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NANCY FLOYD*

Just by way of background, I have spent my entire career in energy—I hate to say it has been since 1977—and specifically working on clean energy, which really has been my passion.

And there is not a doubt in my mind that there has never been a time like now, where we have this collision of forces that are causing many people to think, out loud, that the green economy *is* the new economy. An unprecedented amount of money is going to support this area. Already \$150 billion in stimulus dollars have been earmarked for clean energy and energy efficiency, in addition to \$66 billion thus far in the United States. China has committed \$59 billion, and of course, there is more to come.

If you look back at past recessions, prolonged recessions, deep recessions, and the Great Depression, history shows us that the jobs that were lost do not come back; in fact, we have to invent new jobs. And this morning, as I was checking out CNN.com, the headline stated that the United States has already lost two million jobs just in 2009. So, I want to spend twenty-five minutes sharing my view as a serial entrepreneur and as an investor in this nascent, yet rapidly

* Founder and Managing Director, Nth Power LLC; M.A., Political Science, Rutgers University.

growing, industry, which people think will be the basis or the platform for a new economy.

Nth Power LLC was the first venture company to specialize in new energy technology, now called clean-energy tech or green technology, and I want to digress for a minute and give some history because this is a tough market to find a job. I say do not give up. Do not give up. It is tough but not impossible. When I started Nth Power in 1993, I had more people tell me it would be impossible not only to start a first-time fund, which is difficult in any circumstances, but to start a fund that has literally been a zero venture-capital investment. It was a missionary sell and took three and a half years to raise \$65 million. My cofounder and I calculated that we visited 197 investors around the world during the beginning, and nine of them signed up. So, for those facing this tough job market and just coming out of school, really anything is possible. Do not give up.

We have been investing since 1997, so three and a half years of raising that first fund. We now have \$420 million under management and have certainly reviewed more business plans than any other venture capital firm—six thousand business plans—and invested in less than one percent of those companies. Note that there are a lot of good companies that do not fit the venture capital profile, so those of you that become entrepreneurs and decide that you want to pitch a venture capital firm must understand that there are other sources of funding. We have to invest in companies that are going to grow very quickly. That is a small subset of all successful or potentially successful businesses.

Bloomberg New Energy Finance is a London-based group that keeps track of venture capital statistics, specifically in clean tech, and we have been listed as the most active clean-tech investor since 2001. Since there were not many clean-tech investors before that, I can confidently say we are the most active clean-tech investor.

Now, what is driving the opportunity in clean technology and renewable energy? When I prepared this speech, oil was \$150 a barrel. And oil is a little north of \$50 a barrel today—it is still relevant. The fact is that we have a fundamental supply and demand imbalance, and, even though demand for energy decreased in 2008 according to the International Energy Agency (IEA), the Agency is predicting that demand will increase in the next couple of years. Predictions for the next twenty years are pretty dire: the nation is going to double its energy consumption or energy use by 2050, at a time when the country is going to really have to reduce its CO₂

emissions by eighty percent. That is a daunting task, which cannot be accomplished with the technology available today.

We are watching as China, India, and other developing countries are coming online, demanding a standard of living that leads to resource demand. In the last twenty-five years in China alone, fifty million people rose out of poverty, and during that time frame, China tripled its demand for energy. Predictions show that in two years China will be the largest consumer of fossil fuels, finally surpassing the United States.

Of course, climate change is potentially the largest issue that is going to impact our planet, and the United States is now finally beginning to pull together from a policy perspective and link climate change with energy and other resource usage. That is going to be the greatest economical and technical challenge facing the country, specifically those of you who are students about to enter into the work world.

Finally, there are infrastructure issues, here in this country and elsewhere. The United States has grid constraints and other infrastructure problems related to oil and natural gas. My firm has the view that if the country is going to meet the world demand for energy, it is going to have to look at every option. So, our firm is looking everywhere—at natural oil and gas and other ways to produce energy cleaner and more efficiently. And there are ongoing security concerns that alone are reasons for this country to get off of fossil fuels.

This is really what is setting up all of the activity in clean-energy technology. I want to underscore the previous point that the status quo is not an option here. This is a chart that we put together, and I only have two countries on it, China and the United States. But the chart is populated with many of the developed and developing countries. This is data that comes from the United Nations, the IEA, Oakridge National Labs, BP, and Gap Minder. Now let me explain the organization of this chart. So, the horizontal axis is total CO₂ emissions in billions of tons, the vertical axis is primary energy consumption, and the size of the circles represents the population in both China and the United States. The chart begins in 1985 and ends in 2005. So notice the circle size change between 1985 and 1990, between 1995 and 2000, and between 2000 and 2005—the CO₂ emissions for China increase almost fifty percent. I mean this trend, if anything, underscores the need for new solutions, to apply our best entrepreneurial and technical talents. This is it.

