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MuseLetter #262 / March 2014 by Richard Heinberg

This month's newsletter brings together the transcript of an interview on energy limits, which I did with Chris Martenson at Peak Prosperity, and a presentation on my book on energy limits — Snake Oil, which I gave recently in Vancouver, British Columbia.

The Oil 'Revolution' Story Is Dead Wrong

Interview Transcript

Chris Martenson: Welcome to this Peak Prosperity podcast. I am your host, Chris Martenson, and today, I am really excited to introduce a man who needs no introduction, Richard Heinberg, author, educator, speaker, writer now of eleven books including *Party's Over*, the one that got me started on the peak oil story, [The End of Growth](#), and [Snake Oil: How Fracking's False Promise of Plenty Imperils Our Future](#).



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Richard Heinberg: Try say that fast five times.

Chris Martenson: [Laugh] I did, and that is the best I could do [laughter]. Welcome, Richard.

Richard Heinberg: Good to be with you, Chris.

Chris Martenson: So I want to start here. *The Party's Over*, the book that did get me started on peak oil, written in 2003. And very clearly articulated, oil is a finite substance, and we built this whole giant growing economic model around it and that is a problem, it is a predicament. Here we are, eleven years later in 2014, and the party is still continuing. What is going on?

Richard Heinberg: Well, you know, I recently went back and reread the first edition of *The Party's Over* because it was the tenth year anniversary. And I was actually a little surprised to see what it really says. My forecasts in *The Party's Over* were really based on the work of two veteran petroleum geologists—Colin Campbell and Jean Laherrère. So they were saying back before 2003, because it published in 2003, so it was actually written in 2001 and 2002. So they were saying back in 2000 and 2001 that we would see a peak in

conventional oil around 2005—check—that that would cause oil prices to bump higher—check—which would cause a slowdown in economic growth—check. But it would also incentivize production of unconventional oil in various forms—check—which would then peak around 2015, which is basically almost where we are right now and all the signs are suggesting that that is going to be a check-off, too. So amazing enough, these two guys got it perfectly correct fifteen years ago.

Chris Martenson: Well, it is an amazing part of the story is that at a price, there is always more oil, right? If it was a trillion dollars a drop, I assume we would find ways to actually flip North Dakota over and scrape the source rock out. And so the price and availability and supply of oil is always a big deal. I see that a lot when people are talking about the resources of natural gas that exist but fail to tell me at what price those exist, right? To get the resource is always possible but the price is important.

And yet, we look at the economic sphere and we discover that the economy also has a price for oil but it's what it can afford to pay.

Richard Heinberg: That is exactly right.

Chris Martenson: And as I look across the last three years, we have roughly been averaging \$100 a barrel on the international landscape. And what do we see? We see Ukraine suddenly dissolving, we see Southern Europe with 50% unemployment rates—all things that I think were predicted by almost anybody who was really looking at the peak oil story a long time ago. It is all really coming true and yet the story today is not really connecting those two pieces together, except for people like you and myself and a number of others, but really a handful.

Richard Heinberg: Right. Yeah, the big news right now is that the industry needs prices higher than the economy will allow, as you just outlined. So we are seeing the major oil companies cutting back on capital expenditure in upstream projects, which will undoubtedly have an impact a year or two down the line in terms of lower oil production. That is why I think that Campbell and Laherrère were right on in saying 2015, 2016 maybe, we will also start to see the rapid increase of production from the Bakken and the Eagle Ford here in the US start to flatten out. And probably within a year or two after that, we will see a commencement of a rapid decline.

So you know, on a net basis, taking all those things into account, I think we are probably pretty likely to see global oil production start to head south in the next year or two.

But this change in capital expenditure by the majors, that is a new story. You know, just a couple of years ago, they needed oil prices around \$100 a barrel in order to justify upstream investments. That is no longer true. Now they need something like \$120 a barrel but the economy cannot stand prices that high. So you know, if the price starts to go up a little bit, then demand just falls back. People start driving less. And so the economy is unable to deliver oil prices to the industry that the industry needs. This is—I think Gail Tverberg is saying this is the beginning of the end. I think she is right.

Chris Martenson: Well, this part about the oil majors, I really want to harp on this because to me, this is a smoking gun. The oil majors are not in the business of supplying us oil. They are in the business of making money and they have been extraordinarily good at it. And they are businesses. Very intelligent people—I know a lot of people who work at Shell and Exxon. They are really hardworking. And they have scoured the globe. They have looked at all their possible opportunities and they have come to the conclusion that the extent to which they spend money on capex is the extent to which they are going to hurt cash flows and the potential for shareholder value and dividend payments.

