long frustrated by another enduring Nixon legacy: passage of the National Environmental Policy Act of 1970 (NEPA).[4] NEPA gave us the "Environmental Impact Statement" as one of the most powerful tools available to anti-energy organizations and their "public interest" attorneys. The pipeline was built only when a frustrated Congress simply decreed that its developers had effectively met all the legal requirements.[5]

The Carter Administration began with an attack on nuclear energy when it blocked the closing of the nuclear fuel cycle by banning commercial spent fuel reprocessing. And, the Carter era gave us all the big messes: a tepid roll back of price controls; a proposed "solar energy bank" (20 percent solar by 2000); the "Crude Oil Windfall Profit Tax of 1980"; the gas production-depressing "Powerplant and Industrial Fuel Use Act of 1978" (Fuel Use Act); the "US Synthetic Fuels Corporation Act of 1980"; and every conceivable incentive for solar, wind, and geothermal spending.[6]

Consumers were stuck for many years beyond Carter with an expensive mandate imposed on utilities, the "Public Utility Regulatory Policies Act of 1978." PURPA required that utilities purchase wholesale electricity from solar, wind, biomass, geothermal, and co-generation projects at so-called (state-determined) "avoided cost" – the money that it would have *allegedly* cost the utilities to build or buy the same kilowatt-hours on their own. Those "avoided cost" determinations were fraught with Green politics at state public utility commissions (PUCs), and they were often set artificially high to encourage "renewables" and "efficiency" through co-generation.

To be sure, several major power-consuming industries made legitimate use of co-generation incentives under PURPA. Chemical and forest products companies, for instance, sold excess electricity from on-site generation to their local utilities at high-avoided costs, and used their excess steam in their manufacturing processes.

But, it didn't take long before the market for legitimate co-generation steam "hosts" was sated. So, many project developers – who couldn't resist a guaranteed market for their electricity at a guaranteed high price – stretched the limits of PURPA's legitimacy.

Scores of otherwise conventional power plants were fitted to use their excess steam to heat greenhouses for flowers, or to produce distilled water that wasn't sold to anybody. These facilities were a risk-free gravy train, whose high-price electricity even inspired some utilities to form subsidiaries to build similar PURPA "Qualifying Facilities" (QFs) all over the country.

Homeowners and businesses - especially in the Northeast and the West – suffered long for this 1978 experiment in "stimulating" renewables and efficiency because their local utilities were forced to sign front-loaded multi-year wholesale power supply contracts with QF developers.[7] And, the wholesale prices paid by utilities were simply passed through to residential and business customers at the retail level.

Indeed, the key sections of the now-significantly repealed PURPA defined much of the Carter era. So did the misnamed 1980 Crude Oil Windfall Profit Tax – which had nothing to do with profits – and applied only to domestic production. It predictably cut domestic production almost every year that it was on the books.

The 1980s & The 1990s

The Reagan Administration began with big expectations, especially among Green activists, who thought it would run roughshod over all the Carter-era energy policy malaise. The environment would suffer, and "Big Oil" would steamroll everybody. This must sound familiar.

Indeed, Reagan's commitment to free markets was verified when, within days of his inauguration, he ended all Nixon-Carter oil price controls. Prices fell, and there's never been any widespread return to the gas lines of the 1970s.

President Reagan's first DOI Secretary, James Watt, was a feisty but impolitic crusader when it came to general resource development on public lands, and he aggressively stood against the ever-encroaching withdrawal of public lands from "multiple use" designations. Alas, Secretary Watt was the poster child for fundraising by environmental activists, and he lost his job in 1983 after one particularly noteworthy press conference.

President Reagan's first EPA Administrator, Anne Burford, tried to hold the line against overreaching regulation. She slashed the EPA budget and the number of enforcement actions the agency filed against industries of all sorts. She lost her job, after 22 months, during a fight with Congress over EPA's management of Carter's "Superfund" program.

Much of the Reagan record was, by absolute necessity, grounded in his administration's need to first undo the destructive production disincentives, market distortions, and outright boondoggles left behind by his predecessors. He largely succeeded.

Besides the near-instant elimination of oil price controls, Reagan got rid of most of the anti-gas Fuel Use Act of 1978. And, by 1988, President Reagan had also succeeded in getting rid of the so-called Windfall Profit Tax, and US Synfuels boondoggle.

But Reagan's attempts to open a slice of the Arctic National Wildlife Refuge (ANWR) to oil and gas exploration were rebuffed by Congress in 1987. Administration initiatives to rationalize nuclear power licensing were also frustrated.

In short, much of the Reagan era could be characterized as a rollback of many destructive policies, and a firewall against others. But some positive policies were allowed to wither, and the Green Left got its first big toehold in blocking offshore oil and gas exploration.

Reagan-Bush on Nuclear Power

The Reagan Administration was predicted to be a boon for the nuclear energy community, whose on-going projects had suffered stupendously from Nixon-Carter inflation; *ad hoc* and protean regulation by the Nuclear

Regulatory Commission (NRC), especially after the Three Mile Island accident; and recession-depressed electricity demand.

Activist intervention and changing requirements combined to stretch nuclear construction lead-times from 4-6 years to double-digit years – years of very high interest rates that saw, in some cases, the interest expense on construction debt match actual construction costs. Cost overruns on many big reactors threatened huge electricity rate increases that angered consumers, and undercut the viability of important local employers all over the country. Around 100 reactors were cancelled – some that were already more than 50 percent complete.[8]

As for new reactors, the key would have been to radically reduce the regulatory pressure on construction lead times, and the Reagan Administration did send legislation to Capitol Hill that could have helped a lot. Proposed legislation recognized the futility of the Atomic Energy Act's two very litigious, but often years-separated proceedings before NRC administrative law judges: a "Construction Permit" application, followed, sometimes after a decade, by a separately litigated proceeding for an "Operating License" for a completed facility.

Reagan revived a proposal to give the industry a combined construction permit and operating license (a "COL") upfront for new reactors – before a shovel of dirt was turned – in exchange for the industry's obtaining Design Certifications from the NRC, based on essentially complete designs – also before a shovel of dirt was turned.

Reagan's proposal recognized, and tried to correct, how nuclear power had grown up in America. Most of our 104 operating reactors are "one-of-a-kind" facilities, designed almost uniquely for the utilities that had ordered them. Further, many were constructed on a "design-as-you-build-basis" (the exact opposite of the much-praised French and Chinese models of nuclear energy development).[9]

Our own history, with the technology that we invented, is what made the original two-step NRC licensing process necessary: nobody really knew *exactly* what most finished nuclear plants would look like before they were close to being finished. So, US reactors were licensed in two separate proceedings.

Obviously, the industry's way of doing business, and the NRC's way of regulating it, invited lengthening construction lead times. Fueling the lengthening of the process were the opportunities it afforded activists in litigating every law and regulation – twice. Environmental activists sued on the basis of alleged violations of the Atomic Energy Act; NEPA; the Clean Water Act; the Administrative Procedures Act; the Endangered Species Act; the Clean Air Act; etc. Lawsuits became the stock in trade for foundation-supported activists in the 1970s.

Combined licensing for new and standardized nuclear plants was an old idea, and the administration might have invested more political capital in what the industry and consumers most needed: predictable and vastly compressed planning and construction schedules.

But though the Reagan Administration sent good legislation to Capitol Hill in the 1980s, lower-level Department of Energy officials were sent to testify before perfunctory Congressional hearings that went nowhere. To be fair, anti-nuclear Congressmen led the relevant House committees at the time, so the Reagan Administration surely saw little return on any big political investment in nuclear licensing reform. Then, Russia's Chernobyl accident in 1986 made the politics of reform impossible for anybody for a long time.

But the Reagan White House did take a very strong action to allay concerns in the nuclear energy community. On his way out of office, in November 1988, President Reagan signed Executive Order 12657 to address an arcane but very vital point in nuclear plant licensing: "Emergency Preparedness Planning."

Emergency planning had become, by the late 1980s and early 1990s, the activist community's tool of choice for blocking finished nuclear plants from actually operating. First put in place after the Three Mile Island accident, NRC regulations required a FEMA-approved emergency plan for every community within a plant's 10-mile radius. So, state and local boycotts of emergency planning were used to stop the completed Shoreham reactor on Long Island from ever operating, and nearly derailed the completed Seabrook plant in New Hampshire.[10]

At any rate, addressing emergency planning was vital because no developer would ever think of undertaking a new multi-year and multibillion-dollar project if, at its end, the vagaries of future elections in a host state – or even elections in an adjoining state – might result in a boycott of emergency planning.

So, in terms of changing actual conditions on the ground for existing reactors, and not just for some dreamed-up nuclear future, President Reagan's emergency planning executive order was very significant. The activists took their worst-ever defeat on the false and high-sounding "states' rights" narrative that they'd crafted for six small Massachusetts towns in their fight against Seabrook, just 2-miles across the state line.

As for preserving a nuclear future, credit the first President Bush, and the tenacity of former Senator Pete Domenici (R-NM), and Rep. Joe Barton (R-TX), for setting the stage. They secured passage of the same single-stage licensing process, sought by Reagan in 1980s, in the Energy Policy Act of 1992. And, after much delay and awful expense, that process has finally been put through its first successful test (below) – exactly 20 years after Congress first created it in 1992.

Reagan, Bush, Clinton & Bush on Oil

We know that the Reagan Administration was a strong proponent of oil and gas exploration on federal lands. Both successors to DOI Secretary Watt – Judge William Clark and Don Hodel – strongly defended pro-development policies.

But even Reagan, and later, the Bush and Clinton Administrations, added to the burden on American energy progress in the post-1970s period. First, President Reagan was pressured into signing legislation that began the lock-up of most of the Outer Continental Shelf (OCS).

It all goes back to the Santa Barbara oil spill of January 1969, the worst US rig accident before 2010's Deepwater Horizon explosion in the Gulf of Mexico. A Union Oil platform blowout sullied the picturesque Santa Barbara Channel with oil. Ronald Reagan was then California's governor.

That made his White House receptive to pressure from California Congressional Republicans to restrict leasing for oil and gas exploration. And he did, in 1981, by signing FY 1982 DOI Appropriations legislation. The ban started with the California coast, and then spread, through succeeding DOI Appropriations bills, and

through succeeding administrations – to include virtually all the OCS acreage off the Pacific and Atlantic coasts, and the eastern Gulf of Mexico.

The George H.W. Bush Administration not only extended the signing spree of DOI Appropriations bans on OCS leasing, but President Bush also signed, in 1990, an executive order extending the ban for 10 years off the coasts of California, New England, and the eastern Gulf Coast.

President Clinton also approved Interior Appropriations bills that continued the ban. He even signed, in 1998, an extension of President George H.W. Bush's 1990 executive order through 2012.

Then, President George W. Bush approved all the same DOI Appropriations bills necessary to keep the OCS ban statutorily alive through FY 2008.

But the late 2008 upsurge in gasoline prices, our first national visit to more than $4.00 a-gallon gasoline, made the George W. Bush White House brake, and finally shed the "oil patch" biases that had been assigned to it by its media and political critics. So, President Bush rescinded the executive orders. And, under intense public pressure – the "Drill Here/Drill Now" campaigns – even the Democrat Congress of 2008 allowed the DOI Appropriations bans on OCS exploration to expire.

Cumulatively, the ban had kept 85 percent of US territorial waters off-limits, *by law*, through FY 2008 (they still are, *effectively*, because of DOI Secretary Ken Salazar's leasing plans and delays). And, according to a 2006 report by DOI's Minerals Management Service (now called the "Bureau of Ocean Energy Management, Regulation and Enforcement" or BOEMRE), the mean estimate of the total "undiscovered and technically recoverable resources" of the Pacific, Atlantic, Gulf and Alaska OCS areas comes to 86 billion barrels of oil and 420 trillion cubic feet of natural gas.

That's a lot. And, it could be lots more. DOI's 2006 report was basically an update of prior reports, informed by changes in gas potential in the Gulf. But for the most part, no new exploratory drilling has been allowed to actually find out how much oil and gas lies under most of the OCS.[11]

Today

In short, not the 1980s nor the 1990s – or even the 2000s – ever saw an unlocking of blockbuster resource equivalents to Alaska pipeline-type projects. These were often unserious times, in which some Congressional "moderates" and liberals could combine to force unserious policies.

So, while we brought competition to wholesale electric power markets, and finally "fixed" nuclear power licensing, we also got lots of silly and destructive policies. Ethanol is a big case in point, going back to the Energy Policy Act of 2005, and so were the subsidies that went with it.

Now, the tax credit subsidy for ethanol (45¢ a gallon) was allowed to expire at the end of 2011. But the 2005 Act's volumetric mandate for ethanol blending continues. It started at 4 billion gallons a year in 2006, and rose to 7.5 billion gallons a year by 2012. And, nobody seemed to have thought about the consequences of turning food into fuel.

The economic damage of corn based ethanol goes beyond its being a net energy loser (taking more energy to make and distribute than it produces from burning it), and extends to our food supply. Forty percent of the US corn crop is now devoted to fuel, and this has raised not just corn prices, but also the prices for every food product that relies on corn as a feed in the production of beef, milk, pork, poultry, eggs, bacon, etc. Indirect uses of corn derivatives are too numerous to mention. "Big Corn" and its allies – formerly including the (now embarrassed) Green Left – have stressed the US and world food supply.

But rather than see a mistake, the Democrat Congress that took office in 2007 decided to double down. It passed the Energy Independence and Security Act of 2007, which raised the volumetric mandate for renewable fuels to 36-billion gallons a year by 2022. The silliest part, though, was the requirement that 21-billion of the 36-billion gallons come from "advanced biofuels" that are derived from sources other than cornstarch. To this day, there are no commercial quantities of advanced biofuels available to meet any mandates.

Lest a 2022 mandate seem distant, the 2007 Act had intermediate requirements: 950-million gallons per year of advanced biofuels by 2010; 1.35-billion gallons by 2011; and 2-billion gallons by 2012. Again, though the fuel doesn't exist to meet any mandate, it's still required by law today. Congress simply thought it could wish non-food liquid fuels into being. Even with all the emphasis on non-food fuels, the 2007 Act still allows up to 15-billion gallons of corn-based ethanol to count in meeting the overall 36-billion-gallon renewable fuels mandate for 2022.

The Mythical Disconnect

How was it that even pro-energy administrations, those for which economic growth and national security were of paramount concern, allowed such situations to develop? Why did they tolerate wasteful mandates and polices that even included major resource lock-ups?

