

Energy and Climate Realities

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Power-Gen Conference
Las Vegas, Nevada
December 8, 2009

Thank you, David. Good morning, everyone. I'm honored to join you today.

In my 34-year career in energy I can't recall a time when the public discourse about energy has been so tortured with contradiction, bad math, hyperbole, and wishful thinking. And now the Copenhagen climate summit, the EPA's formal finding that carbon dioxide (CO₂) is a public health hazard, and the so-called "climategate" scandal have put global warming back in the news. So this morning I'm going to try to do something that seems impossible these days – and that's have an honest conversation about energy policy, global warming and what proposed "cap and trade" regulation means for America. My goal is to appeal to your common sense with easily verifiable facts – not hype and propaganda. But first, a few words about Questar.

Questar's mission is simple: We find, produce, and deliver clean energy that makes modern life possible. We focus on natural gas. We're one of the fastest-growing natural gas producers in the U.S. today. We're a major shale-gas producer, and that puts us at the center of what may be the story of the year in energy – booming U.S. natural gas supply. We're also in the interstate pipeline and retail gas utility businesses.

But you didn't come here for a commercial about Questar and I didn't come here to give you one. Let's talk about energy and climate realities.

There may be no greater challenge facing mankind today than figuring out how we're going to meet the energy needs of a planet that may have 9 billion people living on it by 2050. The magnitude of that challenge becomes even more daunting when you consider that of the 6.5 billion people on the planet today, more than 1.6 billion people don't even have electricity – never flipped a light switch.

Now, I'd love to debate the science of global warming. The media of course long ago declared that debate over. We're told that global warming's a "planetary emergency - got to change the way we live *now*." I've followed this debate closely for nearly 20 years. I'm an engineer. I'm surrounded by geologists and earth scientists. Our search for natural gas requires an understanding of the geologic history of the earth going back several hundred million years. So I tend to be skeptical when journalists hyperventilate about science: "world coming to an end – details at 11." My research convinces me that claims of a scientific consensus about global warming mislead the public and policy makers – and may reflect other agendas.

Here's what we know. Yes, planet earth does appear to be warming – but by a not so unusual and not so alarming *1 degree* per century over the past 250 years since the end of the so-called Little Ice

Age. And, yes, CO2 levels in the upper atmosphere have increased over the past 250 years from about 280 *parts per million* to about 380 parts per million today – that’s .00038. What .00038 tells you is that CO2 – the gas we all exhale, the gas in a *Diet Coke*, the gas that plants need to grow – is a trace gas, comprising just four out of every 10,000 molecules in the atmosphere. Imagine a football stadium with 40,000 people in it. 380 parts per million CO2 is analogous to just 16 people in a stadium with 40,000 people. Everyone agrees that CO2’s an important trace gas – there’d be no life on earth without it. And, yes, most scientists believe that man has caused much of this increase in CO2 levels.

But that’s where the *alleged* consensus ends. Contrary to what you read in the papers, *no one knows* how much warming will occur in the future. No one knows how much of any warming that does occur will be due to man, and how much to nature. No one knows how warming will affect the planet, or how easily people, plants and animals will adapt to any warming that does occur. When someone tells you they do know, I suggest Mark Twain’s advice: respect those who seek the truth, be wary of those who claim to have found it.

My perspective on global warming changed when I began to understand the limitations of the computer models that scientists have built to predict future warming. If the only variable driving the earth’s climate were manmade CO2, then the math would be simple – global-average temperatures would increase by a harmless 1 degree over the next 100 years. But the earth’s climate is what engineers call a “non-linear, dynamic system” and thus virtually impossible to model. The world’s most sophisticated climate models have dozens of inputs. Many inputs are little more than the opinion of the scientist – in some cases, just a guess. For example, clouds and water vapor. Many scientists believe that the net effect of clouds is to cool the earth by reflecting radiant heat from the sun back into space. But all of the IPCC’s climate models assume that clouds *amplify* human CO2 forcing. While this is possible, it’s an assumption, one that some well-qualified scientists doubt. The point is: If you don’t have consensus on how to model clouds, you don’t have consensus on the significance of human CO2 emissions.