So they have decided to cut back on capex—capital expenditures—meaning exploring for new finds, in-fill drilling in existing places, all the places, that upstream word you mentioned, that is creating more supply. They all have now, I think we are on the fifth year of declining output from the seven oil majors. These are the big ones—Total, Exxon, Shell, BP, etc.—and they have been spending, I think they have doubled their capex in the last five years and their collective output is down at least 10% or 12%. So they are spending more, getting less, and they have just thrown in the towel this year and said, “Until and unless oil prices are higher than they currently are, we cannot invest in this game anymore.” How is that not front-page news with Congressional committees being formed immediately in urgent haste?

Richard Heinberg: Yeah, I totally agree with you. I mean, this is extraordinarily important news and we are just not hearing it really. I mean, you know, the occasional article in the *Wall Street Journal*. But this is going to impact our entire way of life.

Another way of looking at this is declining energy return on energy investment. We have been talking about declining financial returns on investment in the oil industry and as you say, that is huge news. But just as big of news is declining energy returns. You know, high energy returns on energy investment is what made the Industrial Revolution happen. It is what made the middle class, it is what made urbanization and all the rest.

But you know, the industry is having to invest not just more money but also, more energy in producing unconventional oil and gas. So this means that more labor and more real investment of materials, as well as money, has to go into the energy production business all the time.

Now, if we go all the way back to the average energy profits of agrarian times, which were maybe three or four, five to one, something like that. You know, basically, virtually three-quarters of the population would have to be involved in producing energy in order to produce enough surplus for the other 25% to live in towns and specialize in being bankers or mayors or [laugh] whatever else, you know, stamp collectors, who knows. But that is the path we are on.

I read an article the other day talking about solar energy and how it produces more jobs than the oil industry and the coal industry

combined. But what the article did not say is that yes, and solar provides only a tiny proportion of the energy to society as coal and oil combined. So yeah, we want more jobs. That is a good thing. But look at where this is headed. If this trend continues, then at some point basically, there is not going to be enough surplus to fund all the things that we are used to, like education, healthcare, [laugh]...

Chris Martenson: Retirement?

Richard Heinberg: Yeah, right, on and on.

Chris Martenson: Well, speaking on solar for a second, whenever I give a talk, inevitably the hand goes up and says, "But what about this alternative future?" You know, Amory Lovins, we are all going to have carbon fiber cars and going to have this solar future. And for a while there, I had a hard time getting the energy return on energy-invested data out of what solar really was. I sort of have this twenty to thirty to one thing waving around on a graph. But that was industry-supplied data. And so the only real data I have seen so far is Charlie Hall and another gentleman whose name I do not...

Richard Heinberg: Pedro Prieto.

Chris Martenson: Yes, they took a look at the Spanish return. So Spain has enough experience and they have built both an aggregated solar tower collector with all the mirrors pointing at a central device, plus they have lots of install base. And they came up with some interesting results, didn't they? When they looked at the energy return.

Richard Heinberg: Yeah, they came up with, I think, a five to one or less. And just so folks understand, you know, a five to one return on investment would be great in the financial world. But in the energy world, everything we do requires energy whether—again—it is healthcare or education or manufacturing. All those things use energy but they do not produce any energy. So the little bit of energy that we invest in getting more energy has to be extraordinarily productive. Historically, it was in the range of a hundred to one with oil and coal and the early Industrial Revolution. Now in the US, it is down to about ten to one.

So it is questionable whether we can continue to operate a complex industrial society on energy profit ratios of less than ten to one. So if solar really is five to one, that is problematic.

Now, my friend, Chris Nelder, would probably be sitting here arguing with us that, in fact, solar is much better than that. And I am not an engineer myself, I have not done the calculations so I do not know. But I think there is good reason to assume that renewable energy sources, intermittent energy sources like solar and wind can give us better energy returns than were common during the agrarian era. But they are not going to be able to power the way of life we have gotten used to with cheap, portable, on-demand energy from oil and fossil fuels.

Chris Martenson: Well, my perception—and perhaps this is wrong—but when I look back and when people were in agrarian societies, I

see those as times when people's work life was rather expansive. The farming life is not easy. Anybody listening who is a farmer knows that and I have hung out with lots of farmers. It is a pretty full-time commitment. When the growing season is up, you are working hard. And what I see today is that even on minimum wage, which I think is paltry, but even on minimum wage, your need to work—the number of hours you have to work in order to buy the number of calories you need to live for the day—is really still very modest by any agrarian standard whatsoever.

And so that is what I think we are talking about here is that we have got these very expansive lifestyles that have sort of pushed out into all these really creative ways of existing. And those, just by necessity, retract as the amount of surplus energy we have shrinks.