The answer, at least in part, was that they were awed by a new fashion in economics that had taken root in the 1970s and 1980s, that of the "Post Industrial Economy" or the "Service Economy." Policymakers everywhere were taught to see a mythical disconnect between our economy's energy intensity and its real growth potential. Much of officialdom saw certain trends in energy consumption in absolute terms, and then compared those trends to growth in nominal GDP. They learned the wrong lesson from the experts, that we were supposedly using less energy to sustain healthy economic growth.

Over most of our energy-driven golden age (1950-1973), total US oil consumption grew by an astounding 168 percent. But over the following comparable 23-year period, through 1997, total consumption growth was only about 12 percent. And, over the succeeding 14 years through 2011, when consumption averaged around 18-19 million barrels a day, growth was essentially flat.

Indeed, annual GDP growth during 1945-1973 was roughly matched by rising rates of growth in energy consumption. But annual GDP growth after 1973 saw energy consumption rise by far lesser rates.

Policy By Pop-Theory

So, the experts could convince policy makers that we'd "broken" what had been a near-lockstep link between energy consumption and economic growth. By this logic, markets had worked, and rising energy efficiency – in cars, factories, homes, etc. – could harmlessly allow some resource lock-ups. Elected officials could calm nervous environmental constituencies, without really bothering anything important.

And, to bolster the de-linking philosophy of the time, we saw the rise of nuclear power (now 20 percent of electricity generation), and coal (now 36 percent, down from 47 percent in 2010). Natural gas has reached 23 percent of electricity production, and rising. Oil is now close to zero, when it accounted for 17 percent of electricity production in 1973. All of this supposedly allowed even more of our productive base to electrify, instead of directly burning oil in industrial processes, or buying electricity generated from burning oil.

Let's concede that we've achieved huge strides in electrification and conservation. That's all true, but it glosses over so very much about changes in the underlying *physical* wealth-producing (and energy consuming) potential of our economic system as a whole.

The point about "electrification" is that no matter its primary fuel source – coal, gas, uranium, hydro, etc. – energy consumed in the form of electricity is still only about 40 percent of total consumption, measured in quadrillion Btus. The balance is still consumed as gas and liquids in vital industrial processes, transportation and heating and cooling.

The main question is about the nature of the economy that we have today. Has all this relatively new electrification and conservation supported or accompanied a generalized growth in real wages and living standards similar to what we enjoyed in the post-war golden age?

No, clearly not. In fact, legions of academicians find a perverse ("Green") virtue in our lower-energy economy because it ratifies the underlying transformation that they've blessed as the "Service Economy," or as the "Post-Industrial Society."

Another Economy, Not Our Own

It's an old saw that the US economy is today far more services-based. We do employ more people, making more things in *absolute terms*, but manufacturing is a shrinking percentage of everything we do.

Manufacturing was 26-30 percent of our economy in 1947, and it's shrunk to around 10-12 percent today (depending on who's measuring what). And, ever-greater proportions of us are employed in service industries, some 30 percent today, compared to 11-12 percent in the early 1970s.

Many economists on both the left and right see this as either inevitable or even positive, mirroring what had happened in the world-historic and productivity based transformation of American agriculture, which, at the start of the 20th century, employed more than 70 percent of Americans. That number dropped to around 16-18 percent by the mid-1940s, and today, only about 2 percent of the American workforce is on farms. Yet, that 2 percent feeds not only a much bigger America, but also people around the world: the US had a net agriculture balance of trade *surplus* of $43 billion in 2011.

The Flawed Food Model

There's no minimizing the revolution in American agricultural productivity. Along with plant genetics, it was energy intensification that made the food revolution possible. Animal and human power was replaced by gasoline and diesel powered machinery; hydrocarbon-based fertilizers fed the soil; and electricity and diesel power allowed many types of irrigation systems to temper the fickleness of rain. Trucks and trains (more oil) took products to distant urban markets, and mass markets supported the economics of mass production of food at ever-lower real per unit costs.

Agriculture is a productivity miracle, and nobody complains about any downsides. Politicians don't run for office today by decrying the loss of "good paying middle class farm jobs." Why not?

Because the dynamism of manufacturing innovation and growth, and the general rise of US productivity, produced *on shore* labor *creation* opportunities that exceeded labor *savings* in agriculture. People who were displaced from farms, and people who'd never even seen farms, had other productive and high-value places to go in a manufacturing sector that was growing fast enough to absorb them and their descendants at rising real wages. And yes, the developing service sector helped, too. (See Don Draper in AMC's *Madmen*.) Hence was born the post-war "middle class."

Like agriculture, the American manufacturing sector has had its own boom in productivity. A *Wall Street Journal* editorial on Feb. 18, 2012 said, "manufacturing productivity has increased by 103% since the late 1980s . . ." (For reasons to believe that the WSJ's number is highly exaggerated, see "Worse Than The Great Depression: What the Experts Are Missing About American Manufacturing Decline," a March 19, 2012 report by the Information Technology & Innovation Foundation.)

But whatever the real number for US manufacturing productivity growth, it's clear that yesterday's model, when farms were yielding to factories, hasn't been replicated by *new* waves of *on shore* manufacturing growth at rates sufficient to absorb people displaced by older waves of manufacturing productivity increases. In short, we've allowed the post-1970s system to create labor *savings* opportunities, without the more-than-commensurate *on-shore* labor *creation* opportunities that defined the post-war golden age. And, rather than being properly alarmed, the experts blessed it all with euphemisms about a "post-industrial" country.

This is not to say that there aren't large numbers of high-wage and high-value services that rely primarily on brainpower, especially in law; finance and accounting; the arts; information technology; health care; architecture; electronics; fashion; entertainment, etc.

But not everybody can be a high-earning lawyer, or run a Greenwich hedge fund. Not everybody can make movies and music, or create powerful software code. Most people can't plumb the genetic bases of diseases, and devise therapies to treat them. And, there's a limit to how much the entertainment business can provide high-wage employment.

So, many Americans have inherited a lower-energy economy that comes with lower wages, or with no-to-slow growth in real wages.

A startling symbol of the low-energy and low-wage service economy comes from Dr. Paul Craig Roberts, Assistant Treasury Secretary for Economic Policy under President Reagan, who reported that "one-quarter of all new US jobs created between June 2006 and June 2007 were for waitresses and bartenders." And, *that* was a supposedly good year for the US economy.[12]

And, a lot of *on shore* capital investment that might otherwise have gone into new kinds of machinery or process innovations to make more, better, or different *physical goods per man-hour* (the source of labor productivity and all real wage growth), was instead directed to reducing every possible gallon, Btu, or kilowatt-hour of energy consumed per unit of output or per dollar of total cost.

It's no wonder that real wage growth has been low, flat or declining for many Americans for much of the post-1970s period. Only during the last few years of the Clinton era – which saw years-gestating information technology finally deployed into economic activity everywhere – did we get our longest run of post-golden age growth in real output and wages.

But dot-coms were not the whole story of the Clinton mini-boom. Cheap energy had a vital, if less noticed role. Nominal yearly average oil prices sank – with help from a strong dollar – to $11.91 per barrel in 1998, and reached only $27.39 in 2000. It may have been Nasdaq stocks that got most of the press, but it was still cheap energy that helped fuel a nice little run in the late Clinton years.[13]

Americans know all of this intuitively, no matter how many rosy pictures are painted of some onward march of the agricultural model. They know from shopping for clothes, cars, electronics, shoes, bicycles – and household items of all sorts – that the US does not run a trade surplus in manufactured goods. But the biggest reminder of our dependence comes when visiting the gas pump or heating homes. Of our $497.8 billion trade deficit in 2010, petroleum and petroleum products accounted for about 53 percent.

And it's the loss of low-cost energy independence that continues to have a very profoundly negative influence on our daily lives. Combine the dollar price of that dependence with the rest of the left-liberal agenda: the world's highest corporate income tax (levied on worldwide income); high costs in once-strong manufacturing (blue) states; ideologically-driven environmental regulation, and feel-good regulation of every other stripe; a voracious and stultifying tort system; the drag of public sector union obligations; and it all goes on and on.

And the more it goes on, the further we travel every year, from an American golden age, where rising real wages were buttressed by energy-intense *on shore* growth, to an era of greater debt, stagnant standards of living, and slow deindustrialization.

In this light, "energy efficiency" for *its own sake* has been a fake virtue that has misled even the most pro-production policy makers for decades about a mythical "disconnect" between energy intensity and economic health. It's a mistakenly praised barometer of the underlying conditions of a *physical* economy that has almost voluntarily surrendered much of its dynamism and uplift potential to other places.

Imagine a magnificent and world-inspiring triathlete, who decides, at her prime, to relax and spend days in her Manhattan loft designing high-end handbags and scarfs that are made elsewhere. She's sure to eat a lot less at her drafting table. But how would her fans and the sports media react? They'd regret her missed prowess on the field much more than they'd laud whatever new "food efficiency" she'd found in her new line of low-energy work.

To again paraphrase Dominick Dunne, we have "Another Economy, Not Our Own."

OIL & GAS

Oil will be an essential energy source for America for generations to come, especially in the transportation sector, which accounts for two-thirds of our total consumption of about 19 million barrels a day.

The truth is that nobody knows how much oil and gas remain economically recoverable in the United States. Estimates vary according to technological and economic conditions, and big news headlines periodically recharge the debate.

For instance, a May 10, 2012 report by the Government Accountability Office (GAO) cited spectacular numbers for unconventional oil in the Green River Formation areas of Colorado, Wyoming and Utah. GAO cited estimates by the US Geological Survey (USGS) that about half of the Formation's 3 trillion barrels of oil shale are recoverable, "an amount about equal to the entire world's proven oil reserves." There's no shortage of oil in the United States.[14]

On-Shore Federal Lands

A May 2008 report by the DOI's Bureau of Land Management estimated that federal lands in the US hold 31 billion barrels of conventional oil and 231 trillion cubic feet of natural gas under the 279 million acres that were inventoried in the report. But 60 percent of those acres are completely closed to leasing, making 62 percent of the oil and 41 percent of the gas completely unavailable to us.

Further, according to the 2008 report, an additional 30 percent of on-shore federal oil, and 40 percent of the gas, is available only under environmental restrictions – that are expensively litigated for years – that go beyond the government's "standard lease terms." The bottom line, said the report, is that only 8 percent of the oil on federal land, and 10 percent of the gas, is effectively open for leasing.[15]

Of course, major improvements in technology (below) can change what's "recoverable" all the time. Computer models and sampling techniques also change all the time, as actual exploration experience alters – or completely displaces – lots of preceding models and estimates.

No matter how current the data, there's no question that agencies of the Obama Administration have frustrated oil and gas recovery on on-shore federal lands. The first early signal came in February 2009, when DOI's Ken Salazar cancelled leases on 77 parcels (some 130,000 acres) in Utah – it was a "pristine" area, as they all are, in the language of the Green Left. Weeks later, he cancelled the Bush Administration's oil shale development plans in Colorado, Utah and Wyoming.

And that was just the beginning of the Salazar approach to resource development on public lands. The bottom line of all the Obama Administration's actions, according to a March 20, 2012 report by the Congressional Research Service, is that production on federal lands declined by 275,000 barrels a day between 2010 and 2011.[16]

The Special Case of ANWR

There probably isn't a more charged acronym in American energy policy debates than ANWR. The Arctic National Wildlife Refuge consists of 19.3 million acres (roughly the size of South Carolina) that was last bounded by Congress in the Alaska National Interest Lands Conservation Act of 1980. Section 1002 of the 1980 Act set aside 1.5 million acres (8 percent of 19.3 million acres) for oil and gas study in ANWR's coastal plain. But actual exploratory drilling was prohibited, and would have to await specific Congressional authorization. (Pro-energy activists have sought that authorization for some 30 years.)

Modern legislative proposals to "open ANWR" have required the Department of Interior to:

> **"…ensure that the maximum amount of surface acreage covered by production and support facilities, including airstrips and any areas covered by gravel berms or piers for the support of pipelines, does *not exceed 2,000 acres on the Coastal Plain.*" (Emphasis added).**

That's it: a footprint of 2,000 acres out of more than 19 million acres. That comes to 0.01 percent of ANWR's total acreage. Hence, the misnomer in describing the acronym: nobody has ever proposed that the US throw open the gates to a "wildlife refuge." An oft-quoted analogy has equated the proposed exploration and

production area to a Dulles-sized airport in South Carolina. That's indeed a very small footprint in a very big place.

The Green Left has been rank dishonest for decades about any proposed development in the tiny slice-of-a-slice approach to development in ANWR's coastal plain.

First, their general presentations and fundraising appeals show gorgeous photographs of ANWR's Brooks Mountain Range, full of captivating wildlife and general beauty. And, it's true that much of ANWR is, in a word, "pristine."

The trouble is that the 2,000 acres proposed for oil exploration are far from the picturesque Brooks Range, and too cold and too dark an area for too many months of the year to supply photos to any but the most intrepid seekers of flat, dark and treeless places. The relevant area is a moonscape.

But the Green Left needs to stimulate its fundraising base. So, we get pictures of the *whole* ANWR, complete with purple mountains majesty and scampering animals, images that are very far from drilling in any relevant place.

The Green Left developed a new line, too, variations on the following theme: "ANWR will supply us with just some tiny amount of oil – only X month's worth, or just Y year's worth – based on our current consumption levels, so why destroy something pristine for the very short-term?"

That argument presumes a total cut-off from all other domestic supplies (the Gulf, Prudhoe Bay, TX, NM, OK, CA, PA, LA, OH, ND, etc.), and from all international supplies from every other country (Canada, Saudi Arabia, Mexico, Venezuela, Nigeria, Indonesia, Russia, etc.).

The data selectivity is astounding. But dishonesty helps to oil the fundraising machine that the Green Left has built to keep itself wealthy and relevant, to keep the credit card numbers rolling in to preserve yet another "pristine" place. ANWR has been a money machine for the Green Left.

What Happened?

ANWR has been the subject of lots of votes in Congress over the years, and the issue's most significant and modern political lives started when Reagan DOI Secretary Don Hodel was rebuffed by Congress when he sought to open the coastal plain in 1987. Later, in 1995, both chambers of a newly Republican Congress tried to open it. They used "budget reconciliation" legislation, which can't be filibustered in the Senate, to send ANWR's opening, in a larger budget bill, to President Clinton. The President vetoed it, and there weren't the votes to override.

Ten years later, in 2005, another Republican Senate again opened ANWR's coastal plain through budget reconciliation legislation. This time it was the nominally Republican House that refused to go along. With all Democrats uniformly voting against reconciliation for overall budget reasons, a group of mostly northern Republicans – led by Rep. Charlie Bass (R-NH) – had greater leverage in denying a House majority for budget reconciliation language that contained an opening of ANWR's coastal plain.