Let me talk for a moment about the investment environment. That is the world I come from now, and it has changed exponentially in literally seven years. In 2001, there was not a lot of capital flowing into clean technology. Our firm had less than a billion dollars in investment capital, less than a billion dollars in initial public offerings (IPOs), and less than a billion dollars in merger and acquisition (M and A) transactions related to clean-tech companies. It really was a nascent industry, and in fact, our challenge as an investor was finding other venture capitalists (VCs) to invest with us. There were very few liquidity events. In venture capital, the way we make our investors money is by either taking companies we have funded when they were young public, or selling our investments to companies for cash or liquid stock that we can turn over to our investors. So, we had very little capital flow into start-up companies and few liquidity events. In terms of the entrepreneurs, we had very inexperienced management teams. They were technology focused; some of them came out of labs and some came out of utilities. The entrepreneurs did not think in terms of market and profit. They were really developing technologies in hopes of finding a problem to solve. They had really no track records in starting companies, growing them, and selling them or taking them public. The natural resource development program in this country was really focused on long-term research and development (R&D), and R&D budgets had been flat, even going back to the Clinton administration. And then we had apathetic customers. Customers frankly thought energy was just not important, just too cheap to think about—both saving energy or approaching energy issues differently.

So, 2001 was probably still too early to have a venture fund focused on clean technology. In 2007, there was \$3 billion in venture capital. The number last year [2008] was \$5 billion, though there was a significant slowdown in venture capital investment in the fourth quarter, with \$15 billion in IPOs and \$33 billion in M and A transactions. Clearly, clean technology has started to hit, has become or started to become mainstream. We literally have funds at every stage along the financing continuum, whether early-stage venture capital or early-stage mezzanine funds. As I said, we had a very healthy market while the economy overall was rather sick last year. In the long term, we certainly expect that will come back and may even come back in the second half of this year.

In terms of entrepreneurs, we are seeing the best and the brightest attracted to clean technology. These are entrepreneurs who have been

successful in other industries and are taking those talents and bringing them to clean tech.

The customers are empowered. Seventy billion dollars of corporate investments were made in the United States alone. Some of that empowerment comes from corporations that are feeling pressure from their institutional investors like the California Public Employees' Retirement System, and we have seen an acceleration of technology breakthroughs. We have not seen a big increase in R&D budgets. In fact, the venture capital community in some respect has jumped in to fund some R&D. We certainly expect bigger coffers for R&D out of the Obama administration, but venture capital firms will contribute to this acceleration of technology breakthroughs. And just a comment on that: we are seeing technologies that have been developed for other industries now being applied to energy. Wireless communications developed for the telecommunications industry are being applied to smart metering and the smart grid. Nano materials developed for other industries are now being applied to batteries. And that is a tremendous leverage off of R&D and investment made in other industries.

So, I want to quickly talk about the solutions landscape here, and, if you either agree with the IEA prediction of double energy use by 2050 or agree with my firm, Nth Power, we are going to need everything. The nation is going to need a broad set of new solutions to meet energy demand and address climate change. This is how venture capitalists categorize the landscape. I will comment on what is happening in the policy environment, though that is shifting everyday. In two weeks, I will be at the Capitol for two intense days of long meetings with the Senate and House Energy Committees and one-on-one meetings with key senators and representatives, as well as meetings at the White House and the Department of Energy.

It is really interesting—I never thought I would spend so much time on policy as a venture capital investor, but policy is a really important underpinning for this still-nascent industry. The good news is that this administration, the Obama administration, recognizes the green economy is one of the biggest economic development opportunities. Here in the state of Oregon, we are going to try to take advantage of that and translate the opportunity into jobs, which translates into investment capital.

Renewable energy—solar, wind, geothermal, and waste energy—has received 50% of all the venture capital funding in clean tech since venture capitalists started investing in this sector. This is a market

that has been growing rapidly: 25 to 30% annually for the past decade. But in 2008, it exploded. In spite of what happened with the world economy, solar photovoltaics grew 110% globally, U.S. wind energy grew 50%, and wind development in China doubled. Even at the 25 to 35% annual growth rates—and we are still in the early stages of this industry—this sector's growth is akin to the computer, the internet, and the wireless industries during their heyday. We are not talking about growth during their early days—during their heyday. And we do not see this slowing down in the long term. This year, there are going to be challenges, but not in the long term. Costs have come down for wind and for solar. Wind is cost-effective now in many wind regimes, and solar module prices fell 30 to 40% last year. Again, this is the combination of R&D, venture capital, and volumes. Note that of the top-ten solar companies today, three of them did not exist in 2000. And of the top solar companies today, none of them are headquartered in the United States.