Richard Heinberg: Yeah, and we are seeing that. Americans—even though the GDP is going up—for most Americans, their actual experience is that they are losing ground. Yeah, there are more jobs being created each month, we hear the statistics from the government. But they do not pay as much as the jobs that disappeared over the last few years. And so on average, people are finding that they are losing ground. And this is exactly what we would predict based on what we have been talking about with regard to the larger energy picture.

Chris Martenson: Oh, absolutely. So, I want to finish out on the energy story before we move on to really, the implications and I think socially, culturally, and psychologically of all this. Because you have got some fascinating things to say there. I have a quote I want you to build out on.

But first, let's really talk—so the shale miracle has really been pumped and hyped. And from my perspective, it is a lot of propaganda at this point in time because what I see are pieces in the *New York Times* even, which look like PR collateral shipped out by Range Resources and copy and pasted into the article.

Richard Heinberg: [Laugh] That is exactly what they are probably. [laughter]

Chris Martenson: Range Resources being one of the premiere North American operators in the shale play, not to pick on them personally. But something is really interesting going on there when we look at the Red Queen Syndrome, which says you have to run really fast. And I think people are familiar with this now because the shale wells deplete so rapidly that when you are in a semi-mature play like the Barnett, soon to be the Bakken, you have to then put in a thousand, fifteen hundred, maybe two thousand wells per year just to maintain production. Because behind you, your existing wells are falling off these cliffs. So you are running in place just putting in these new high-producing but rapidly depleting wells.

And in that story, somehow we are supposed to believe that this is our new energy future. But you said something really interesting earlier, which is that the Bakken is probably going to top out at some point in the not too distant future a couple, three years away. When did we first start drilling seriously in that? 2007?

Richard Heinberg: Well, the Bakken has been producing for a long time with conventional wells. But in terms of horizontal, hydrofractured wells, yeah, just in the last few years. I think 2007 is probably a good number.

Chris Martenson: So we are talking about supposedly one of the most productive, most amazing fields, and it is going to go from basically inception to peak in ten years. That is a completely different profile from the Ghawar, which is still, what, first tapped in the thirties, I think, and really producing in the fifties maybe?

Richard Heinberg: Late forties probably.

Chris Martenson: Yeah. And it did not hit a peak of production for decades, many decades. And we will have a long gentle down slope of many, many decades.

Richard Heinberg: Right, right. That is the difference between a conventional oil well where you have caprock and highly porous rock holding the fuel and what we are seeing here in the US in these unconventional plays, which is—you used the term earlier, "source rock." This is rock that has very low permeability. Much of the oil is already migrated out of it into conventional reservoirs or just migrated to the surface and volatilized probably millennia ago. And getting that oil out is technically possible but it is really difficult. It does not want to move through the rock, it wants to stay right where it is. That is why they horizontally drill and hydrofracture it.

But these are the last, worst plays—onshore plays—in North America. And geologists have known about them for decades and thought, you know, "We will never be going after source rocks," but here we are. That is where we are. This is the bottom of the barrel.

Chris Martenson: Arthur Berman put it beautifully in a presentation I saw where he said, "It is not a shale revolution, it is a retirement party." And I held a piece of this so-called "source rock" in my hand and I would not be disappointed to have this stuff as kitchen counter surface. It is not this open, wonderful, porous material that you could put your lips up to and suck something through. It is literally solid rock, by my human interpretation of feeling it. A little greasy, but it is basically just really, really impenetrable stuff, and that is what we are going after.

So between the oil majors saying, "We cannot make money at \$100 a barrel. We are slowing down or stopping or even reversing capex," and then the idea that we are drilling into things that take this extraordinary effort that are going to peak within maybe ten to fifteen years of their initial rapid, almost frantic production. And yet, somehow through this story, most people I talk to have no concern whatsoever because that is what they have been told. "Our energy concerns are in the rearview mirror, we have a hundred years of natural gas." We have all sorts of things that are just contextually and patently false. Like, provably false.

Richard Heinberg: Amazing public relations machine that the industry has trotted out. But you know, they need that public

relations in order to maintain the value of their assets. And those assets are basically millions of acres of drilling leases. And especially in the dry gas area, you know, they need those drilling leases to be valuable so they could sell them at a profit. And that is what many of these companies are subsisting on. Companies like Chesapeake that has not turned a profit on actual production of dry gas in any one of the last ten years, but still remains a profitable company. How? By selling off drilling leases. So how do you maintain the value of those drilling leases? Through the fiction that there are a hundred years' worth of gas there; that you can drill anywhere and hit a bonanza.

And that is what we decided to test with our Drill Baby Drill report that David Hughes authored at Post Carbon Institute. We looked specifically at the assumptions that they are making that the different plays are uniform among themselves and also, within plays. That in fact, you can drill almost anywhere successfully. And we looked at almost sixty-five thousand wells, we looked at the location of each well, the initial production rate, the rate at which they decline over time. And we found that those assumptions are not confirmed. That there are only small core areas within each of the plays that are initially significantly productive and that production declines rapidly over time in almost all wells within the plays.