The last gasp in late 2005 came when ANWR supporters, led by Senator Lisa Murkowski (R-AK) and the late Senator Ted Stevens (R-AK), decided to attach ANWR to a supplemental defense appropriations bill. ANWR cleared the House in that form, but not the Senate, where 60 votes would have been required to overcome a filibuster of the defense bill.

Unfortunately, ANWR's potential output is off the table for years to come. This is not to say that pro-energy advocates have been silent or without determined leadership. Led by House Resources Committee Chairman Richard "Doc" Hastings (R-WA), the full House last voted to open ANWR on February 16, 2012 (in a bill that also set a deadline for approval of the Keystone XL pipeline) – the twelfth time in more than 30 years that the full US House has acted to open a slice of ANWR. The vote on HR 3408 was 237-187, with 21 Democrats defying the Green Left, and 21 Republicans defecting from the pro-production position. Naturally, the bill was dead in the Democrat Senate from the get-go.

How Much Oil and Gas in ANWR?

Again, nobody really knows how much recoverable oil and gas reserves there are in ANWR because nobody's been allowed to drill to make solid estimates of what lies beneath the coastal plain. Only surface geological studies are allowed, along with complex computer modeling.

The most recent assessment by USGS was in 1998. Combining the federal section 1002 lands, with State and Native lands in the coastal plain (for which Congressional action is not necessary for development),[17] USGS estimated *"technically recoverable"* resource availability at 5.7 billion barrels, at a 95 percent probability; 10.3 billion barrels, as a mean; and 16 billion barrels, at a 5 percent probability.

USGS' bigger corresponding numbers for "Oil in Place" were as follows: 15.6 billion barrels, at a 95 percent probability; 27.8 billion barrels, as a mean; and 42.3 billion barrels, at a 5 percent probability.[18]

Again, the numbers are all over the place, and they're based on what we might have learned in 1998, with *1998 technology* – had we been allowed to drill to find out. But technology improves all the time, and so do USGS estimates, when they're allowed to, based on real life data (see Bakken Formation below).

The point is that ANWR has a lot of oil and gas – no matter how you slice it. And, it's recoverable from a very small drilling footprint. There probably isn't another more concentrated on-shore area in the US that could more significantly, by itself, alter our reserve position.

Let's note one last canard about ANWR: the Green Left and its Congressional allies have always told us that actual production would be "10 years away" from any actual authorization to begin leasing. That may be true, according to the USGS, though other experts disagree.[19] The point is that the Green Left has been running that same story every ten years. Even late-night comedian Jay Leno caught that one.[20]

Off-Shore Federal Lands – An OCS Update

As we know, the Green Left got to the oil and gas-rich OCS years ago, and kept a statutory moratorium alive for a long time, until the price spikes of 2008 made the Congressional blockage go away for most of the area.

Even the Obama Administration, in March 2010, showed some real flexibility when it came to OCS leasing. It proposed then to open some of the Atlantic seaboard for leasing, from the northern tip of Delaware to the central east coast of Florida. Even arctic waters in northern Alaska would be "studied" for possible development. The rest of the Atlantic and Pacific OCS would stay closed.

But even that very modest proposal died with the explosion of the Deepwater Horizon rig in April 2010. Instead, a 6-month moratorium was imposed on deep water drilling in the Gulf, and 33 rigs – and thousands of jobs – were either idled or moved to other places. And though the *formal* moratorium expired in November 2010 – and only after Secretary Salazar had ignored two federal district court orders to end it – a deep water "permitorium" remains effectively in place through endless reviews, shifting regulatory requirements, and restrictive leasing plans.

It's All Ideology

And for our knowing just how ideologically-driven the Salazar DOI is, we can credit the leadership of Senator David Vitter (R-LA), who, with Chairman Doc Hastings, on the House side, exposed the false scientific rational for the original 6-month moratorium. Indeed, there was no science – just innocent "editing" mistakes, according to DOI's own "independent" investigation.

In brief, it goes like this: the well explodes, and the White House and DOI want a 30-day study to (among other things) make recommendations for improving off-shore rig safety. Experts affiliated with the National Academy of Engineering were appointed to peer-review DOI's work. DOI produced its 30-day report on May 27, 2010: "Increased Safety Measures for Energy Development on the Outer Continental Shelf." The engineers had peer-reviewed some 20 recommendations to enhance rig safety.[21]

But the engineers did not endorse, or peer-review any moratorium. Eight of the experts actually went on the record to say that they'd opposed a moratorium. Yet, there they were, in the May 27, 2010 report – portrayed as having provided a scientific rationale for a political decision.[22]

So, the rebellion of the engineers, upset about the use of their names, prompted Senator Vitter to request that DOI's Office of Inspector General (OIG) investigate the whole thing. DOI's Acting Inspector General Mary Kendall's November 2010 report claimed that the staff of then-White House energy and climate "tsar," Carol Browner, under the pressure of a late-night deadline, made innocent editing errors. (Ms. Browner had been the Clinton Administration's EPA administrator.)

Acting IG Kendall's report might have been plausible in light of what everybody in Washington knows about caffeine and pizza-fueled rushes to meet deadlines. But Ms.

Kendall's credibility collapsed when Senator Vitter and Chairman Hastings learned later about her role in drafting and editing DOI's original May 2010 report. In short, she helped create the same document that she was later compelled by Senator Vitter to investigate.

This is <u>not</u> what independent inspectors general ever do, and Acting IG Kendall, instead of recusing herself, when Senator Vitter first asked for an IG investigation, ended up acknowledging to *USA Today* her (passive) participation in everything:

> **"I was an active listener. I was not an active participant in these meetings . . . My participation was educational only, for my own edification."**[23]

But that claimed passivity was called into question later in the same news story, by a quoted e-mail to Ms. Kendall by Steve Black, councilor to Secretary Salazar: "Thank you for your kind words, Mary, and for your participation in so many of the meetings and interviews leading up to this report." Surely, the word "interviews" suggests something more actively interrogative – a level of involvement beyond passive listening. Senator Vitter has formally requested an investigation of Acting IG Kendall by the Integrity Committee of the Council of the Inspectors General on Integrity and Efficiency.

Beyond The Gulf

The permitorium goes beyond deep water in the Gulf. In June 2012, the Salazar DOI released its Outer Continental Shelf Oil and Gas Leasing Program for 2012-2017. It provides for only a few new leases (most of which are in "old" areas of the Gulf), and administratively keeps alive much of the old and now-expired statutory ban from 2008. That is, about 85 percent of the OCS stays off-limits – again.

DOI's big exception, in its leasing plan, was its refreshingly different perspective on Alaska's relatively shallow-water OCS. The administration has actively defied vocal elements of its own Green Left base, by allowing exploration in the Beaufort and Chukchi Seas. And, Shell Oil, which has devoted billions of dollars and years to the regulatory process, plans to sink five exploratory wells during the warm water summer months of 2012. A 2006 report by BOEMRE came up with a mean estimate for the entire Alaska OCS of 26.61 billion barrels of oil, and 132.1 trillion cubic feet of natural gas. Those numbers alone would give Alaska – all by itself – the eighth largest reserve position in the world.

Non-Federal Lands

Rapid technological progress has opened new opportunities in both unlikely and in traditional areas – on non-federal land.

Portions of North Dakota, South Dakota, eastern Montana, and southern Saskatchewan in Canada, sit atop the Bakken Formation, first discovered in the 1950s, before technology had matured to recover oil that's often thousands of feet down. But even though estimates of what's economically recoverable are all over the map –

as low as 4.3 billion barrels (USGS in 2008), and as wildly high as tens of billions of barrels (independent petroleum engineers) – it's a lot of hydrocarbons.[24]

Whatever the correct number – and it will continue to change with production experience – the US portion of Bakken may become the single largest on-shore field ever discovered in the lower 48 states. (Even the USGS's 2008 estimate was 25-times higher than its 1995 estimate.) Indeed, North Dakota crossed a major threshold in March 2012 when its average daily production of 575,490 barrels beat out Alaska to make it – after Texas – the second-highest producing state in the country. North Dakota has estimated that its share of Bakken will reach 700,000 barrels a day during the 2014-2017 timeframe.

The point is that nobody really thought, until recently, that the upper American prairie offered much beyond wheat, soybeans and depopulation. The media used to cover out-migration, stories about young people having to leave to find work. Today, it's hard to find rooms at a Motel 6 in North Dakota. Oil workers, and workers in their supply chains, are taking up most of the space, and they're bidding up prices for everything everywhere. They're also paid very well.

Texas, of course, is still number one, and technology is making it more robustly productive all the time. Hydraulic fracturing in the Permian Basin of West Texas has given new life to fields that were in decline, and the technology is expected to bring 500,000 barrels a day of production from the Eagle Ford shale formation by the end of 2012.

Even Kansas has joined the boom. Sandridge Energy told CNN Money in May 2012 that it estimates 15 billion barrels of recoverable oil in the southern part of the state. Oil, money, and people are reviving towns that were withering a few years ago.

The Shale Gas Revolution

It's hard to believe that natural gas, like oil, was once also a heartbreaker for several years, a fuel that's seen plenty of price volatility and even periods of supply shortage.

It was in response to a supply "crisis" (caused by interstate price regulation) that the Carter Administration secured approval of the 1978 Fuel Use Act. That law restricted the use of natural gas in new electric utility and industrial boilers, and the Carter Administration exhorted utilities to convert to coal. They did, of course, setting the stage for today's EPA to remind us all that no good deed goes unpunished.

Gas prices began a decline in the 1980s, and began rising rapidly in the 1990s and early 2000s. Some of the upward price pressure began in response to Reagan's repeal of the Fuel Use Act, as utilities – and QF developers, under PURPA – scrambled to build gas-fired power plants.

Then a boom in gas-fired electricity generation really took off in response to the electricity "restructuring" provisions of the 1992 Energy Policy Act (as implemented under FERC Order 888). Wholesale electricity prices were deregulated in the context of mandated open-access transmission rules, and this advantaged gas-fired power plants, given their quick construction schedules and greater load-following capability in competitive markets. Of course, natural gas prices rose significantly.

Homeowners felt the pinch (natural gas heats half of all homes). So did the industrial sector – the largest gas user – for its reliance on gas for process heat, and as a feedstock for producing fertilizers, plastics, synthetic rubber and fabrics, and chemicals of all sorts.

Natural gas was thought to be going the way of oil, just another growing manifestation of American energy insecurity and dependence. Firms were lining up to invest in new liquefied natural gas (LNG) terminals to accommodate a projected growth in US gas *imports*. The Energy Policy Act of 2005 eased and streamlined the siting of LNG facilities, and the first new onshore LNG plant in 25 years opened in 2008 in Freeport, TX. That was also the year that natural gas prices peaked at almost $14 per mcf (a thousand cubic ft., roughly equal to a million Btus).

Then everything changed as imports and prices swooned. Imports fell to 11 percent of consumption in 2010, the lowest level since 1992. Prices are in the $3.00 range as of the summer of 2012.

The Fayetteville Shale in Arkansas; the Haynesville Shale in both Arkansas and Louisiana; the Barnett and Eagle Ford Shale in Texas; and the Marcellus Shale formation in New York, Pennsylvania, West Virginia, and Ohio (also hosting the Utica Shale) are transforming their regions, and increasing production so dramatically that the US can look forward to natural gas self-sufficiency (the US has already overtaken Russia as the world's biggest producer).

The key to all this new production was combining horizontal drilling and hydraulic fracturing ("fracking"). Fracking is a process of injecting a high-pressure mixture of water (about 90 percent), sand (8 or more percent), and some trace chemicals (which, among other things, preserve fracking fluid viscosity under high temperatures). The high-pressure mixture opens the rock and releases the gas.

Outside of New York, where a moratorium on permits was imposed in 2008 because of manufactured concerns about ground water contamination, few people had even heard of fracking as recently as a few years ago. The Green Left didn't make much noise at the national level, and for several years even welcomed the natural gas industry as a *junior* partner – a provider of a "bridge fuel" – to its solar-wind future.

For the Green Left, gas offered the movement something it had never had before: the attractive credibility of a partner and cheerleader that actually produced a viable product, one with a better-than-coal carbon profile. And, though gas was always to be cheaper than most projections for solar-wind prices, the Green Left never felt threatened because those price differentials were supposed to stay too narrow to overcome the movement's subsidies and its essential cultural goodness.

What Washington calls a "consensus" was in the air for natural gas, and even the EPA seemed friendly when, in May 2011, EPA Administrator Lisa Jackson said, in testimony before the House Oversight and Government Reform Committee, "I'm not aware of any proven case where the fracking process itself has affected water, although investigations are ongoing."

Indeed, they have been ongoing, as the consensus falls apart. Natural gas has lost its favored status, and its new friends have run away, back to their Greener pastures.

The Counter Revolution

The Green Left has turned against its junior partner with the same zeal that it's always used against coal. Indeed, the Sierra Club decided in 2012 to complement its "Beyond Coal" crusade with a "Beyond Natural Gas" lobbying and "awareness" campaign. The movement has leveled high-profile attacks against gas developers in three states, and, at this point, they've been stalemated twice, and completely routed in a third high-profile case.

First, in Dimock, PA, residents started to complain about drinking water issues in 2008, and they blamed the deep drilling operations of Cabot Oil and Gas. And, after the Pennsylvania Department of Environmental Protection accused Cabot in 2009 of allowing methane and other contaminants to seep into the ground water from its fracking operations, the EPA began its own water-testing program in Dimock in early 2012. EPA's preliminary mid-March 2012 report – based on testing 11 wells out of a planned 61– said that the drinking water "did not show levels of contamination that could present a health concern."

In Pavillion, WY, EPA took the lead in attacking the operations of Encana Corp. The agency issued a draft report in December 2011 stated: "ground water in the aquifer contains compounds likely associated with gas production practices, including hydraulic fracturing."

But Wyoming state officials and others swiftly dismissed the draft report for a number of flaws in EPA's sampling methodologies and in the testing controls that EPA designed. EPA couldn't even demonstrate that its own procedures hadn't introduced certain contaminants. And, the area around Pavillion is a shallow natural gas field, where naturally occurring methane has been known for decades to be present in ground water. EPA has gone back to the drawing board in Pavillion, and another report isn't expected before the end of 2012.

EPA was at its most daring when it came to fracking in Parker County, Texas, where, without giving its target any real opportunity to respond, the agency used its Safe Drinking Water Act (SDWA) authority, in December 2010, to issue an administrative "Imminent and Substantial Endangerment Order" against Range Resources, where Range was ordered to stop any flow of contaminants, and to clean up drinking water wells.[25]

Then, believing that Range hadn't been obedient enough fast enough, EPA sued the company a month later in federal district court. To go that far that fast suggested that EPA certainly had the goods against Range – maybe even *the* big indictment against fracking itself – until it didn't.[26]

In March 2012, the EPA not only withdrew its SDWA administrative endangerment order against Range, but it also completely dropped its January 2011 federal suit against the company. The attack just sputtered. And it seemed to die without any of the usual sort of bureaucratic face-saving that otherwise would have extracted millions of dollars from a target, or at least *some* press release-worthy pound of flesh or plea for mercy.[27]

But what the Range case shows above all else is that today's EPA shoots first, and asks questions later. It doesn't allow due process to get in the way of asserting its authority. And sometimes – every now and then – a target actually fights back.