And as Climategate reveals, computers can in fact lie – when humans make them lie.

There are many other “inconvenient” facts for those who claim that the “science is certain.” Common sense tells us that the sun is by far the biggest driver of the earth’s climate. Over the past 50 years, global-average temperatures have shown a higher correlation with solar radiation from the sun than atmospheric CO2 levels. In fact, empirical data over millions of years shows no cause-effect relationship between CO2 levels in the atmosphere and global-average temperatures. The warmest year in the U.S. in the last century was 1934 – 75 years ago, when human CO2 emissions were far less than they are today. Global-average temperatures have been essentially flat for the past 11 years, despite continued increases in manmade CO2 – none of the models predicted this. Atmospheric CO2 levels have been much higher in the past and somehow the planet has survived. None of this disproves the theory, but clearly, the climate is always changing.

But there’s science, there’s *Scientology*, and then there’s *political science*. With the media cheering them on, and with dissenting views ignored or suppressed, many in Congress believe they have a mandate to “do something.” So in late June the U.S. House “did something” – it passed the Waxman-Markey bill.

Show of hands, please: How many have read the entire Waxman-Markey bill? Well, you're not alone. Neither did anyone in Congress. The 1,428-page bill was still at the printer's when the House was voting 219-212 to pass it. In late September, Sens. Barbara Boxer and John Kerry introduced similar legislation in the Senate.

I'm not here to make a political statement. But Waxman-Markey is arguably the most asinine piece of legislation in American history – government at its worst. According to the U.S. Chamber, Waxman-Markey promulgates over 1,500 new regulations and mandates involving 21 federal agencies. It contemplates a level of federal government micromanagement of energy choices that is, frankly, shocking. Please, don't take my word for it. Judge for yourself. Go online, read the Waxman-Markey bill and then ask: Is this really what we want from government?

The core of Waxman-Markey is a plan to cap and trade CO2 emissions, to reduce those emissions by 83% from a 2005 baseline by 2050. To understand what this means in practical terms, let's do the math. Americans emitted about 5.8 billion tons of CO2 into the atmosphere in 2005. Divide 5.8 billion tons by the U.S. population of 300 million and you get America's carbon footprint - just under 20 tons of CO2 per person in 2005. Under Waxman-Markey, by 2050, we'd have to cut U.S. CO2 emissions by 83% to just 1 billion tons per year. The Census Bureau projects that by 2050, the U.S. population will reach 420 million people. Divide one billion tons by 420 million people and you get 2.4 tons per person per year.

Question: When was the last time America's carbon footprint was as low as 2.4 tons per person per year? Answer: probably not since the 1800s, before Thomas Edison taught us how to use electricity, before cars, trucks, and planes. 2.4 tons is about the per-capita carbon footprint of Bangladesh, Cuba, and North Korea.

In short, an 83% reduction by 2050 means that by the time today's high school kids reach my age they won't be allowed to use much, if anything, made possible with – or by – fossil fuels.

How on God's green earth – pun intended – are we going to wean ourselves from energy from fossil fuels in just four decades? We need to ask that question now – because when it comes to “how,” there's clearly *no consensus*. Simply put, with today's technologies, we can't get there from here.

The hallmark of this dilemma is our inability to reconcile our prosperity and our way of life with our environmental ideals. We like our cars. We like the freedom to “move about the country” – drive to work, fly to conferences, take vacations. We aspire to own the biggest home we can afford. We like to keep our homes and offices warm in the winter, cool in the summer. We like devices that use electricity – computers, flat-screen TVs, cell phones, the Internet – and many other conveniences of modern life that come with a power cord. We like food that's low-cost, high-quality, and free of bugs – which means farmers must use fertilizers and pesticides made from fossil fuels. We like things made of plastic and clothes made with synthetic fibers – and all of these things depend on abundant, affordable, growing supplies of energy.

And guess what? We share this planet with 6.2 billion other people *who all want the same things*.