We see growth slowing in 2009 but we also certainly see significant growth rates along the lines of 25 to 35% in the long term. In terms of policy considerations, there are strong policy drivers, which has been the case even before the current President, Barack Obama, was elected. For the past eight years, the states have really filled a critical void at the federal level as a policy driver. Twenty-six states have adopted renewable portfolio standards. Oregon adopted these standards in the last legislative session, and that adoption has been a very strong market driver. The President has a goal of increasing renewable energy threefold by 2010, and billions and billions of dollars from the initial stimulus package and other sources have been pledged to this goal.

When we make an investment though, we look at that investment as a stand-alone without any rebates or incentives that might be available today because those rebates or incentives could go away overnight. We are already investing in companies that are risky—more than half do not survive—so layering on the risk that the companies are dependent upon regulation or tax incentives is just too much risk to bear. We have to evaluate these companies absent any kind of incentives that are in place. The caveat to that evaluation is something like a renewable portfolio standard (RPS) adopted in twenty-six states. It is unlikely that all of those states will reverse that legislation overnight, and so, an RPS at the state level can now be viewed as a market driver when analyzing renewable companies.

Advanced transportation—new vehicles, next-generation fuels, clean-fueling infrastructures—is a very interesting area. Transportation in this country *alone* consumes thirty-two billion gallons of fuel a year and contributes 33% of our greenhouse gas emissions.

Customers are feeling tremendous pain because they are really stuck on one fuel. Alaska Airlines is stuck on Jet A fuel. Royal Caribbean is stuck on one fuel. Companies cannot move nimbly in response to price volatility for those fuels. The automotive industry is obviously very broken, entrenched, slow to move, and that situation is creating opportunity for innovation.

Over one hundred start-up companies have emerged in the last year and a half in this advanced transportation/clean transportation field. Some of these entrepreneurs are veterans of Detroit that have just thrown up their hands and said “Detroit cannot get it right. We can design a vehicle that makes sense, that consumers want, that addresses energy and climate concerns, but Detroit cannot do it. They will not do it. They cannot do it.” Some very interesting products are going to come on the market. Just last week, Tesla Motors announced the availability of their midpriced car—it is not very midpriced, at a cost of \$50,000—that is an all-electric vehicle, showing the start of a stream of other products coming out from outside Detroit.

In terms of policy support, there is strong support from this administration for clean transportation, including thirty percent manufacturing credits for electric and hybrid cars. But California really leads the way in policy support. The state has connected the dots between climate change legislation and transportation. In 2006, California passed groundbreaking legislation called AB 32, which is the Global Warming Solutions Act of 2006.¹ The law requires California to reduce its greenhouse gas emissions to 1990 levels by 2020.

Last week, California came out with regulations that allocate \$250 million a year for the next four years to build the infrastructure to fuel alternative vehicles. There is really a chicken-and-egg issue here. How can you have a proliferation of electric vehicles without charging stations? How can you have a proliferation of flex-fuel vehicles without ethanol and biodiesel dispensing stations? So, California has really led the way here. It is interesting to note that of the \$250 million, a third of the money is going to build hydrogen

¹ Cal. Health & Safety Code §§ 38500–38599 (West 2007).

refueling stations in California. Although it is not final yet, my understanding is that the California Air Resources Board has really bent to pressure from the U.S. automakers that said, “If you do not put in hydrogen fueling stations, then we are going to leave the state of California.” None of the investors think that fuel cell-powered cars are going to be here anytime soon—there are clearly other faster, cheaper options to address greenhouse gas emission reductions.

Energy efficiency in green buildings is the third category. This category clearly includes the lowest-cost, highest-impact measures that can reduce greenhouse gas emissions. The category ensures absolutely the best payback for customers in months, not years. Importantly, buildings consume 40% of the total energy used in this country and 70% of the electricity used. And buildings produce more CO₂ emissions than the transportation sector in the United States.

Green energy has not really been embraced by the venture capital community because it has not been viewed as really sexy technology. But, with all the stimulus dollars that are going to energy efficiency now, every clean-tech venture capital firm, a venture capital firm with a clean-tech strategy, is now looking very seriously at energy efficiency. And I think that is a good thing. It is the first step needed before renewables.

The other problem with energy efficiency is that there has been no sense of urgency on the part of customers. I think back on a magazine in 1996, not all that long ago. Chief financial officers from the *Fortune* 50 companies were interviewed and they said there was one expense they could not control—one uncontrollable operating expense—and that was energy. I think clearly attitudes have changed and there are new tools out there with very quick paybacks. We are going to see a proliferation of new energy efficiency technologies.