So take all those things into account and you get a very, very different picture not just from what the industry is telling us but also, from what the government is telling us. President Obama in his State of the Union address in January was touting shale gas and tight oil as the energy saviors of America. And when you have it coming from the President himself, I mean, what more credibility could you possibly want? And yet, it is all down to public relations. The assumptions are disconfirmed by the actual drilling data.

Chris Martenson: And when you say government, I also think the state governments have really fallen down on the job. I think Texas does the best possible job of managing the situation. They have got really high quality people who know how to regulate the environment. I think they do a pretty good job with—you know, given the number of holes they punch in the ground, the number of accidents that you have with casing failures or water table disruptions statistically are low. Still very damaging to those that actually get impacted by them. And yet despite that, all that great sort of oversight and with Texas taking the highest severance tax, which is a direct tax on actual production, out of any of the like—you know, Pennsylvania is not even getting remotely what Texas takes.

Even with that, the Department of Transportation in Texas did this analysis and said, "Fracking is doing about four billion dollars of damage to our road surfaces and bridges on a yearly basis. These eighty-thousand-pound trucks, of which it might take as many as almost twelve hundred to complete a single well—six hundred if you want to re-frack it—and those twelve hundred trucks weighting eighty thousand pounds filled with sand and water and fracking fluid and who knows what and giant diesels and...

Richard Heinberg: Drilling rigs, yeah.

Chris Martenson: "...drilling rigs and stuff. They are only collecting

about a billion dollars in severance tax back to repair the road damage and doing four billion in damage." Who is going to pay that?

Richard Heinberg: Right, yeah. Well, you know, this story is slowly starting to leak out to state and local officials. I say slowly because there is still a lot of public officials who are victims of the snow job of the industry saying, you know, "This is going to be a bonanza for states in terms of not only tax revenues, severance taxes, but also, in terms of jobs and therefore, state income tax revenues and so on."

But more and more analysis is showing that the jobs are fewer. They often go to out-of-state workers who are flown in to do the fracking jobs and well completions. That the costs to state and local governments are often greater than revenues. And as this news comes in, you know, more and more places are turning against fracking. It has really gotten its toehold here in the US largely because of the subsurface mineral rights ownership regime in the US, which is different from almost everywhere else in the world where property owners also own subsurface mineral rights. So they benefit directly financially from fracking operations.

But it is still dividing neighbor against neighbor and it is still resulting in this boomtown frenzy that turns communities upside down. And more and more places are enacting laws or restrictions against fracking. Now this is in the United States. Elsewhere in the world where people do not own subsurface mineral rights and have no direct financial stake in oil or gas production, you can bet that the public outcry against this technology is going to be ten times greater than in the US. So when people talk about "Oh, we are just getting started and what we are going to do in the UK and Australia and China and so on," well, wait a minute. It is probably not going to go so well both because of the things I was just talking about and also, because the geology is different.

Chris Martenson: Right. And the regulatory environment, certainly in Europe—I will not speak as much about China, obviously, in this regard, but what—a lot of people are concerned about fracking fluid in the water table, but I think they are missing a big part of the story, for me. So, I was a former toxicologist. You know, fracking fluid—five hundred nasty chemicals in random combinations—toluene, benzene, xylene, you pick it, right?

Richard Heinberg: Known cancer-causing chemicals.

Chris Martenson: Awesome stuff, right? The fracking operation, you pump all these millions of gallons of water plus however many gallons of this fracking fluid down. You pop it and then it flows back and it goes into this big holding pit. And this is where I do not think Europe is going to lie down on this. When it goes into the holding pit, anything that wants to aerosolize or volatilize or otherwise drift away from that holding pit is free to do so. And lots of people downstream from these operations during the fracking operation report nausea, headaches, nosebleeds, all kinds of things that are very consistent with polyaromatic hydrocarbon toxicity. It is clear as day. And the reason that the oil companies can do this is because of the so-called Halliburton Amendment. They are exempt from any clean air act, clean water act regulations around these chemicals.

So what it is interesting is you could have literally hundreds of gallons of these things aerosolizing out of the fracking pit and going downstream. And right next door, you could have a dry cleaner that accidentally spills a liter of the same substance and boy, they would get in trouble—a huge amount of trouble because the EPA would regulate the bejesus out of that particular incident. There would be hazmat teams and oil scrubbies. And it is just this dichotomy between what we allow in the name of oil production versus other ways we would regulate ourselves. The gap is just enormous in the US. I do not think that gap exists in Europe.