The real question is why the Green Left suddenly decided to demonize what it had so recently embraced as a partner and resource "bridge." It's not as though the Sierra Club was suddenly shocked to find that fracking was going on under the nose of America's oldest and largest environmental organization.

No, the Green & Gas marriage frayed when the junior partner didn't stay junior, and low gas prices brought producers much better prospects outside the G&G partnership. Gas had bolstered the claimed legitimacy of Green, until all comparative price projections showed that solar and wind could never even come close to a fossil resource that hadn't stayed politely demure and expensive. The culturally pure solar and wind advocates saw their partner as an embarrassment, and the prospect of a permanently wide price gap was enough for the Sierra Club to abruptly turn against its friends and political partners.

Might the Left Have a Point?

Americans fall in love when it comes to energy, and many people still believe – after decades – that solar and wind are real *baseload* electricity generating alternatives, when it comes to growing a high real-wage economy. The myth persists because fantasies are easy and lend themselves to slogans. The Green Left counts on the ignorance of much of its core base – articulate and academically degreed people – who somehow managed, for the most part, to learn very little about how most things are actually made, grown, extracted, or delivered to their homes, stores, gas stations, or wall outlets.

But the Greens may have a point – just ***not*** a valid environmental point – when it comes to a disproportionate reliance on natural gas. We're in love again, and, like Steinbeck's Lennie, we will pet it and squeeze it and love it to death. Our new demands and uses for gas will artificially raise its price because EPA and the courts are simultaneously restricting other resources, like coal (below). It's not that solar and wind could ever possibly compete with gas, but, rather, that gas users and producers will make long-term plans based on today's prices. Electric power generators fell in love with natural gas in the 1990s, thanks largely to Congress, and helped drive up prices, at the expense of homeowners and employment in the all-important manufacturing sector.

Today's low prices have made the gas romance even more intense than it was in the 1990s, as ever more interests vie for pieces of today's cheap gas pie. There were proposals last year on Capitol Hill to use big tax incentives to convert trucks to natural gas, and to retrofit service stations to accommodate them (See the "Pickens Plan").

And, the producers understandably need the higher prices available overseas – it's around $16 per mcf in Japan, in the summer of 2012 – by using LNG terminals and ships to *export* gas. That's because US production costs from shale have started to exceed natural gas prices in certain areas.

ExxonMobil CEO Rex Tillerson told a New York audience in June 2012 that "We are all losing our shirts today. You know, we're making no money. It's all in the red."[28]

Producers won't for long voluntarily lose money. ExxonMobil can certainly ride it out, but smaller players won't be able to handle it. And that's why many producers are looking at export markets – as they should, to simply survive. So, different export plans crop up almost monthly.

A consortium that includes Exxon, ConocoPhillips and TransCanada has announced plans to build a $45-$65 billion gas liquefaction plant and pipeline in Alaska to export North Slope gas to customers in Asia.[29]

Almost 20 LNG export facilities had been announced near the end of 2012. Most were announced for the Gulf Coast, though Virginia and Georgia were also on the list, along with Oregon.[30] Among them is Freeport LNG Development Ltd, which has signed LNG contracts with two Japanese utilities, Chuba Electric Power, and Osaka Gas. Another Freeport affiliate, Gulf Coast LNG Export LLC, has proposed a facility in Brownsville, TX. The point is that developers are scrambling to find higher prices elsewhere.[31]

These new claimants for shares of *today's* cheap gas pie are joining the electric power sector, as the latter again becomes a driving engine of rising gas demand. Many electricity generators will cite today's low gas prices as the reason to build new gas plants, or to convert older plants from coal. But most electricity generators will crowd into the gas market because EPA is forcing them to, because the "war on coal" is real and chokes our biggest and cheapest electricity resource, rulemaking by rulemaking, and court order by court order.

COAL, WAR ON

Accounting for a diminished 36 percent of electricity generation today, coal is still "king" for electric power and for the American economy. And, it's still the cheapest and most plentiful fuel in the country. The National Academy of Sciences estimated in 2007 that the US has at least 100 years of economically recoverable coal.[32]

There is no question that coal has its environmental challenges. Nonetheless, as American electricity consumption increased 85 percent between 1980 and 2008, emissions of sulfur dioxide (SO2) – "acid rain" – and oxides of nitrogen (NOx) – smog/ground-level ozone – fell significantly.[33]

Progress like this doesn't begin to impress the Green Left. Coal's very existence unnerves the movement, and feeds its zeal to drive coal from the marketplace. And, the Greens are succeeding because their stalwart allies in the EPA are advancing draconian carbon and mercury controls in order to prop up the false economics of solar and wind.

The administration's agenda for coal was never a surprise. After all, one of candidate Obama's most cited quotations is from an interview he gave to the *San Francisco Chronicle* on January 17, 2008:

> "So if somebody wants to built a coal-fired plant, they can; it's just that it will bankrupt them because they're going to be charged a huge sum for all that greenhouse gas that's emitted. That will also generate billions of dollars that we can invest in solar, wind, biodiesel and other alternative energy approaches."

At the time, candidate Obama was championing a "cap and trade" approach to carbon reduction. "Under my plan," he said, "electricity rates would necessarily skyrocket." The sad thing is that repetition has made his quotations lose whatever shock value they should have had. Never before in American history had anyone else sought (or won) leadership on the basis of an explicit promise to lower living standards across the board.

Cap and trade legislation had taken its last dying breath in the late fall of 2009, after being shepherded through the Senate Environment and Public Works Committee (Senate EPW), on a party-line vote, by Chairman Barbara Boxer (D-CA), who'd taken over when Democrats won control of the Senate after the 2006 election. The Green Left pinned a lot of hopes on her "Kerry-Boxer" bill. After all, the Democrats had a 60-vote super majority in the Senate, and the bill had gotten a big boost that same Spring, after the Pelosi-controlled Democrat House had very narrowly passed (219-212) its version of cap and trade, the "Waxman-Markey" bill. But nothing happened, other than a lot of deal – making that couldn't secure sufficient Senate floor support.

Three other failures preceded the final one. In December 2007, the Senate EPW reported a cap and trade bill – "Lieberman-Warner" – that also failed in a Democrat Senate. And twice before that, in 2003 and 2005, the full Senate defeated "McCain-Lieberman" amendments to bigger energy bills by wide margins.

One wonders why the Green Left's flagship legislation failed so badly so often. Their allies had complete control of the Congress and the White House for two years, and, in a campaign that started in the 1990s, the Left had already rolled up the loyalty of most mainstream news organizations, movie stars, rock stars, and many relevance-seeking academicians. Much of the public had followed along, fed by the celebrity praise heaped on Al Gore's "Inconvenient Truth" movie, and NPR did its part to pull in the "serious" liberal arts demographic. They seemingly had it all – a perfect coalition for success.

That the Left never ultimately prevailed in the *legislative process* is owed largely to US Senator Jim Inhofe (R-OK), a former Tulsa mayor and Congressman who first won election to the Senate in 1994. Senator Inhofe joined the Senate EPW, which has authorization and oversight jurisdiction over the EPA and the NRC. EPW's reach extends to everything related to clean air and water, mining, fisheries, pesticides, solid waste, to say nothing of highways and bridges.

Senator Inhofe and the crack Senate EPW staff, along with other committee leaders, like Senator David Vitter, took the time to develop themselves into experts on the state of climate science. They burrowed into the complex minutia of the data as it evolved over centuries, and they saw glaring inconsistencies that were often papered over in the name of achieving a preferred "consensus."

The 2002 election brought Senator Inhofe to the chairmanship of Senate EPW, and the Green Left has never been the same. Senator Inhofe used his gavel to convene any number of hearings on climate change, and most every expert of every affiliation was offered his or her day in the spotlight.

Senator Inhofe was getting to the bottom of the alleged scientific consensus supporting man-made climate change, or, to use the term, "Anthropogenic Global Warming" (AGW). The Inhofe probes made the claims start to melt away. Over time, the Committee's core Republicans and other Senators – even those too cautious to question the AGW consensus outright – benefited from the intense education program provided by the

Committee's staff. In the end, it was Inhofe's sowing of quiet skepticism that doomed cap and trade, even after the Democrats had re-taken both houses in 2006, and the White House in 2008.

And that quiet skepticism rested on the science that Committee staff had distilled from thousands of pages of studies, reports, analyses and memos – and yes, from those famous leaked e-mails from the Climate Research Unit (CRU) of the UK's University of East Anglia – gathered from academicians and global institutions everywhere.

The "Consensus"

Basically, all claims that the earth is dangerously warming – to say nothing of whether people play a driving role – rely on developing points of comparison with the distant past, say, 1000 or more years ago. Since the first reliable thermometers didn't come along (and only in a few western countries) until the late 18th century, and satellites, covering the globe, obviously came much later, scientists must try to reconstruct the conditions of ancient times with "proxy data" that rely largely on tree rings, ice cores, and the like.

Naturally, proxy data can be expected to show inconsistencies and gaps that widen with the distance of time. It's *how* those inconsistencies and gaps are handled that colors the value of long-term climate change research. Are gaps, inconsistencies, and *sampling selections* presented openly, so they can be identified and debated? Or, are they papered over, with some researchers going so far as to urge their colleagues to "hide the [temperature] decline"?

By the way, that oft-repeated and parodied phrase, from the leaked CRU e-mails, refers to a problem of "data divergence." In this case, CRU researchers, attached to the UN's Intergovernmental Panel on Climate Change (IPCC), discovered that tree ring temperature reconstructions showed sharp temperature declines after 1960, while land-based instruments showed increases. This was not welcome by IPCC authors and editors, one of whom, Dr. Chris Folland, feared that the divergence "dilutes the message rather significantly" that warming in the late 20th century, relative to the last 1000 years, was "unprecedented."

Then, there was the struggling Prof. Keith Briffa, a CRU director, who, in looking at the problem, told his colleagues:

> "I know there is pressure to present a nice tidy story as regards apparent unprecedented warming in a thousand years or more in the proxy data, [but] in reality, the situation is not quite so simple. We don't have a lot of proxies that come right up to date . . . I believe that the recent warmth was probably matched about a 1000 years ago."

The point isn't only that the world has seen its current temperatures before – long before anybody thought of burning coal, or using any fossil fuels to generate electricity, or to move cars, trucks, or airplanes. The point is that when there was "data divergence," leading IPCC scientists – in the words of CRU-head, Dr. Phil Jones, decided to mix and match data to "hide the decline." Defending the consensus was everything.

The Science Remains Very Uncertain

Readers need to look elsewhere for a science debate. For instance, the *Wall Street Journal* has covered AGW exhaustively for years – citing only the most prestigious names and university affiliations among authorities labeled by the Green Left as illegitimate AGW "deniers."

None of us can be absolutely certain about whether AGW is real in any significant way. We don't know whether the "deniers" are right (because most "deniers" don't actually "deny" anything; they're just scientists, who, by training and temperament, refuse to declare "winners" and "losers," based on huge data gaps, and re-created data, spread over a 1000 years). They don't *do "consensus* science."

So, we don't know whether the skeptics are right. But we do know that the AGW advocates probably have to be wrong, because, otherwise, there wouldn't have been a need to fabricate and mislead, to make the data fit the conclusions. They wouldn't have needed to go to court in Virginia to hide IPCC author Michael Mann's e-mails about his "hockey stick" reconstruction of global temperatures. Scientists who have nothing to hide don't need lawyers or courtrooms; they live by the transparency of their work, so that others can reproduce it.

The Inhofe Analysis

Let's credit Senator Inhofe for tying together most of the scientific case against AGW in one place, in his book, *"The Greatest Hoax"* (WND Books, Washington, DC, 2012). *The Greatest Hoax* is probably the most accessible single-volume survey of the science and politics of AGW, and it weaves together the outcome-driven and supposedly private deliberations of scientists attached to the CRU and IPCC. (All the IPCC/CRU e-mail quotations in this paper come from sourced quotations in Senator Inhofe's book.)

Senator Inhofe placed the leaked e-mails in context, and subjected the analytical methods and models of IPCC contributors to the harsh scrutiny of very highly credentialed critics. And, Inhofe's readers can see much more than the IPCC authors ever intended, including the political conversion of scientific uncertainties in actual IPCC reports, into certain and dire predictions in IPCC *Summar*[ies] *For Policymakers*, written mostly by activist groups and leaders of other non-governmental organizations (NGOs).

It's the politicized *Summaries* of the IPCC's four Assessment Reports that most activists and headline writers ever read or quote. By the time the fourth Assessment Report came along in 2007 – when the *Summary for Policymakers* had declared humans to "very likely" be the cause of "unequivocal" warming – it became clear that the summaries could trump actual IPCC report chapters themselves, if necessary:

> "Changes (other than grammatical or minor editorial changes) made after acceptance by the Working Group or the Panel shall be those necessary to ensure consistency with the *Summary for Policymakers* or the Overview Chapter."

A last point about the Inhofe book is its detailed probe of Dr. Michael Mann's "hockey stick" – the famous graph alleged to prove that global temperatures were horizontally flat and stable for almost 1000 years, until zooming up, with industrialization, in the 20th Century. The de-bunking of the hockey stick, by eminent scientists and statisticians, is alone worth picking up a copy of *The Greatest Hoax*. Either way, readers will

wonder how the EPA ever relied so much on the IPCC to justify the agency's most dramatic assertions of energy and economic power.

Plan B: Endangerment & Regulation

Like any competent advocacy movement, the Green Left was not content to leave the fate of its favorite cause solely to elected representatives. Their Plan B relied on unilateral administrative action by the EPA, with support from the courts.

In 2003, the Bush EPA denied a petition, filed by a number of activist groups, seeking regulation of carbon and other alleged "greenhouse gases" (GHGs) under the Clean Air Amendments Act of 1990 (1990 Act). Later joined by Massachusetts and other states, the activists filed suit in the DC Circuit Court of Appeals - where they were also denied in 2005. But the Supreme Court took the case, and a 5-4 majority found for the Green Left in a decision written by then-Justice John Paul Stevens (*Massachusetts, et al., Petitioners v. Environmental Protection Agency*, et al. April 2, 2007).