America's energy demand has been growing by over 1% per year, driven by prosperity and population growth. But while our way of life depends on ever-increasing amounts of energy, we're "schizo" when it comes to the things that energy companies must do to deliver the energy that makes modern life possible.

We want energy security – we don't like being dependent on foreign oil. But we also don't like drilling in the U.S. Millions of acres of onshore public lands plus the entire east and west coasts of the U.S. are off-limits to drilling. We hate paying \$3 per gallon for gasoline – but not as much as we hate the refineries that turn crude oil into gasoline. We haven't allowed anyone to build a new refinery in the U.S. in over 30 years. We expect the lights to come on when we flip the switch, but we don't like coal. We get 50% of our electricity from coal, but it's dirty, and mining scars the earth. We also don't like nuclear power, the source of nearly 20% of our electricity – it's clean, France likes it, but we're afraid of it. Hydropower is clean and renewable. But it too has been blacklisted – dams hurt fish.

We don't want pollution of any kind, in any amount, but we also don't want to be asked: "How much are we willing to pay for environmental perfection?" When it comes to global warming, *Time* magazine tells us to "be worried, be very worried" – and we say we are – but we don't act that way.

Let me suggest that our conversation about how to reduce CO2 emissions must begin with a few "inconvenient" realities.

Reality 1: Worldwide demand for energy will grow by 30-50% over the next two decades – and more than double by the time today's high schoolers reach my age. Simply put, America and the world will need all the energy that *markets* can deliver.

Reality 2: There are no near-term *alternatives* to oil, natural gas, and coal. Like it or not, the world runs on fossil fuels, and it will for decades to come. The IEA's recent *World Energy Outlook* forecasts that fossil fuels will supply about 80% of world energy demand in 2030 – roughly the same as today. Yes, someday the world may run on alternatives. But that day is still a long way off. It's not about will. It's not about who's in the White House, or who controls the gavel in Congress. It's about thermodynamics and economics.

We're told that wind and solar power are "alternatives" to fossil fuels. A more honest description would be "supplements." Taken together, wind and solar power today account for less than one-half of 1% of America's primary energy usage. Over the past 30 years the federal government has pumped big subsidies into wind and solar power, and all we've got to show for it is a fraction of 1%. In 2007, federal subsidies for wind and solar averaged about \$7 per MMBtu-equivalent energy production. Compare that to the price of natural gas today – \$4.50 per MMBtu.

Why have subsidies for wind and solar power failed? Because our energy choices are ruthlessly ruled, not by political judgments, but by the immutable laws of thermodynamics. In engineer-speak, turning diffused sources of energy such as photons in sunlight or the kinetic energy in wind requires *massive* investment to concentrate that energy into a form that's usable on any meaningful scale.

As you folks know, you can't safely and reliably operate the power grid today with more than 10 – 20 % of electricity supply coming from intermittent sources like wind and solar. Until there's a major breakthrough in high-density electricity storage – a problem that's confounded scientists for more than 100 years – wind and solar can't be relied upon for base-load power.

And it's not just thermodynamics. It's economics. Over the past 150 years, America has invested trillions of dollars in our existing energy systems – power plants, the grid, steam and gas turbines, pipelines, refineries, service stations, home heating, boilers, planes, trains, cars, and trucks. Changing systems based on renewable energy will require massive new investment – and many decades.

To be clear, we need all the wind and solar power *the markets can deliver at prices we can afford*. But, please, let's get real – wind and solar are not “alternatives” to fossil fuels.

Reality 3: You can argue about whether global warming is a serious problem or not, but there should be no argument about the consequences of cap-and-trade regulation – it's going to drive the cost of energy painfully higher. That's the whole point of cap and trade – to drive up the cost of fossil energy so that otherwise uneconomic “alternatives” can compete. The price tag for cap and trade to U.S. consumers could be trillions of dollars over the next few decades. Higher energy costs will hit low-income Americans especially hard.

Given this staggering cost, Americans have a right to ask: How much future warming will we avoid for all of this sacrifice? The sobering answer is: probably none.