Richard Heinberg: Yeah, I think you are right about that. It is going to be much, much more difficult for this. And you already see the public reaction in places like Romania and the UK—some pretty gutsy citizen efforts to stand in the way of trucks and just prevent this from happening.

Chris Martenson: Well, I guess that is encouraging. Now from my perspective, I think fracking happened because it happened so fast and under the radar in the US. In fact, I started tracking what I thought was a very obvious PR campaign back in 2011. There were a number of articles—one in *Reuter's*, one in the *New York Times*, one in the *Washington Post* that all had very similar language that basically boiled down to, "If the government and the environmentalists get out of the way, this is an awesome story," right? And there were flavors of that in each one of these pieces. I said, "Wow, somebody has got a PR message that says, 'If we can just get the environmentalists out of our way and if we can get the government regulators out of our way, shale oil and gas is going to be this awesome thing.'" It was a very, very brilliant campaign. [claps] Golf claps, right? It was nice.

But people bought it. They ran with it and it took years for citizens with nosebleeds and nausea and dizziness and destroyed aquifers to say "time out" on this. And so it took a while for this story to really begin to develop, and it is developing.

But I want to get to this quote because I think this is the crux of the whole thing. It is a recent article from your newsletter found at your website, RichardHeinberg.com. And the quote is, "Today, it is especially difficult for most people to understand our perilous global energy situation precisely because it has never been more important to do so." What do you mean?

Richard Heinberg: [Laugh] Yeah. Well, that is from an essay where I sort of take apart the politics of energy. You know, energy has never been more important—it has always been incredibly important because it is the basis of life, it is the basis of the economy. But it is even more important right now because we are faced with a requirement for an energy transition both because of climate change and because of the depletion of the energy sources we have been relying on, all the things we have just been talking about.

So we know we have to get off of fossil fuels and this is going to be a huge job. It is going to require trillions of investment and decades of work and so on. But nothing is happening. Why? Because it is

totally politicized. Climate change is completely politicized. On one hand, you have Democrats who say, "Oh, look at the science. You know, it is clear this is an important thing. We have got to do something about it. We do not know what but we have got to do something about it." And then the other political party says, "No, it is not happening. No, no, it is all just a conspiracy theory. There is no climate change." [Laugh] "And if the weather is changing a little bit, it is not because of fossil fuels. You know, that cow farts or I do not know, we do not know." [Laugh]

So as a result, nothing happens, you know, nothing happens with climate—depletion is not acknowledged. All of the things we have been talking about with the problems of the oil majors and capex, none of that is talked about by politicians because it would actually require them to do something.

So it has never been more important for the average person to understand energy issues than it is right now. But I doubt if there has ever been a time when energy issues have been so deliberately confused by the people who should be explaining it to us.

Chris Martenson: Well, I have certainly seen that. You know, one piece that I have to fight constantly is this idea of energy independence, where they lump all the BTUs from coal, natural gas, oil, hydro, wind into one spot as if they are the same thing and then say, "Oh, look, we are almost independent on this basis." It is a really bizarre way to do it and it is very deliberately obfuscatory and confusing, and unnecessarily so.

I am wondering in this quote, though, if there is not a sense that it is difficult for people to talk about this precisely because it is just too large.

Richard Heinberg: Yeah. Well, I think that is true, too. You know, if you go very far into this and you really start following the evidence closely, it gets kind of overwhelming. Not just in terms of the detail and the requirement for some math and engineering knowledge and so on, but just in sort of human toll, understanding that our entire way of life is really on shaky legs right now. And that we cannot count on a future looking anything like what we have today and that our children's future is likely to be very, very different and far poorer than our lives.

This is, psychologically, it is very difficult for a lot of people. I call this "toxic knowledge." And my books are full of this toxic knowledge and I always have kind of mixed feelings about conveying this stuff because I know I am going to depress people. I am going to cause them to go through probably some trying times personally, coming to terms with this information. And yet, is it better to know or not to know? Is it better to live in denial or to be aware of troubling truths? And when I think it through, I always come down on the latter side—it is better to know.

Chris Martenson: Well, I agree. And not doing anything is still doing something in this story, right?

Richard Heinberg: That is true.

Chris Martenson: There is no avoiding this. I understand the human desire to avoid unpleasant information. You know, if you have got that angry, irregular mole on the back of your leg, you can choose to ignore it or not. You know, that is really where we are at in this story. It is like, maybe we do not want to have to face this but here we are.

And so I really think of this as just a monumental, colossal failure of leadership, if not imagination. I totally understand if you are an unimaginative politician, you look at this story, and you say, "I cannot talk to people about self-imposed hardship and austerity. They are going to hate that." And they would.