Whole books could be written about the Supreme Court's 2007 decision. But the premise that launched everything else was the majority's finding, against the Bush EPA, that carbon dioxide is an "air pollutant" under the 1990 Act. Quoting the definition of "air pollutant" under section 302 of the 1990 Act, the majority said that the term meant:

> "any air pollution agent . . . , including any physical, chemical, . . . substance . . . emitted into . . .the ambient air . . . "

And, "since carbon dioxide and other greenhouse gases are undoubtedly 'physical [and] chemical . . . substances[s],'" they obviously fit "the Act's capacious definition of 'air pollutant.'"

But things look less "capacious" when the relevant part of section 302 is read more closely and with less choppiness:

> "The term 'air pollutant' means any air pollution *agent* or combination of such *agents*, including any physical, chemical, biological, radioactive . . . substance or matter which is emitted into or otherwise enters the ambient air. Such term includes any precursors to the formation of any air pollutant . . ." (Emphasis added).

The shading is subtle, but important. Qualification as an "air pollutant" demanded more of a substance than its simply being something "physical" or "chemical" emitted into the air. An "air pollutant" had to first already be something recognized as an "air pollution agent." The Supreme Court basically equated the two terms, and declared that carbon dioxide – and the other so-called GHGs – were air pollutants because, well, they just were.

It's impossible to believe that Congress ever intended that carbon dioxide – which sustains all plant, animal and human life on earth – be considered an "air pollutant" under the 1990 Act. Congress did, in fact, reject EPA regulation of carbon dioxide, in language first introduced by Senator Max Baucus (D-MT), for passenger

cars in Title II of S. 1630, the bill that became the 1990 Act. That the Baucus language did not survive says a lot about what Congress thought about carbon dioxide as an "air pollutant."

Nonetheless, the Supreme Court made carbon dioxide an air pollutant, and it gave the Bush EPA only false choices in its 2007 decision. The agency could avoid promulgating regulations "only if it determines that greenhouse gases do not contribute to climate change or if it provides some reasonable explanation as to why it cannot or will not exercise its discretion to determine whether they do." Further, it wouldn't suffice to cite all the "uncertainty surrounding various features of climate change . . ." The scientific "uncertainty [would have to be] so profound" that it precludes EPA from making a reasoned judgment . . ."

In short, the Supreme Court was all but telling the Bush EPA to definitively declare a hands-down winner in the AGW debate, if it wanted to avoid regulating carbon dioxide and some other gases. There could be no meaningful gaps or inconsistencies in the data, and uncertainty had to become certain. This was nearly impossible, because no truly disinterested climate scientist, no matter how intensely skeptical toward AGW, would have been prepared to declare a definite "NO" for all time. That's not what real scientists do, especially, again, in the face of huge and uncertain data gaps.

So, the Supreme Court had come to its own *regulatory* conclusion. It said that EPA had "fail[ed] to dispute the existence of a causal connection between man-made greenhouse gases and global warming . . . " And, taking for granted its own belief in AGW, the Court cited the threat of "a precipitate rise in sea levels, severe and irreversible changes to natural ecosystems . . . and increases in the spread of disease and the ferocity of weather events."

Well, then.

With a Supreme Court-predicted "spread of disease," it's no wonder that the Bush EPA probably found itself stuck. It might have been possible for EPA to make the case that the scientific uncertainty was indeed "profound" – a lot of credentialed experts were available for that – but the clock was ticking on the Bush administration. And what did the Court really mean by the word "profound"? (We only know that uncertainty over AGW couldn't be "residual.")

Most probably, only changes to the 1990 Act itself could have taken EPA off the carbon regulation autopilot that had been effectively activated by the Supreme Court in *MA v. EPA*. But that was impossible with both houses of Congress in Democrat hands starting in 2007. So, the way was clear for an EPA "Endangerment Finding," and an enormous regulatory assault against coal.

The concept of "Endangerment" comes from section 202(a)(1) of the 1990 Act, which says that the Administrator of EPA:

> "shall by regulation prescribe . . . standards applicable to the emission of any air pollutant from any class or classes of **new motor vehicles** or **new motor vehicle engines**, which in his judgment cause, or contribute to, air pollution which may reasonably be anticipated to *endanger* public health or welfare." (Emphasis added).

At any rate, the 2008 election brought a new EPA, and its course was never in doubt. The agency delivered its Endangerment Finding in December 2009 – with a "Technical Support Document" (TSD) that relied largely on IPCC reports – after it was clear that cap and trade legislation was dead. EPA administrator Lisa Jackson had made it very clear that unilateral EPA regulation was going to be the price paid for any failure by Congress to deliver on cap and trade.

EPA started making good on its threat in 2010 with its final rule on "Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring." This rule was part of a triplet that also included the so-called "Timing" and "Tailpipe" rules.

Some background. "Prevention of Significant Deterioration" (PSD) is found in the 1990's Act's Title I requirements for stationary sources (factories, power plants, etc.). It kicks in for areas that reach "attainment" for standards set by EPA for individual pollutants (usually expressed in parts per billion for gases, or in size for particulate matter), and met through EPA-approved state implementation plans. To prevent "significant deterioration" in those areas, new stationary sources – or *modifications* to existing sources that trigger "New Source Review" – are required to install "Best Available Control Technology" – BACT – if certain thresholds for regulated pollutants are crossed.

For example, new or *modified* coal-fired power plants, steel mills, copper smelters, cement plants, and oil refiners – among other sources – would be hit with BACT requirements if they emitted more than 100 tons per year of a regulated pollutant. Other sources got a 250-ton per year limit. Whichever applies, the source would have to get a permit under Title V of the 1990 Act.

The Act's traditional PSD thresholds of 100/250 tons for new and modified stationary sources might have been plausible (except for decades of EPA overreach in applying New Source Review to "modifications," as defined under section 111) when dealing with known and recognized pollutants. For instance, EPA has always set standards for a "big six": carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter (soot), and sulfur dioxide.

At least for stationary sources, these substances can be traced to discrete, local and regional emitters that could lend themselves to the low 100/250-ton thresholds of EPA's PSD program.

But it's also the 100/250 numbers that show, more than anything else, that Congress never intended to regulate something as high-volume and ubiquitous as carbon dioxide under the 1990 Act. Millions of schools, hospitals, apartment buildings and shopping centers would have to be regulated if Congress had ever intended to shoehorn high volume sources of carbon dioxide (and other alleged GHGs) into the low stationary source thresholds of the 1990 Act.

EPA knew this, and also knew that there'd be intense political fallout from any attempt to force carbon dioxide to fit the plain language of the law. So, EPA regulators simply rewrote the law.

Under its 2010 rule, EPA "tailored" a new and higher 100,000 tons per-year threshold for a group of "well mixed" GHG emissions (expressed on a "carbon dioxide equivalent basis") from new sources, and a 75,000 tons per-year threshold for "modifications" – again, a very loaded and expensive term – to existing facilities.

Of course, EPA said it was doing everybody a favor by avoiding the "absurd result" of *immediately* burdening millions of lower-emitting facilities and local permitting agencies with regulatory chaos and crippling expense.

But, lest apartment dwellers and operators of smaller commercial and public properties think they're safe, they need to look at the June 26, 2012 DC Circuit Court of Appeals decision that upheld EPA on the Tailoring Rule (and everything else). Sprinkled throughout the decision are phrases that hint at only temporary safety for small emitters. Indeed, it's only "*for now*" (pg. 54) that the high 100,000/75,000 ton-threshold applies. We learn (on pg. 74) that "EPA decided 'to *phas[e]* in the applicability of these programs . . . *starting* with the largest [GHG] emitters.'" Then, on pg. 75, the Court lauds EPA's "*phased-in* approach . . ." (emphases supplied).[34]

This was the only language that the DC Circuit Court could use to make EPA's rule legally work. EPA's re-writing of the plain numbers of the law had to be converted from agency lawmaking into something closer to a mere milepost on a longer road to obedience to Congress at the lower thresholds. But that's also why every condo complex, department store – or school, or library, or hotel – needs to be concerned about some "next phase" in EPA's claims that it's obeying the law, and just *beginning* its implementation – *starting* with coal-fired power plants and other large stationary sources. What can be counted on, at some point or another, are lawsuits by Green groups against the EPA, intended to force the agency to regulate under the 1990 Act's 100/250 limits.

There were countless legal challenges to EPA's 2010 rules. Many states sued the agency (led by Texas and Virginia), and so did businesses of every strip (led by the US Chamber and the National Association of Manufacturers). In the end, challenges to the Tailoring Rule were dismissed for lack of standing by the June 2012 DC Circuit Court decision. After all, nobody had actually been "injured" by the Tailoring Rule, because none of the low-emitters, who'd been left out of it, had complained about their exclusion. They hadn't demanded regulation that was then denied them by EPA.[35]

All the challenges to EPA's Timing Rule were also denied. EPA's Timing Rule basically said that regulation of stationary sources under Title I of the 1990 Act would start on the same day as regulation of mobile sources under the Tailpipe rule under Title II. This continues the agency's view that whenever a substance becomes a "regulated air pollutant" under one part of the 1990 Act, then it's regulated under every other part.

That's how we got carbon and GHG "Endangerment" transplanted from the mobile source requirements of Title II (dealing with "new motor vehicles or new motor vehicle engines"), to stationary sources under Title I.

The law itself never explicitly addressed spillover from one of its parts to another. And there are reasons that there are separate titles of the law – and separate requirements – that impose different burdens on different pollutants, at different times, from different sources.

But the DC Circuit Court finally vanquished those boundaries by deferring to EPA itself. The Court went back to a 1978 EPA administrative decision to declare that EPA's cross-title application of the law was "longstanding." So, EPA's own interpretation of its own decisions and rules was solidified as the law of the land.

The Court's action wasn't unusual by itself. There's always been "judicial deference" granted by the courts to all regulatory agencies, when Congressional intent is vague or conflicting. But it would be hard to say that the 1990 Act – taken as a whole – wasn't pretty clear about what it intended to fit into its separate and specific titles. And, it's very clear that carbon dioxide – and other so-called GHGs – could never fit the hard numerical thresholds, or the very structure of the Clean Air Act itself.

Endangerment Again

Parties that lost at the DC Circuit Court of Appeals in June 2012 had also sought reconsideration of EPA's original Endangerment Finding from 2009. That would have been a tough call for any panel of appellate judges, an effective re-visiting of the US Supreme Court's 2007 decision in *MA v. EPA*.

But new information had become available since 2007 – all dismissed by the DC Circuit Court. Indeed, the Court scoffed at the implications of the leaked CRU e-mails. Instead, the Court ruled, claims against the EPA's reliance on IPCC consensus-based science were "exaggerated . . . and not a material or reliable basis for questioning the credibility of the body of science at issue . . ." And, two of the IPCC's most obvious whoppers – the percentage of the Netherlands that lies below sea level, and the alleged melting of Himalayan glaciers – were dismissed as mere "mistakes" that the IPCC had itself corrected.

(It seems as though the IPCC is allowed to get the relatively easy and contemporary stuff wrong as mere "mistakes," but is still supposed to be treated as gospel when it comes to the dauntingly complex task of reconstructing a thousand years of average global temperatures).

In the end, the DC Circuit Court didn't have to rely on leaked e-mails, or make its own scientific judgments about the worthiness of IPCC reports. It could have sent the Endangerment Finding back to EPA's drawing board on procedural grounds, the basis for most successful court challenges to federal agency rules.

Courtesy of a request by Team Inhofe, the EPA's own Inspector General reported in September 2011 that EPA's peer review and vetting process for its Endangerment Finding's TSD, violated Office of Management and Budget (OMB) rules under the Data Quality Act of 2000. EPA's own IG concluded that the TSD used to support the Endangerment Finding was a "highly influential scientific assessment" because it supported regulation with a cost impact of at least $500 million in any given year, and is "novel, controversial, or precedent-setting or has significant interagency interest."[36]

A highly influential scientific assessment requires more stringent and transparent independent peer review than other federal technical or scientific findings – and without any participation by a sponsoring agency's employees. (An EPA employee was among the 12 federal scientists who reviewed the Endangerment Finding's TSD.)

Naturally, OMB sided with EPA management against the EPA's own Inspector General – the TSD was somehow not a "highly influential scientific assessment" – despite the plain language of OMB's data quality guidelines to agencies. What should have been a red flag to the courts and to Congress that something was wrong, that the rules weren't followed, was thrown aside in deference to EPA's war on coal.

More Carbon Drama

Just in case it wasn't clear that the Tailpipe, Timing and Tailoring rules were meant to kill coal in a broader attack on GHGs from larger emitters, EPA drove home the obvious in a proposed March 2012 regulation that's specific to carbon and coal-fired generation. This one is called "Standards of Performance for Greenhouse Gas Emissions for New Stationary Sources: Electric Utility Generating Units."

In a nutshell, and with some grandfathering for a few new coal plants that already have preconstruction permits, the rule would limit CO_2 emissions to 1000 lbs. per megawatt-hr. of electric output. That is, coal would have to be as "good" on carbon emissions as the best combined-cycle natural gas-fired power plants.

And that's never going to happen for coal, as even EPA acknowledges, without economic "carbon capture and sequestration" technology. CCS is a lab experiment that's never come close to any commercial deployment. Bush era plans to demonstrate CCS (2003's "FutureGen" program) fell apart under the weight of big and impossibly vague money.

We're told, of course, that EPA's proposed March 2012 rule applies to carbon emissions from only "new" coal-fired power plants. But if EPA's carbon-specific rule is meant to be so "new" and prospective in application, then why isn't the Green Left howling in uproar? After all, they're concerned that oceans are supposedly rising *now*, and they're upset about the *imminent* spread of pestilence and disease *today*. So, why aren't they complaining about EPA regulations that purportedly apply only to power plants that don't yet exist?

The answer is that the Green Left will earn its grants and litigation donations from what the 1990 Act requires for modifications of existing sources. As EPA said in its Regulatory Impact Analysis (RIA) for the proposed March 2012 rule:

> "The Statutory authority for this action is Clean Air Act (CAA) section 111(b), which covers the regulation of new, *modified*, and *reconstructed* sources . . . A reconstructed source is generally defined as an existing source that conducts extensive replacement of components and is treated as a new source under CAA section 111. A modification is any physical change in, or in the method of operation of, a source that increases the amount of any air pollutant emitted by the source . . ." (Emphasis added).[37]

So, plant owners, who strive to keep what is still, in most instances, their lowest-cost generation in good repair, by replacing worn out or defective parts or components, will probably face – at one point or another – EPA's proposed CO_2 limit for "new sources."

Anyway, that's why the Green Left doesn't whine about the *supposedly* prospective nature of EPA's proposed March 2012 CO_2 rule, or about EPA's now court-affirmed Tailpipe, Timing and Tailoring rules for "new" GHG sources. The activists will litigate, and courts will probably comply.