Global warming is by definition a *global* problem. A pound of CO₂ emissions in Chicago is the same as a pound of emissions in Shanghai. Even Lisa Jackson, head of the EPA, admits that Waxman-Markey will have *no discernible impact* on global temperatures unless the rest of the world makes similar cuts in CO₂ emissions. Our government's own forecasts show that by 2050, 70% of global manmade CO₂ emissions will be coming from China, India, and other non-OECD countries. Again, it's simple math. We can cut U.S. emissions by 83% - we can turn America into Bangladesh – and *global* emissions will still grow by over 30% by 2050. 219 members of the House and many in the Senate apparently accept as a matter of faith that the rest of the world will jump off the cliff if America jumps first. But China – the world's largest emitter of CO₂ – has publicly refused to jump. Ditto India. They've made it clear that they're not going to sacrifice economic growth in a futile attempt to sever the link between prosperity and fossil fuels. It makes no sense for America to act without a transparent, verifiable, global pact that includes China, India, and the rest of the world.

That begs another question: “How much more are Americans willing to pay for what is likely a futile attempt to fight global warming?” The answer is: not much. According to a Dan Jones & Associates poll, 63% of those surveyed said they worry about global warming. But when asked how much they'd be willing to see their electricity bills go up to help cut CO₂ emissions, only half were willing to pay more for electricity. Only 18% were willing to see their power bill go up by 10% or more. Only 3% were willing to see their power bill go up by 20%. Here's the rub: Credible studies show that the cost of electricity will rise by at least 20% under Waxman-Markey.

So, if Americans aren't willing to pay a lot more for their energy, how do we reduce CO2 emissions? Well, we can all agree that we should improve energy efficiency, stop wasting energy, and conserve. We can all agree that where it makes economic sense we should substitute lower-carbon energy for higher-carbon energy. Well, here's breaking news: We don't need a 1,428-page bill to do all of this. We've already got an energy policy that's working. It's called the *free market*.

Thirty years ago the U.S. government, extrapolating from then-current trends, projected that total U.S. primary energy consumption would exceed 160 quadrillion Btus today. Well, that forecast was "just a bit outside." U.S. primary energy consumption today is about 100 quadrillion Btus – 40% below the forecast from 30 years ago, despite the fact that the U.S. economy has tripled over that time period. Over the past 30 years, U.S. energy consumption per unit of GDP has declined by nearly 50% while U.S. oil consumption per unit of GDP has declined by 55%.

What's more, the private sector is pouring billions of dollars into the pursuit of new and more efficient energy technologies. These trends will continue – with or without cap and trade. It doesn't take an act of Congress – in the real world prices and incentives drive behavior.

The market – or more precisely, America's natural gas industry - has given U.S. consumers some really good news on U.S. natural gas supply. America's recoverable natural gas resource base has jumped 35% from just two years ago – to 2,100 trillion cubic feet (Tcf). That's over 90 years' supply at current consumption. To put 2,100 Tcf in perspective, that's the energy equivalent of 350 billion barrels of oil. Saudi Arabia claims proved oil reserves of 260 billion barrels. "Technically recoverable" and "proved" are not the same. But these estimates are just a snapshot. U.S. natural gas reserves will continue to grow as the smart people in my industry figure out how to produce gas from formations that today are thought to be unproducible.

Booming U.S. natural gas supply helps reduce our dependency on foreign energy. Unlike oil, 97% of America's natural gas supply comes from North America. But it gets even better: Booming natural gas supply is not only driving down natural gas prices. It's driving down CO2 emissions. U.S. CO2 emissions in 2009 are down nearly 8% from 2005. Some of that drop is due to lower energy use in a severe recession. But much of it comes from price-induced substitution of natural gas for coal in existing power plants. America's almost halfway to the Waxman-Markey goal of 17% CO2 reduction by 2020. No other country in the world can make this claim – and we didn't need a 1,400-page bill to do it!