Richard Heinberg: Yeah, absolutely right.

Chris Martenson: But the failure of imagination is, "Oh, by the way, we have done some really hard things in the past if we had the appropriate vision." And that is what we are lacking—that vision that says here is where we are going to go and here is how we are going to get there. "Hey, we have to fight some Nazis so here are all the things you are going to have to do without as we go through this process." If conveyed properly, I think people will move mountains. Conveyed improperly, which is just, "Oh, by the way, we just want your energy to become more expensive until you start using less of it and all your jobs sort of fall away," I agree, bad story.

Richard Heinberg: [Laughter] Yeah.

Chris Martenson: But what is really troubling for me in this story is when I talk to younger people, there is this extraordinary divide between my generation, the Boomers, and younger people, say the Millennials, and the poor Xers stuck in between. But the Millennials have looked into this larger narrative and said, "I do not get it. You know, how does preserving the status quo help me at all? Crumbling infrastructure, maybe an inappropriate infrastructure for the future I see coming, massive amounts of debt. I am going to have to pay for your retirements with no guarantee that I will get one out of this story," and that is not really a compelling vision in their—where is that vision going to come from?

Richard Heinberg: Yeah. Well, frankly, for all the reasons I outlined in that essay that you quoted from, I think it is unlikely that it is going to come from the top anytime soon, absent some kind of major government restructuring, whether it comes in the form of a coup or revolution or what have you. Where I think it has got to come from is the bottom up. And of course, that is terribly problematic because there are lots of things you cannot do from the bottom up. You cannot institute a carbon tax from the bottom up, you cannot reform agriculture as we know it nearly as quickly and efficiently from the bottom up as you could with just a few rule changes at the USDA.

But nevertheless, that is what we have got. And it is happening. I mean, I mentioned the USDA. The USDA points out in its recent literature that the segment of agriculture in the US that is growing fastest is local food. The local food movement trumps everything else in current agriculture.

So people are getting it at certain levels. Things are happening. It is just it is kind of below the radar and it is not going to be fast enough. It is not going to be enough of a change to avert the kinds of climate impacts that we are all concerned about and so on. But it is the leverage point we have. Operating locally, whether it is through the local grange or transition towns or just in your own backyard with your own neighborhood, that is where we can make a difference and a lot of people are already doing it.

Chris Martenson: In the absence of a compelling national narrative, people are arriving at their own. And by the way, it is very common. I go all kinds of places. I see the same sets of responses and reactions in Louisville as I do in Sacramento as I do in Austin. Still on a fairly small percentage basis but really growing...

Richard Heinberg: Yeah, when I tell people I am from California, they all go, "Oh, well, in California you have blah, blah, blah, blah. That must be so easy there." But you know, when I travel around, I see basically the same thing happening everywhere. You know, whether it is Michigan or New York State or British Columbia, you know. The local food movement is happening, farmers markets are happening, people are concerned about where energy is coming from and they are doing what they can to put solar panels on their own houses and do what they can in their communities.

Chris Martenson: Well, with that, a gentleman I was talking to yesterday, I think, outlined it very well. He said—he has done all those things. He said, "I have got my solar panels, I have got my garden, I support local food." Very necessary, completely insufficient steps.

Richard Heinberg: Absolutely.

Chris Martenson: There is this gap [laughter], you know?

Richard Heinberg: Yeah.

Chris Martenson: And he feels uncomfortable with it but a.) you have to be the change you want to see, so what else can you do besides be that change? And at the same time, in the sense that the things that we cannot control are still very large and potentially overwhelming, they might swamp our efforts.

Richard Heinberg: That is true.

Chris Martenson: And how do we begin to close that up? What can we possibly do?

Richard Heinberg: Well, I think knitting together all of those local movements is really important. I think what you are doing with Peak Prosperity, what we try to do with Resilience.org, is helping people understand that they are not alone in this. That there are people everywhere who are fighting the same fight. Help them connect up first with the people in their local communities, but also with people maybe on the other side of the planet who face the same challenge and figure out a really good strategy for dealing with it. Beyond that, I wish I could say, "Well, let's start a new political party," you know,

or something like that. But frankly, right now, maybe it is just the mood I am in but I do not have much hope for that.

Chris Martenson: Yes, I applaud people who are trying to work from what I will call the top down, you know.

Richard Heinberg: Yeah, if somebody is working with a big organization like 350.org or Sierra Club or trying to infiltrate the Democratic Party and change its policies with regard to fracking, you know, more power to you. If you can make some change at the top end, you have my total support. And I do not want to be discouraging with that.