Among the more cynical points made by EPA in its RIA for the proposed March 2012 rule is that the rule has no cost. It imposes no burden on electricity prices; it's free. EPA reasoned that its actions weren't foreclosing

any future for coal, but were, instead, merely following the larger electric power market's decision to switch to burning natural gas as the fuel of choice for electricity generation. This assumes again – against all history – that today's low natural gas prices stay low, despite all the competing demands from all sectors, new and old, for slices of the cheap gas pie.

Well then, if we're to take EPA at its word, then why regulate carbon or other alleged GHGs from coal at all? Why regulate mercury, or anything else from coal? Why not simply allow the electric power market to work, as EPA says it's working, to allow natural gas to naturally drive coal out of the electricity generation mix?

The reason is that EPA does not really believe itself, that it's just some passive bystander in the energy market cosmos. But to admit otherwise would be politically foolish when facing important organized labor constituencies in coal mining states, or among unionized operators of coal-fired power plants.

The Congress elected in 2010 did not sit still in the face of EPA's war on coal. In April 2011, the full House followed Energy and Commerce Committee Chairman Fred Upton (R-MI), and Energy and Power Subcommittee Chairman Ed Whitfield (R-KY), in passing HR 910 on a vote of 255-172. The bill listed each of the alleged GHGs – not just carbon – and banned EPA from regulating any of them as "pollutants" under the 1990 Act. Alas, companion legislation failed in the Democrat-controlled Senate on a 50-50 vote. But it didn't matter, because a White House veto was always waiting around the corner.

Mercury MACT

Even before carbon restrictions were front and center, coal-fired electricity generation had faced years of uncertainty over the nature of mercury and air toxics regulation, looming ever since passage of the 1990 Act. Regulation was always coming, and it was always out there to be imposed, by one court decision or another.

Mercury is a neurotoxin, to be sure. The question was never about radically reducing mercury emissions, but, rather, about the best way to get the biggest and fastest cuts for the electricity buyer's buck.

The Senate EPW tried during 2003-05 to move "Clear Skies" legislation. It would have relied on a "cap and trade" program, which had worked successfully with another regional and discrete pollutant, sulfur dioxide, to cap and ratchet down mercury emissions to achieve a 70 percent reduction by 2018. Dramatic reductions would also have been achieved for other pollutants. Alas, the Senate EPW deadlocked on Clear Skies, so the Bush EPA moved forward in 2005 to implement its key provisions by rule.

But the DC Circuit Court of Appeals vacated EPA's rule in early 2008, and sent it back to EPA to be redone. And, as feared, the new Obama EPA responded in December 2011 with a much more expensive command-and-control regime, its final rule on "Mercury and Air Toxics Standards." Known variously as "Utility MACT" or "Mercury MACT" – for imposing "Maximum Available Control Technology" – the rule is considered, even by EPA itself, to be the agency's most expensive-ever regulatory imposition on electric power generation. Even for an agency that often downplays or ignores costs, EPA pegged the price of the Utility MACT at $9.6 billion *per year*.

With EPA basing its Utility MACT standard on the 12 best performing plants in the sector, the rule is supposed to cut mercury emissions by 90 percent by 2016. (Of course, much of that reduction will come from the forced retirements of many coal-fired generating plants, whose owners can't economically justify the investment in *today's* era of low natural gas prices).

The problem is that there is no single "bolt-on" technology or process modification that can quickly bring coal plant operators into compliance with EPA's Utility MACT. As DOE itself has noted,

> ". . . no single technology can cost-effectively provide add-on mercury control for all power plant configurations or fuel types."[38]

True. Coal plants have different types of boiler configurations (e.g., tangential, cyclone, fluidized- bed, etc.), and mercury emissions also depend on the kind of coal that's burned. There's higher-sulfur bituminous Eastern coal, and there's low-sulfur Western sub-bituminous coal mined from the Powder River Basin in Wyoming and Montana. (The characteristics of each determine the extent to which mercury emissions are water-soluble, and so more easily captured by certain technologies).

And, with no one size that fits all, operators will have to use some combination of scrubbing, fabric filter bag-houses, or activated carbon injection to meet EPA's Utility MACT standard. Operators will have to cope with the costs of these mandates, on top of the *cumulative* costs of all the other EPA mandates, i.e., carbon and other supposed GHGs.

There's More

Today's EPA has more than carbon and mercury regulation in mind for the nation's coal fleet. There's a pending "Cross-State Air Pollution Rule" – on hold after a rare loss by EPA in the DC Circuit Court of Appeals. Further, several Green Left organizations sued EPA in April 2012 to force the agency to update and revise its regulation of "Coal Combustion Residuals" (ash) under the Resource Conservation and Recovery Act of 1976 (RCRA). Without saying so explicitly, the plaintiffs clearly want coal ash regulated as a hazardous waste under subtitle C of RCRA.

And, EPA has vowed next year to finalize a rulemaking under section 316(b) of the Clean Water Act that requires "best technology available" for protecting tiny aquatic life from power plant cooling water intake structures. Though technically not specific to the war on coal – EPA's anticipated "cooling tower" rule would also apply to any thermal power plants, including nuclear, that rely on once-through cooling water from oceans, rivers or bays - it's still another significant challenge that coal operators have to weigh against the lure of *today's* natural gas prices.

We Quit

Many coal operators have decided that the cumulative weight of it all isn't worth it. According to a June 2012 report update by the Institute For Energy Research, more than 34,000 megawatts of mostly-coal capacity, in 31 states, has been announced for retirement between 2012 and 2016. Some of the hardest-hit states will be Michigan, Ohio, Indiana, West Virginia, and Virginia. There will be a scramble to preserve regional grid reliability in these areas.[39]

The war on coal is nearly over, and key federal court decisions have brought EPA and the Green Left to the cusp of winning it. Only very determined Congressional action can clarify EPA's authority under the Clean Air Act, and under other statutes, to save what is still a "king" of America's electricity sector.

NUCLEAR POWER

There was talk of a nuclear power "renaissance" in the US a few years ago. And, there were reasons to believe that a reformed licensing process, AGW pressures on coal, and financial incentives might spur significant growth in nuclear power's contribution to American electricity production. The renaissance proved to be elusive, though the industry has come back to life with four new reactors in two states – a very big deal, all by itself.

Today, nuclear energy contributes 20 percent of US electricity production from 104 reactors on 65 sites in 31 states (lots of sites host multiple reactors). And, in terms of keeping what we already have, the NRC has almost routinely granted conditional 20-year extensions to the initial 40-year operating licenses of reactors in the existing fleet. The good news is that these plants will be around for some time, and monitored appropriately.

Good News for New Nuclear

As we've seen, the 1992 Energy Policy Act satisfied the industry's long *statutory* quest for COLs for essentially complete reactor designs that were pre-certified by the NRC. But it was always the NRC's follow-on *administrative* process, costing hundreds of millions of dollars for any new design approval, which caused skepticism and nervousness.

But the process finally saw its first proof of principle in December 2011, when the NRC finally certified an amended version of Westinghouse's design for its 1,200 MWe AP1000 reactor. The NRC followed through two months later with COL approvals for George Power's Vogtle Units 3 and 4, both AP1000 reactors.

Then, in March 2012, the NRC approved COLs for SCANA Corp's (South Carolina Electric & Gas) VC Summer Units 2 and 3 reactors (also both AP1000s).

The road to approval for these plants was long and costly. Just because Congress had changed the law in 1992 did not mean that developers were suddenly willing to risk hundreds of millions of dollars on new designs in an untested NRC licensing process. Recognizing that nobody wanted to be first, the Bush DOE, in 2002, initiated its Nuclear Power 2010 program, a government-industry cost-shared initiative to bring to market a new generation of advanced and passively safe designs. The Westinghouse AP1000 is the first new design to navigate the new NRC system, and, after many years, actually make it out of the regulatory starting gate.

The 2005 Energy Policy Act took the nuclear process reforms of 1992 and added financial incentives. Nuclear advocates recognized that potential project developers – seeing what had happened financially to their corporate forbearers – needed to be "kick started" back into the game.

So, the 2005 Act extended to new nuclear the same production tax credit that was available to wind energy. This would apply to a new nuclear facility's first 8 years of operation, and be limited to the first 6,000 megawatts of new nuclear brought on line nationally. Secondly, section 203 of the 2005 Act listed "advanced nuclear facilities" among ten categories of "innovative technologies" that could qualify for federal loan guarantees for up to 80 percent of project cost.

A Burst of Activity

Given the new environment of growing public acceptance, there did indeed seem to be a burgeoning nuclear renaissance in the US during the mid-2000s. At the peak of activity, the NRC had docketed COL applications for more than 20 reactors around the county, mostly at sites that already hosted at least one reactor.[40]

Business Reality

But by the end of 2011, developers had already either suspended most of these, or had declared that their participation in the NRC approval process was meant to simply "bank" COLs for the future, as energy and financial markets might warrant in their areas.

Most of the suspensions started to take shape as project costs rapidly accelerated, fueled by rising price inflation for steel, concrete, copper, etc. Match rising commodity prices to the substantial economic downturn in the US – and the fall in natural gas prices – and it's easy to see how multi-year and multi-billion dollar projects were sidelined.

This made the 2005 Act's loan guarantee program the deciding factor in making several projects viable, as opposed to simply licensed and banked for some indeterminate future. Several developers queued up for a piece of DOE's small $18.5 billion loan guarantee pie. (The Obama Administration tried to significantly raise it to over $50 billion.)

In February 2010, President Obama held a news conference to announce an $8.3 billion loan guarantee for Georgia Power's new Vogtle Units. Other developers wanted to join the action.

Princeton, NJ-based NRG said that a federal loan guarantee was absolutely vital to its now-cancelled plans to build South Texas Units 3 and 4 in a joint venture with Toshiba.[41]

Pennsylvania Power & Light has a COL application pending at the NRC for its proposed Bell Bend reactor, and the Company's CEO told Lehighvalleylive.com in 2008 that "without federal loan guarantees, companies like PPL will not be able to secure financing for the substantial cost of building new, advanced-design nuclear energy plants that will help this country achieve . . . energy independence."

OMB's Fees Can Make a Nuclear Project

Users of the DOE loan guarantee program are required to pay – upfront – a credit risk premium (a percentage of the total loan guarantee) as security. Georgia Power probably paid something small for its Vogtle loan guarantee. And that works nicely for the US Treasury because Georgia Power is still cost-of-service regulated at the retail level for generation.

That means that the Georgia Public Service Commission can set retail rates for Georgia Power's captive retail customers at a level sufficient to assure investment cost recovery in the Vogtle units, and thereby better secure Georgia Power's federal loan guarantee. In short, Georgia Power was never a credit risk, and it reminds one that it's mostly people who don't need credit who can get it.

And though SCANA never sought a loan guarantee for its two VC Summer reactors, it's important to note that South Carolina is also a cost-of-service state in which the SC Public Service Commission can, through ratemaking, create a predictable and positive cost-recovery environment for new generation (nuclear or otherwise).

And, not coincidentally, it's a third cost-of-service state, Florida, which might yet host a pair of new AP1000 reactors. Progress Energy applied to the NRC in 2008 for COLs to build its Levy County units, and the Florida Public Service Commission accommodated the company by approving CWIP financing.[42] Levy County is in doubt today, not because the project lacks a congenial investment recovery environment in Florida, but because Duke Energy, which acquired Progress Energy in 2012, faces high and uncertain repair costs with regard to Progress' Crystal River reactor, which has been shutdown since 2009.

. . . Or Break a Nuclear Project

Contrast Georgia Power, SCANA and Progress Energy with Constellation Energy in Maryland, now a subsidiary of Chicago-based Exelon, and the parent company of Baltimore Gas and Electric. Constellation had planned, in partnership with state-owned French utility giant EdF, to build a third reactor at its Calvert Cliffs site in Maryland – a big Areva (also French) 1,600 MWe "Evolutionary Pressurized Reactor."

But Maryland, unlike Georgia, South Carolina or Florida, is not a cost-of-service regulated state for generating facilities. Utility consumers in Maryland have "retail choice," so state regulators cannot set retail rates for new generation at levels that would assure cost recovery for investments in that same generation. Calvert Cliffs Unit 3 would have been "merchant generation," and Constellation would have needed to competitively secure long-term wholesale power purchase agreements with utilities throughout the region – or otherwise compete

in the wholesale auction market system of the 13-states that comprise the PJM Interconnection. PJM is one of the new "Regional Transmission Organizations" (RTOs).[43]

In short, Calvert Cliffs Unit 3 might have posed a bigger credit risk for the US Treasury than Georgia Power's new reactors at Vogtle, so the OMB demanded a higher credit risk premium for any loan guarantee – rumored to be in the $700-$900 million range – for Calvert Cliffs Unit 3. So, Constellation quit the project in October 2010.

Competitive markets also help explain the importance of federal loan guarantees to the viability of NRG's South Texas Project, and PPL's Bell Bend project. Most of Texas has deregulated at the retail level, and so has Pennsylvania (the "P" in the PJM Interconnection). Again, it's retail choice in these states that makes investment in big nuclear plants riskier.

The bottom line is that private capital markets can probably support new and big 1,200 MWe reactors (at $7-$10 billion a copy) in traditional cost-of-service regulated markets, mostly in the South and parts of the Midwest. The power of state PSCs provides some predictability to lenders.

But private capital markets probably can't or won't (alone) support huge and expensive reactors in states that have "deregulated" generation at the retail level. New generation pricing in these states is either consigned to the vagaries of regional auction-based wholesale electricity markets, or relies, again, on developers' securing long-term wholesale power purchase agreements with area utilities.

New nuclear has to adapt to different US market structures if it's to substantially grow again. States that have deregulated need small machines that give them fuel diversity, and a hedge against gas prices, without requiring developers to play "bet the company" with huge upfront commitments to huge new nuclear reactors. Besides, as we've seen, federal loan guarantees aren't a practical option (so far) in areas that seemingly present a greater level of investment risk.

Going Small

Congress, DOE and the nuclear industry are giving more attention to a group of developers of small, modular reactors (SMRs), defined by DOE as plants that generate 300 MWe or less. These are machines that can be added to sites incrementally as market conditions warrant. They're passively safe to one degree or another, can largely be factory-built, and delivered to sites on railroad flat cars or even, in some cases, by truck. Four vendors are in the SMR vanguard today.

1. NuScale Power is an Oregon-based startup that's developing a 45 MWe reactor based on technology developed by Oregon State University. The reactor itself relies entirely on natural convection for cooling, so no pumps or other mechanical devices are required for heat removal from the core.