And get this: 40% of America's installed electric generation capacity has been built to run on natural gas – over 400,000 MW, compared to 315,000 MW of coal capacity. But unlike those existing coal plants, which run at an average load factor of about 75%, America's existing natural gas plants operate at an average load factor of less than 25%. Over half of this underutilized gas-fired power plant capacity has been built since 1995. It turns out that the market's been way ahead of politicians who want to "do something" to reduce CO2 emissions from power plants.

Waxman-Markey makes a big bet that clean coal will someday become economic. But that day is also a long way off. Clean coal is sort of like the tooth fairy – we talk about it as if it's real, but no one's seen it. Based on what we know today, clean coal will be hugely expensive and it'll take decades to implement *on any meaningful scale*. The high costs will be passed on to consumers in electricity rates.

Once we figure out how to capture CO₂ at the power plant, we'll have to build a massive pipeline grid to transport captured CO₂ to where it can be safely injected. We'll have to drill thousands of CO₂ injection wells. The facilities required to do all of this will consume huge amounts of energy – perhaps as much as 30% of the output of the power plants. And where are we going to put all this CO₂? Questar owns and operates underground natural gas storage facilities. Gas storage is in high demand – we're always looking for suitable underground formations. But I can tell you that there aren't many.

Taken together, these energy and climate realities convince me that it's time America has an honest conversation about an alternative response to global warming: adaptation. In truth, while many scientists believe man's use of fossil fuels causes global warming, many also believe the planet will easily adapt to warming. In fact, many respected scientists believe that added CO₂ in the atmosphere may be good for the planet because CO₂ helps plants grow. When was the last time you read that in the paper?

You've no doubt heard the argument that even if global warming turns out to be harmless, we should still cut CO₂ emissions – as an insurance policy – the so-called precautionary principle. While appealing in its simplicity, there are three major problems with the precautionary principle.

First, none of us live our lives according to the precautionary principle. Let me give you an example. Around the world about 1.2 million people die each year in car accidents – about 3,200 deaths a day. At that pace, 120 million people will die this century in a car wreck somewhere in the world. We could save 120 million lives by imposing a 5 mph speed limit worldwide. Show of hands: How many would be willing to live with a 5 mph speed limit to save 120 million lives? Most of us won't – we accept trade-offs. We implicitly do a cost-benefit analysis and conclude that we're not going to do without our cars, even if doing so would save 120 million lives.

Second, the media dwell on the potential harm from global warming, but ignore the fact that the costs borne to address it will also *do harm*. We have a finite amount of wealth in the world. We have lots of problems – hunger, poverty, malaria, dirty water, to name just a few. Shouldn't we ask: How can we do the most good with our finite wealth? The opportunity cost of diverting a large part of mankind's current wealth to solve a potential problem 100 years from now means we do “less good” dealing with these current problems.

Third, the consequence of regulations that force a shift to inefficient and otherwise uneconomic forms of energy will be slower economic growth. Slower growth, compounded over decades, means we leave future generations with less wealth to deal with the effects of global warming, whatever they may be. The impact will hit poor people particularly hard. When was the last time the media pondered the moral implications of that?

In truth, humans are remarkably adaptive. People live on glaciers. People live in the tropics. Some live at sea level, others in mountains 13,000 feet above sea level. What's more, you can take every one of the theoretical problems caused by global warming and identify lower-cost ways to deal with that problem than what is likely to be a futile attempt to eliminate the use of fossil fuels. So before we start down this costly and likely futile cap-and-trade path, isn't it time for an honest discussion about adapting to the effects of global warming, whatever they may be?

Let me close with this historical perspective. We've learned over the past 30 years that energy choices favored by politicians but not confirmed by markets are destined to fail. If history has taught us anything it's that we should resist the temptation to ask politicians to substitute their judgments for that of the market, and let markets determine how much energy gets used, what types of energy get used, where, how, and by whom energy gets used. In truth, no source of energy is perfect, thus only markets can weigh the pros and cons of each source. Government's role is to set *reasonable* standards for environmental performance, and make sure markets work.

I thank you for your kind attention. Good luck with the rest of your conference. May you, your kids, and your grandkids continue to enjoy freedom, prosperity and a high standard of living made possible by abundant supplies of affordable energy!