Chris Martenson: I am in the same camp. I do think that this has to be local from the ground up. And here is part of it, I mean, if you just sort of—let's take two steps back and we will look at the big picture again and we will say, let's imagine for the moment that all of a sudden, world governments get religion around climate change and they really look at this. And obviously, the big sources of carbon happen to all be from coal, oil, and natural gas. That is most of it. So we get religion. We suddenly say, "Within twenty years we have to be burning 75% less of these things." The implications of that are extraordinary. You know, literally, it means my lights might not come on when I flick the switches. It means that I will not be able to transport myself by putting fuel into my tank. It means everything suddenly changes. If there was an Apollo Project and a Manhattan Project, it would be both of those times some other large number, like 100, in terms of the change we would have to go through to restructure ourselves in pretty much every way I can imagine. Plus pour all of this investment into these alternative energies so that we have something we can do.

If that happens, everything changes. But if we do not do that...

Richard Heinberg: Everything changes.

Chris Martenson: Everything changes [laughter].

Richard Heinberg: Yeah, and if we do not do that, then everything changes as a result of the economy coming apart, the debt bubble bursts, you know, agriculture declines because of the expense of oil and because of depletion of topsoil and because you cannot trust the weather anymore. And we have a very dystopian future if we do not do anything.

Whereas if we do what you were describing earlier, you know, if we were to take all of these challenges seriously and put trillions of dollars into the energy transition and relocalize food systems and all the rest, it would be the biggest thing we have ever done as a species. And it would be really hard and all the things you are saying—yeah, we would probably find a lot of economic casualties along the way. But I think the end result would be a lot better.

Chris Martenson: It might also be exciting and fulfilling for people who are engaged in that.

Richard Heinberg: We would have a huge project to devote

ourselves to, and for young people, I think it makes all the difference in the world. If you see the world around you basically going the wrong direction and coming apart, that is one thing. But if you see a big challenge ahead that you can devote your life to, even if it is a challenge on a scale of World War II, you know. It gave a lot of people—it gave their lives meaning.

Chris Martenson: Well I agree. I am going to float an idea. Because we talked about this gap between the Millennials, the young people on the one hand, and Boomers on the other hand. Roughly speaking, Millennials without a whole lot of assets because they are at that stage of their life; Boomers with a lot of assets. Now let's connect that, "I have assets" to this idea that we are kind of darned if we do, darned if we do not, big change is coming.

And so the challenge I would like to promote is this idea that Boomers, to the extent that they have assets and a sense of legacy potentially looming in front of them, really ought to be non-status quo, putting those assets to work while they still have utility. While you can still get traction. You know, the big brown truck of happiness will still roll up your driveway after you click "Buy" on Amazon, right? And give you awesome things, right?

Richard Heinberg: [Laugh] Why not adopt a farmer?

Chris Martenson: But why not that? You know, "I am too old to farm, I do not want to own one." I hear that a lot. And yet, these are people who, some of them are sitting on quite sizable, still recognizable assets in the financial system. The challenge is: why not put those in a place, in a direction, that feels good and makes sense today?

Richard Heinberg: Yeah. And for the young farmers—and there are whole organizations of young farmers now—one of them that I follow closely is the Greenhorns. And they are doing great work. And these are young people who are totally dedicated to farming and ecological—a truly sustainable way. And almost universally, the one thing they lack is access to land. And if they get access to land, it is usually on the basis of land rental.

So okay, supposing you are a wealthy Baby Boomer and you want to adopt a farmer, under what conditions is that actually a fair relationship? I do not know that there is anybody who has totally worked out the answer to that question but it is a question that needs to be addressed. Because if this turns out to be just a new form of serfdom where, yeah, there are a lot of young Millennials around who are capable of working hard and you know, "we can teach them how to farm, okay, let's put them to work for us" [laugh], you know? There is something wrong with that picture, you know. At the end of the day, the people who do the work need to end up owning the land. Again, I do not know how that looks, legally, but these young people need a sense of an end game in this.

Chris Martenson: Well, sweat equity is real equity and this idea that paper money is the be-all-end-all, that is sort of our cultural narrative, right? And if you have that form of capital, you have it all. And we have not traditionally awarded sweat equity. In fact, the

trends in labor are not good over the past decade and a half so we are even devaluing the human inputs more. And "oh, robotics, we will just do this—it will all be about capital."

So you are right. We have to find a way to make this equitable and here is that gap between the younger and the older generations: The older generations have everything to lose if the status quo is not maintained, right?

Richard Heinberg: Right.

Chris Martenson: And to be fair, they have paid into the system, they have worked hard, played by the rules, and had this expectation of retirement, all within the parameters of the system, but now we get to this new part of the story where we say, "Oh, we have over-crossed," right? And we know this, right? The entitlement programs, a hundred trillion underfunded and basic pensions everywhere underfunded and unlikely that that is ever going to, sort of, recover. And so there has to be the sense of releasing of expectations, releasing of what we thought we were promised on one end of the generational scale and finding a way to make it fair for the people on the other end. Because this is ultimately turning into a story that is not fair. And by nobody's fault. Can I say "not fair" without blaming?