And, with no pumps on the reactor side of the system, there's no need for on-site emergency power (diesel generators), or off-site power from the grid. Based on what we know today, a Fukushima-style scenario would not be physically possible. In fact, it's hard to visualize how a NuScale machine could ever create off-site safety problems.

NuScale has probably progressed the furthest among SMR developers at the NRC, having begun pre-application staff reviews for its Design Certification in 2008. The legal and financial difficulties of a major investor stymied progress for much of last year, but the Company's October 2011 acquisition by architect-engineering giant Fluor has put NuScale back on track.

2. The Babcock & Wilcox "mPower Reactor" is a 180 MWe light water reactor that encloses both the reactor and steam generator in a single underground vessel. B&W is furthest along in developing commercial relationships for eventual deployment, having partnered with architect-engineer Bechtel, and TVA. The NRC expects to receive a Design Certification application in the fourth quarter of 2013.

3. Westinghouse has announced a 225 MWe light water SMR, and has partnered with Ameren Missouri to supply the COL application portion – a new Calloway 2 – of its approval and deployment plans.

4. Holtec International is best known as a New Jersey-based builder of spent nuclear fuel storage casks. The company has preliminary designs for its 160 MWe "HI-SMUR" (Holtec Inherently Safe Modular Underground Reactor), and, like NuScale's design – but far less advanced in the NRC approval process – it avoids the need for pumps and external power sources for cooling. Holtec has a Memorandum of Agreement with DOE to cooperate in deploying the HI-SMUR at the agency's Savannah River site in South Carolina.

It was these four vendors that responded to a January 2012 DOE Funding Opportunity Announcement (FOA). Up to two of them will be selected to participate in a 50-50 cost-shared program to commercially deploy SMRs by 2022, and the successful vendor(s) will get (or split) $67 million in already-appropriated FY 2012 money, out of a projected total federal share of $452 million, over the next five years. Of course, the reality of the remaining net federal share is anybody's guess because it's subject to future Congressional appropriations.

The point is to largely replicate, for small light water reactors, the same DOE Nuclear Power 2010 program that successfully navigated the big Westinghouse AP1000 reactor through the NRC's Design Certification and COL processes. This is especially important when the regulatory barriers to market entry are prohibitive, and even a credible start-up, like NuScale, would otherwise never make it. But even for established players, like Babcock & Wilcox – which has long been a supplier to the Naval reactor program – history suggests that nobody will ever march alone with a brand new design through the NRC process.

Beyond Electricity

And, there are other machines out there, besides small light water reactors, which do more than bring smallness and enhanced safety to the conventional machines that we've always used to make electricity from hot water and steam from uranium fission.

For example, San Diego-based General Atomics is developing the "Energy Multiplier Module" (EM^2), a 240 MWe helium-cooled "fast" reactor that also relies on natural convection cooling. The EM^2 is a potential game-changer for nuclear power because it can convert and burn most of the spent fuel from today's light water reactors, without conventional "wet" chemical reprocessing. Only fission products are left, and this vastly reduces the volume and decay time of the remaining waste stream. For this virtue alone, the EM^2 is worthy of

a federal partner in the NRC licensing process – just like Westinghouse, for its big machine, and just like the light-water SMRs.

But a machine like the EM^2 can do more than just generate electricity. Its high outlet temperature of around 850°(C) would allow it to provide industrial process heat in numerous applications, such as the upgrading of bitumen from oil sands, petroleum refining, and the production of hydrogen, steel, and numerous vital chemicals. The beyond-electricity uses are endless, and much of manufacturing itself could be transformed. The EM^2 goes beyond walk-away safety and waste-burning, to potentially deliver the highest nuclear "bang" for the lowest investment "buck."

RENEWABLES

For no other technologies in American history has so much hope and praise been invested for so little return – and so little likely return – than in solar and wind energy. Indeed, decades of research, subsidies, deductions, credits – and even mandatory purchase requirements – have done little to make solar and wind viable in the baseload electricity generation market.

But one often hears about the tremendous *growth* in these resources, and there has indeed been growth in their *installed capacity* – as though capacity, by itself, meant real *production of* useful electricity. Windmills and solar facilities have sprung up throughout the land (capacity), but their inherent limitations have given us very little in terms of actual reliable production.

The 2.7 Percent Solution

Renewables are indeed paltry contributors to actual US electricity production. According to a June 2012 report by the Natural Resources Defense Council – "Delivering On Renewable Energy Around The World: How Do Key Countries Stack Up?" – the *combination* of solar, wind, geothermal and tidal power accounted for 2.7 percent of overall US electricity production in 2011. That's it, 2.7 percent.[44]

After all these years – and after all the mandatory purchase requirements, and all our tax money – at both the state and federal levels – the best that the Green Left can offer is 2.7 percent of our electricity generation?

One also hears about how dramatically costs have come down for solar and wind. That is indeed the trend, but solar still costs between 14 and 30¢ a kilowatt-hour, depending on installation type (thermal or photovoltaic), size, and location. Compare that to the production price from coal, around 8-9¢ before the EPA's latest war on coal was launched in earnest.

Wind costs less than solar, but its highest profile planned deployment to date – the Cape Wind project in Nantucket Sound – is no bargain. With 130 turbines spread across 24 square miles, Cape Wind's developer has signed a 15-year wholesale power purchase agreement with National Grid, the area utility, for half of the project's output. The price (including "renewable energy certificates") is 20.7¢ a kilowatt-hour, which escalates at 3.5 percent a year. Again, that's wholesale, so the delivered price to homeowners and businesses will be higher.[45] This price is beyond ridiculous.

As for the future prospects for wind, the most instructive statistic is Cape Wind's 24 square miles. Wind is, after all, not only an intermittent resource, but also a very diffuse one. It takes a lot of space to do very little. The same applies to solar energy, which, on the surface of the earth, supplies only about 1.3 kilowatts per square meter – the reason, by the way, that man is able to live on the earth's surface: the amount of solar energy that reaches us *per unit of space* is too diffuse to incinerate us.

And, it's the very low density of solar and wind energy that will probably always make them very expensive. Far more material and space – land and ocean floors – are required to gather solar and wind for a given amount of usable energy. Certainly, innovation can continue to improve electricity conversion ratios for the sun and wind that actually strike solar panels, or blow against wind turbine blades. But nothing we do can significantly increase the density of the sunshine or the wind on the earth's surface.

This is not to say that solar and wind are useless; in fact they can be valuable in low-energy applications, where not a lot of consistent "work" is required. Just like a bicycle is a healthy (and resource conserving) way of getting to the supermarket for groceries, no amount of innovation – e.g., carbon frames, better gearing, thinner tires, etc. – will ever result in a bicycle that pulls the tractor trailer that gets the groceries to the market in the first place.

This is probably common sense when it comes to bicycles, so one is left wondering why a very expensive and inefficient pair of technologies survives in any but boutique form – technologies that have made, at best, negligible contributions to America's energy needs. How have they, over the decades since serious incentives were first created for them, come to dominate the national energy policy debate? The answer is that these technologies are a new kind of "theology" for their advocates.

After all, polite society demands a certain pledge of support for solar and wind as replacements for energy dense hydrocarbons and uranium. It's a nobility badge, a sign of sincere "caring." Lately, polite conversation has allowed an "all the above" approach to energy resources. But "all of the above" is acceptable only when all agree that it's just a temporary "bridge" to a completely renewables world. What's not permitted is any discussion of the limitations of solar and wind, and the likely permanence of most of those limitations.

Americans have been conditioned to have a *need to believe*. Opinion leaders in academia, and in the mainstream media, reinforce that need to believe all the time: but for bad people running "Big Oil," we'd be on our way to a "sustainable" renewables world.

Our need to believe is still backed by our national checkbook. Since passage of the Energy Policy Act of 1992, wind projects have been eligible for an escalating Production Tax Credit (PTC), now 2.2¢ per kilowatt-hour. Wind farms, on a large scale, are simply tax farms, and this has been apparent every time that federal tax

credits have either lapsed, or looked like they might – before Congress extended them at the last minute. It's been apparent because the industry always nearly froze in its tracks – investing very little – during those periods.

The American Recovery and Reinvestment Act of 2009 – the "Stimulus" – extended production tax credits through 2012, and added sweeteners in the form of accelerated depreciation and a 30 percent Investment Tax Credit. And, in lieu of tax credits, wind and solar developers could even qualify for a 30 percent cash grant under section 1603 of the Stimulus (now expired). It's no wonder that wind turbines are springing up everywhere, including major wind project proposals for areas off the coasts of Maine and New Jersey.

In short, there would be no wind "industry" as we know it today without the generosity of the US Tax Code.[46] The production tax credit for wind is scheduled to expire at the end of 2012, and maybe this time "Big Wind" will have to stand at least partially on its own.

Mandates

We say "partially" on its own because some 30 *states* have their own "renewable energy standards" (RES) to prop up wind and solar. They differ significantly, and some, like California, which has committed to being 33 percent renewable by 2020, are particularly aggressive. Hence, there's a rush in the West to construct big wind and solar projects supported by the federal loan guarantee and production tax credit programs.[47]

There was a partial DOE loan guarantee of $1.3 billion for the Shepherds Flat wind farm, the country's second largest, developed in eastern Oregon, by Caithness Energy and GE. Its 338 turbines are nominally rated at 845 MWe, and they cover some 30 square miles. The power is being purchased by Southern California Edison as part of meeting the state's RES.[48]

The country's largest solar photovoltaic plant is being built by First Solar in Yuma County, AZ. The federal loan guarantee announced in 2011 for the Agua Caliente facility is up to $967 million; its wholesale customer will be California's Pacific Gas and Electric.[49]

The list goes on. The point is that federal law has forced American taxpayers in general to pay companies to generate uneconomic electricity, while state law, in many places, forces people to buy that same uneconomic electricity.

Again, the triumph of theology over technology has done much to distract the country from meaningful and workable policies for the restoration of an effective level of American energy independence. We have wasted our national will on the renewables myth, and squandered precious time and money for technologies that deliver almost nothing, because of our conditioned need to believe.

The Time Ahead

President Obama's most detailed and lengthy description of his vision for energy remains his 2011 State of the Union address. It said a lot about our prospects for seriousness in the future.

Natural gas, "clean coal" and nuclear energy were each mentioned, but the bulk of the address was a paean to a low energy future. "This is our generation's Sputnik moment." So, taxpayers were asked to "invest" even more in "clean energy technology." Such investment "will strengthen our security, protect our planet, and create countless new jobs for our people."

The president called for "a million electric cars on the road by 2015." Given that there were 246 million cars in the US at the end of 2009 (a recession year), even a success for the administration's goal would yield an electrification rate of only 0.407 percent of *2009's* fleet.[40] And, of course, taxpayers are expected to subsidize this modest goal as well: purchasers of the $41,000 Chevy Volt enjoy a $7,500 tax credit; buyers of the $33,720 Nissan Leaf also qualify.

It didn't matter that this is a wildly uneconomic subsidy – that will barely make a dent in the composition of the fleet – for people who can already afford a second car, which is what limited- range electrics are suited to be. It didn't matter because whether the cause is cars or electric power generation, it's the virtuous Green thought that counts.

And, on the subject of electric power, the president did show room for flexibility: "By 2035, 80 percent of America's electricity will come from clean energy sources." We know that nuclear and "clean coal" counted in this regard, but it's hard to believe that a nuclear renaissance on the scale of the one envisioned a few years ago is around the corner. And, again, it's impossible to believe that commercial scale carbon capture and sequestration will ever materialize to make clean coal "clean" enough for the Green Left.

As for solar and wind, ever bigger piles of taxpayer money will be pushed to give the low-energy fantasy a patina of viability in a low-growth economy.

Conclusion

We can repeat our golden age – 1945-1973 – again, and again. Only politics stops us from realizing a limitless expansion of opportunity for generations to come. The continued development of our oil, natural gas, coal and nuclear power resources must be encouraged to the fullest extent possible, not only because they're available and economically viable *now*, but also because only energy-dense fuels can support a strong and broadly-based growth in real wages. Coupled with a broad range of policies to encourage general investment and economic growth – including tough regulatory reform – a serious energy policy can underpin a dramatic American comeback.

Serious policies will allow the private sector to use its most innovative technologies to extend to federal lands – both on-shore and off – the production revolution in oil and gas that it's brought to non-federal lands. At the very least, there must be an end to temporary moratoriums, "permitoriums," and restrictive leasing programs that amount to the same thing. The point is to turn on all the spigots, and pound prices predictably lower for the long term.

A serious energy policy will recognize that there is no more an out-of-control federal agency today than the EPA. It grabs authority everywhere, and even creates new "pollutants" never before contemplated by Congress.

EPA is today the tsar of the American energy sector, so, by extension, it's a tsar of the American economy itself.

EPA must be overhauled from stem to stern, and so should the major statutes it administers. The authors of those statutes, starting back in the Nixon era, surely did not anticipate the platforms that their laws would provide for the radical Green Left agenda. Confronting this means demonstrating to the public that much of the Green agenda is a feel-good chimera that exists to serve a zero or low-growth ideology – a noble form of widespread poverty. There are no significant alternatives to energy dense fossil or nuclear fuels that can survive in the marketplace, and the need to believe needs its own sustained reality check.

As for nuclear energy, the market, for the most part, should be allowed to sort winners from losers. The advanced designs of today's big machines should silence any legitimate safety concerns, and they're being built in markets that provide some predictability of investment-recovery, under traditional cost-based state rate-making authority.

But the so-called "retail choice" electricity markets in many parts of the country can benefit from a more granular approach to new nuclear power because the financial risk is more manageable in the absence of cost-based ratemaking. SMRs can largely be factory-built and added to sites as market conditions warrant. It would not be a "subsidy" for the federal government to take a few of these machines – both light water and advanced – through the government's own first-of-a-kind-engineering and licensing requirements. After that, they're completely on their own forever.

In the end, Americans won't knowingly go backwards, though we've had to absorb 40 years of relentless hectoring by the Green Left. But even when many people think that the activists "mean well," there are still lines that can't be crossed. That was the lesson of 2008, when decades of the *statutory* OCS lockup vanished within weeks, because $4.00 gasoline was too high a price to pay.

Like any movement that's convinced of its own virtues, the Green Left is arrogant. It scripts and deploys pleasant kids with clipboards to campuses and Starbucks outlets everywhere. Articulate and sincere, their seeming rejection of skepticism and inquiry brings its own kind of arrogance to the movement's larger need to make people believe. After all, the clipboard kids really *believe*.

But there's always a bill that comes due even for the Green Left, and lines that can't be crossed.

Maybe they're crossed again when electricity prices "necessarily skyrocket" due to EPA's actions. Maybe it's when gasoline prices reach $5-$6 a gallon as a *cumulative* result of all sorts of things: EPA's mandates on refiners; decades of banning exploration on most public lands; dollar depreciation; increased demand from an economic recovery; etc.