I mentioned this paper that we are publishing with MIT in the previous panel, and the paper addresses energy efficiency in green buildings. The thesis is that there may actually be accelerated innovation in new green building materials and new green building practices in this real estate meltdown. And the misnomer here is that green buildings cost more than nongreen buildings. I think there is an answer to the question of how, in an economy that is tight and causing everybody to save as much as they possibly can, do we see green products really gaining market traction. It really is looking at the business model, and the essence of our paper is that if you bring together all the stakeholders, the architects, the builders, the general contractor, and the owner at the beginning of the building process,

you can design the highest-standard LEED building for no extra cost. The building design should have little invested in HVAC systems. So, there are new business models in which green is not more expensive, and I think the country needs to think more about that and needs to educate people about that.

In terms of incentives, we all know energy efficiency has been a big focus for the Obama administration. It is in the first wave of stimulus dollars and is really addressing the need for shovel-ready jobs. Those resources, however, are going to go to companies that have already existing products—not really going to help my new, innovative, and small portfolio companies in any way. But there are going to be more incentives following this first wave. And I would really like to see fewer, larger, and maybe more cohesive, or coherent, incentives around energy efficiency.

Finally, we must consider intelligent infrastructure—this is really an oxymoron because we do not have intelligent infrastructure. Intelligent is the last word you would use to describe it. It is clearly antiquated. Twenty years ago, the rule used to be, and now I am specifically talking about the power grid, for every dollar that was invested in power generation, there was a dollar invested in the grid. For the last fifteen years, the rule has been: for every dollar that was invested in generation, ten cents were invested in the grid. We are seeing the fragility of that system at a time of high dependence on highly reliable power. The grid itself is the connective tissue for renewable energy, for clean transportation, and for energy efficiency. What are some of the technologies for improving this? The answer is advanced metering, sensors that sit on the grid, and home energy management. This is really a huge market but a very difficult market to sell into.

The customers for these kinds of technologies are utilities, and utilities are, respectfully, the customer from hell. They are conservative and hard to sell to—it takes years—but once you have them as a customer, they are great. But there are always issues around who owns what in the national infrastructure. It is an important area, an area that is also getting a lot of stimulus dollars. In fact, there is about \$11 billion allocated for smart grid development, and, specifically, much of that is for smart metering, which will enable things like real-time pricing, demand response, and other kinds of energy efficiency measures.

I want to put on my Oregon economic and community development hat. And I just want to talk about Oregon and the opportunity for Oregon—it just seems like a natural.

Oregon has this incredible brand around green, around sustainability. It really first developed as a result of the bottle deposit law, and the brand is one that companies spend tens of millions of dollars to build. The state has a very supportive policy environment. As far as the Business Energy Tax Credit, the jury is still out. We need to give it time to perform a proper cost-benefit analysis, but we have a very aggressive renewable portfolio standard. We have amazing expertise in this state—expertise in green buildings, in renewables, in wave technology, in clean transportation, in innovative agriculture research—and really strong manufacturing know-how. It is amazing, and I really think quite wonderful, that in a short period of time this state has become the leading solar manufacturer in the country. And that is only going to serve as a magnet to attract both other companies serving the solar industry and other companies that want to be part of a clean-tech cluster.

The prize, and this is an estimate that came out of work done by both Climate Solutions and Clean Edge, which are market research firms in the Northwest, is forty-one thousand to sixty-three thousand green jobs by 2025. I happen to think that number is conservative, but the reality is, even though Oregon has this green brand, the state has to systematically act on this because there is a lot of competition. Other states and other countries have connected the dots that green means jobs and investment capital. Our key competition from a state perspective is Governor Ed Rendell from Pennsylvania, Bill Richardson from New Mexico, and Arnold Schwarzenegger from California. I know of companies that have looked at Oregon but went to those three states, and others, because of strong incentive packages.

As oil prices have come down by two-thirds, I have been asked “Whether green technology is going to lose steam like it did when we got through the energy crisis of the 1970s and the 1980s.” The answer is absolutely not. We face an imperative here: not only a doubling of demand in our lifetime as developing countries really come online, but also the need to stabilize and reduce greenhouse gas emissions. That is an enormous challenge requiring the best minds that this world and country have to offer. It is going to require new technology. The status quo is no longer an option. But the good news is that we have shown as a country that we can accomplish this. We have done it before.

I want to leave with something that Thomas Friedman said when I saw him in Washington, D.C. Although this is not an exact quote, he said,

When my generation talks to our parents, we ask, “How could you have put up with racial or sexual discrimination? How could you have put up with it? Shame on you.” And I do not want my kids to ask me, when they are my age, “How did you let climate change happen? You had the tools, the intellectual capital, and the investment capital. Shame on you. How did you let that happen?”

I hope we do not. And I am pleased to be a very small part of finding new solutions. Thank you.