Richard Heinberg: Yeah.

Chris Martenson: And so there is a fairness gap there. And I talk to young people and they look square at it and they go, "Yeah, I am not participating in that. That does not look right at all." And so here is an example of that: I know a guy in his thirties who lives in my county. I happen to live in one of the poorer counties in Massachusetts on a per-capita income basis. Very intelligent, working three jobs really intelligently. Still has to make use of food stamps, right? This is who he is. He has pieced this life together out of what is available as hardworking and as diligently as anybody I can imagine—probably better than I was doing at that age for sure. But I grew up in a different time, right?

And so I look at that and I say, "That is really fundamentally not fair," particularly when you have people on the other end who are sitting on relatively large-ish-sized asset bases at this point but they are desperately afraid of losing it. This guy on this end has nothing, these people are desperately afraid of losing it. We have got to close that gap.

Richard Heinberg: That is right. Yeah, one way or another, we have to address the problem of wealthy inequality in this country. Otherwise, it is already tearing us apart but it is going to do so much more savagely as time goes on.

This is what creates revolutions [laugh], I mean, look back historically, if the wealth disparity gets just too extreme. And we are backing gilded age levels of wealth disparity right now.

So how do you address that? Well, through different banking rules, through all different possibilities. In my book, *The End of Growth*, I suggested the possibility of haircuts for everyone. You know, just

chop a zero off the end [laugh] of all debts and assets. I do not know how likely that is but we are going to have to do something like that.

Chris Martenson: Well, it is encouraging that we see this at the local level. I agree that I do not see much yet at the national level to give me hope. Let me be honest. I think we are further away from what I would call a rational discussion in DC, not closer, over the ten years I have sort of engaged in this project of awareness. And so that...

Richard Heinberg: That is a sad commentary.

Chris Martenson: It is a sad commentary. I have a little personal fault and I am like, "Really? I must have failed at what I have done." I have a little of that lurking in there and yet it also confirms for me this idea that we have to prepare for a very different future because there are no preparations being undertaken that I am aware of. If they are doing it, it is a Skunk Works project.

Richard Heinberg: Well, the only preparations we see are, frankly, the militarization of police forces around the country and the ubiquitous surveillance. So that is not very confidence-building in terms of our future [laugh].

Chris Martenson: It is a set of responses that does make sense and I could actually, if I step into that role, I could understand why people would make those decisions.

Richard Heinberg: Yeah, well, they see that more social unrest is likely as a result of the current trends, so they are preparing for social unrest rather than addressing the trends.

Chris Martenson: Right. So with that, I see we are out of time on this wonderful interview. Thank you so much for your time today.

Richard Heinberg: I am sorry we had to end on kind of a down note.

Chris Martenson: Well, then let's not...

Richard Heinberg: I think—no, there was a lot of content in there that I think folks can draw encouragement from so I am willing to let it go at that, right? [laughter] But it has been a pleasure talking with you, Chris.

Chris Martenson: Well, thanks, and the pleasure has been mine. And people can find out more at your website, RichardHeinberg.com. And, any events coming up or anything people should know about?

Richard Heinberg: Oh, gosh. You know, my calendar is on the website and I do not look at it often enough. I do not even know what I am doing half the time.

Chris Martenson: I understand that model.

Richard Heinberg: More than a week ahead.

Chris Martenson: Well, fantastic. Because I totally understand how that works. So glad to hear you are busy and going to be out there helping to share this message. Because the summary I have is: It is not about preparing for the apocalypse; it is simply understanding and becoming emotionally accepting of the fact that these changes are coming. And if you choose to, the warning signs are all there.

Richard Heinberg: And there are lots of things that we can do ourselves and with our friends and neighbors and relatives. And the more we do, the better we feel.

Chris Martenson: So really, I see this as an invitation to get busy.

Richard Heinberg: Yup.

Chris Martenson: And the invitation is now printed in forty-eight point Helvetica font [laughter] and being hand delivered.

Richard Heinberg: Scrolling across the screen.

Chris Martenson: And there it is in the news every day and it is for anybody to see. So again, thanks for your time.

Richard Heinberg: Thanks, Chris.

Presentation at UBC Vancouver



declining returns on conventional oil

- 1998 – 2005: **\$1.5 trillion** investment in E&P yields 8.6 mb/d in added production
- 2005 – 2013: **\$4 trillion** investment in E&P yields 3 mb/d in added production
- **\$350 billion** spent on unconventionals responsible for all net production increase

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