However the day of reckoning comes, real leadership, with a real infrastructure, has to be ready with a unified, consistent and long-term public education and political strategy that offers a practical alternative to the Green Left's version of its own "faith-based initiative."

All together, trade associations and think tanks, and their allies, need to occupy the information space that the Green Left has so long commanded, and so successfully manipulated in every environmental debate, and in every scapegoating of producers for every price spike and market disruption that's popped up over the years.

And, if we're to finally exorcise the ghost of 1973 – and the spirit of "limits" it created in us – then let's not forget that energy is not an end in itself. It's the sustenance for a repowering of economic growth and broadly based growth in real wages. That understanding requires that we give up the fashion of accepting any notion of a "Post-Industrial" or "Service" economy, and build an energy basis for replicating an American golden age – again and again.

Richard Bornemann has spent 25 years representing some of the nation's largest electric and natural gas companies before the US Congress, Executive Branch agencies, and independent regulators. A specialist in most landmark Clean Air and Clean Water statutes, he also successfully directed the country's last contested nuclear power licensing case, establishing vital points of precedent for the technology's domestic revival. Bornemann is a graduate of Amherst College, and began his Washington career as a Legislative Assistant to Rep. Denny Smith, managing the member's Resources Committee interests in oversight and authorization of the Departments of Energy and Interior, and Nuclear Regulatory Commission. Mr. Bornemann is an energy analyst for the Selous Foundation for Public Policy Research (SFPPR).

Endnotes

[1] A lot of literature only casually mentions the pressure that the Nixon White House had placed on then-Federal Reserve Chairman Arthur Burns. The most succinct analysis is provided by Bruce Bartlett, a former Deputy Assistant Treasury Secretary for Economic Policy under President George H.W. Bush. Please see Bartlett's posting in the April 18, 2004 edition of National Review. http://www.nationalreview.com/articles/210446/more-politics-fed/bruce-bartlett

[2] The Shah of Iran made this point in an interview with Time Magazine published on April 1, 1974:

> "[The West and Japan] had 22 years of cheap fuel that made Europe what it is, that made Japan what it is. Then the price of wheat jumped 300%, vegetables the same, and sugar the past six years by 16 times. Can you imagine?"

[3] Please see: http://www.dailymarkets.com/economy/2011/11/25/net-oil-imports-only-45-6-of-u-s-consumption-dependence-on-foreign-oil-lowest-since-1995/

[4] The Environmental Protection Agency (EPA) itself was created by Nixon in 1970 through executive order, as part of a wider executive reorganization plan.

[5] There are many available chronologies of the role of NEPA (and the Mineral Leasing Act of 1920) in the long struggle that ended with Congressional passage of the Trans-Alaska Pipeline Authorization Act in November of 1973. For a fairly comprehensive and scholarly overview of NEPA generally – from one of its legal defenders – see Lois Schiffer's piece in the October 12, 2004 issue of the Duke Environmental Law & Policy Forum. Ms. Schiffer was President Clinton's Assistant Attorney General For Environment & Natural Resources at the Department of Justice.

[6] Among much else, the original Energy Tax Act of 1978 gave homeowners a 30% income tax credit for expenditures on solar, wind or geothermal energy systems, up to a cap of $2,000. For the increment of investment over $2,000, up to $10,000, the law dropped the credit to 20%. Businesses got a 10% investment tax credit for solar, wind and geothermal, which was on top of the standard 10% Investment Tax Credit. And, the 1978 Act even gave employers a 10% tax credit for investment in "van pools" for their employee commuters. Our review here is by no means comprehensive.

[7] Please see statement below of then-FERC Chairman Joe Kelliher, on February 2, 2006, which recognized and finally dealt with the gaming of the Carter Administration's PURPA.

http://webcache.googleusercontent.com/search?q=cache:1OeChtyahCQJ:www.ferc.gov/media/statements-speeches/kelliher/2006/02-02-06-kelliher-E-2.asp+Kelliher+PURPA+abuse+2006&cd=1&hl=en&ct=clnk&gl=us&client=safari&source=www.google.com

The fact is that PURPA had been abused for years so that "co-generation" developers could capture wholesale electricity markets, and guaranteed wholesale electricity prices, because FERC regulations presumed that their excess steam was actually commercially useful in creating energy "efficiency."

The Kelliher-chaired FERC ended the "presumption of usefulness" of excess steam, even as much of PURPA itself was going away.

[8] For a link to cancelled nuclear power plants, please see: http://en.wikipedia.org/wiki/List_of_canceled_nuclear_plants_in_the_United_States

[9] It's more accurate to say that most of our nuclear power *stations* – as opposed to individual reactors – are unique. For instance, the 3 reactors at the Palo Verde complex in Arizona are duplicates of each other.

[10] Using NRC authorization statutes and NRC regulations, enacted or promulgated in the wake of the Three Mile Island accident – which required an emergency plan for every community within a 10-mile radius of a nuclear plant – the activists went to work. They convinced New York Governor Cuomo (the Shoreham nuclear plant on Long Island), and Massachusetts Governor Dukakis (the next-door Seabrook, NH nuclear plant), to effectively veto the operation of these completed plants by refusing to participate in emergency planning.

That refusal meant that NY and MA withheld their inherent police powers to either routinely *exercise* or actually *activate* their traditional emergency response activities: traffic control; ordering either general or targeted evacuations; activating the Emergency Broadcast System; allowing the placement and use of warning sirens, etc.

Congress tried to deal with this recalcitrance in the mid-1980s. It used NRC appropriations legislation to tell the NRC to "consider" emergency plans developed by the relevant utilities themselves. The NRC itself tried to help with its late 1980s "realism rule," which told its adjudicatory panels to assume that recalcitrant state and local governments would use utility-drafted plans in a "best efforts" response to an actual emergency.

But that didn't do the job. That's because NRC regulations required that the NRC make a *predictive* finding – as a condition for issuing an operating license – that in the event of an *actual* emergency, "adequate protective measures **can and will** be taken . . . " So, a utility-sponsored emergency plan could show, *theoretically*, that adequate protective measures *could* be taken, but utilities, alone, could never show – in the absence of state and local cooperation – that adequate emergency measures actually *would* be taken in a real emergency – the ***and will*** part of the litigation.

And, lawyers for NY and MA made a big show for years – through very expensive and years-long litigation at the NRC, and in the courts, that the "***and will***" part of the NRC standard could never be met.

Why? Well, for one thing, they weren't even going to *read* any utility-sponsored emergency plan. That way, in their logic – even though there were good plans out there – state and local responses to a real radiological emergency would be necessarily *ad hoc*, and therefore "inadequate" by definition.

It all got to be too much – even for the "states' rights" champions within the exiting Reagan Administration. Executive Order 12657 cut the knot. It gave to FEMA all the powers of recalcitrant state and local governments.

It was too late by then for NY's Shoreham, which is now decommissioned, but one of the two reactors at Seabrook survived and became, in 1990, the last contested nuclear plant licensing proceeding to cross the NRC finish line – 15 years after construction began at a projected cost of just over $1

billion for two reactors. In the end, the tab had approached $7 billion for just one reactor at Seabrook, NH.

[11] Please see 2006 Department of Interior Report to Congress at: http://www.boemre.gov/revaldiv/PDFs/FinalInventoryReportDeliveredToCongress-corrected3-6-06.pdf

[12] For Dr. Roberts quote, please see: http://www.paulcraigroberts.org/2007/08/16/free-trade-open-immigration-dogmas-must-be-rethought/

[13] Please see: http://inflationdata.com/inflation/inflation_Rate/Historical_Oil_Prices_Table.asp

[14] Please see GAO report at: http://www.gao.gov/assets/600/590761.pdf

[15] Please see DOI/BLM report at: http://www.blm.gov/wo/st/en/prog/energy/oil_and_gas/EPCA_III.html

[16] Please see CRS at: http://freebeacon.com/wp-content/uploads/2012/03/R42432.pdf

[17] State and Native lands would account for about 26 percent of production in the Coastal Plain, according to the USGS.

[18] Please see Energy Information Administration at:
http://www.eia.doe.gov/pub/oil_gas/petroleum/analysis_publications/arctic_national_wildlife_refuge/html/preface.html

[19] *Ibid*

[20] Please see Jay Leno from 2008 at: http://www.youtube.com/watch?v=DjfssrKGsBU

[21] For the full DOI May 27, 2010 report, please see: http://www.doi.gov/deepwaterhorizon/loader.cfm?csModule=security/getfile&PageID=33598

[22] For a reproduction of the engineers' dissenting views, please see: http://www.marinelog.com/DOCS/NEWSMMIX/2010jun00112.html

[23] Please see *USA Today* at: http://usatoday30.usatoday.com/news/washington/story/2012-05-22/deepwater-drilling-report/55143864/1

[24] For the 2008 USGS estimate, please see the agency's news release at: http://www.usgs.gov/newsroom/article.asp?ID=1911
For a discussion of far greater reserve estimates for Bakken, see LeFever-Helms at:
https://www.dmr.nd.gov/ndgs/bakken/newpostings/07272006_BakkenReserveEstimates.pdf

[25] For EPA's announcement about initial administrative actions against Range in Texas, please see:
http://yosemite.epa.gov/opa/admpress.nsf/d0cf6618525a9efb85257359003fb69d/713f73b4bdceb126852577f3002cb6fb!OpenDocument

[26] For EPA's initial claims in US district court against Range, please see: http://www.scribd.com/doc/47111636/EPA-v-Range-Resources-Jan-18-2011

[27] For EPA's withdrawal from all actions against Range in Texas, please see Bloomberg Businessweek at:
http://www.businessweek.com/news/2012-03-30/epa-agrees-to-dismiss-well-contamination-case-against-range

[28] See Rex Tillerson at: http://www.thepetropro.com/news/world-news/exxon-ceo-losing-our-shirts-low-natural-gas-prices

[29] Please see Bloomberg Businessweek at: http://www.businessweek.com/news/2012-10-04/exxon-bp-estimate-alaska-lng-export-project-at-65-billion

[30] For planned LNG export facilities, please see FERC at: http://www.ferc.gov/industries/gas/indus-act/lng/LNG-proposed-potential.pdf

[31] For Japanese LNG contracts, please see: http://fuelfix.com/blog/2012/07/31/freeport-lng-inks-deal-to-sell-natural-gas-to-japanese-utilities/

[32] Please see NAS for coal at: http://www8.nationalacademies.org/onpinews/newsitem.aspx?recordid=11977

[33] Please see various publications of the Edison Electric Institute, beginning with the Association's home page at:
http://www.eei.org/Pages/default.aspx

[34] For the complete June 2012 decision by the US Court of Appeals for the DC Circuit, please see:
http://www.cadc.uscourts.gov/internet/opinions.nsf/52AC9DC9471D374685257A290052ACF6/$file/09-1322-1380690.pdf

[35] *Ibid.*

[36] For EPA's IG report on the Technical Support Document for EPA's "Endangerment Finding," please see:
http://www.epa.gov/oig/reports/2011/20110926-11-P-0702.pdf

[37] Please see EPA's RIA at: http://epa.gov/carbonpollutionstandard/pdfs/20120327proposalRIA.pdf

[38] Please see US DOE for "bolt-on" Mercury control at:
http://www.fossil.energy.gov/programs/powersystems/pollutioncontrols/overview_mercurycontrols.html

[39] Please see IER report on fossil plant retirements at: http://www.instituteforenergyresearch.org/wp-content/uploads/2012/04/June-12-EPA-powerplant-shutdown-update.pdf

[40] See NRC's "Location of New Reactors" at: http://www.nrc.gov/reactors/new-reactors/col/new-reactor-map.html

[41] Please see NRG CEO David Crane at: http://www.forbes.com/global/2009/1214/issues-united-states-energy-power-nrg-nuclear-lite.html

[42] CWIP stands for "construction work in progress." It means, in cost-regulated states, that state public service commissions allow utilities to recover, from ratepayers, interest and financing costs on construction debt – not the construction costs themselves – before a project goes into operation and becomes "used and useful."

[43] RTOs were created in several areas in the wake of the Energy Policy Act of 1992, as implemented by FERC's wholesale open access transmission rules, starting in 1996 with Order 888 and its progeny. These FERC orders encouraged many transmission-owning utilities, often spread over several states in the same general region (New York and California are single-state systems) to surrender day-to-day management of their systems to "stakeholder-governed" Regional Transmission Organizations (RTOs). (Even utilities that did not join RTOs were required to open up their wholesale transmission systems and provide transmission service to others under the same terms and conditions that the owners provided to themselves).

The theory was that independent management of many individual utility transmission systems, under one roof in a region, and kept independent from generation owners, would promote competition in wholesale generation by preventing bias in terms of "letting in" or "keeping out" any particular owner or type of generation. *Very* generally, wholesale power prices for purchasing utilities would be based around the particular auction systems and rules of the particular RTOs (generators could contract directly with purchasing utilities). Terms and conditions for transmitting power to purchasing utilities would be based on FERC-filed Open Access Transmission Tariffs required of all FERC-jurisdictional transmission owners.

At any rate, and from all of this, we got the 13-state "PJM Interconnection" (above); the six-state "Independent System Operator-New England"; the "Midwest Independent System Operator", with 35 transmission owners; and the single-state "New York Independent System Operator" and "California Independent System Operator."

Then, on the state-regulated retail side of the business, many states (e.g., NY; Il; OH; MI; OR; all of the mid-Atlantic states; most of Texas; most of New England; etc.) required their utilities to open their systems to generation choice at the retail/homeowner level. Some of these states even required their utilities to divest their generation in the name of promoting retail choice. At any rate, the authority of public service commissions in these states no longer covers the pricing of generation, and cannot assure investment cost recovery of new generation.

[44] Please see NRDC's news release and link to full report at: http://www.nrdc.org/energy/12060701.asp

[45] For coverage of Cape Wind contract, please see: http://www.capenews.net/communities/region/news/378

[46] http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=US13F

[47] For a review of state-mandated renewable energy programs, see the Left-leaning "Center For American Progress" at: http://www.americanprogress.org/issues/2009/05/kenworthy_res.html

[48] For coverage of Caithness/Sheperds Flat wind, please see: http://www.reuters.com/article/2010/12/18/us-doe-wind-idUSTRE6BH0FK20101218

[49] For coverage of Agua-Caliente solar, please see: http://www.businesswire.com/news/home/20110120006360/en/Agua-Caliente-Solar-Project-Receives-DOE-Conditional

[50] Please see: http://www.autoblog.com/2010/01/04/report-number-of-cars-in-the-u-s-dropped-by-four-million-in-20/


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