

Keynote Speech

1999 Mathematical Finance Day

Boston University School of Management

April 25, 1999

by

Jeffrey K. Skilling

President and C.O.O.

Enron Corp.

To be a keynote speaker at this conference says something. I was trying to think on the way up. Here's what it says, and I decided that what it says is... I'm getting old. This is because about the only qualifications I have to be here is the fact that I'm getting old. I know all of us go through this. There is this one magic point in your life when you realize you probably do qualify to be a keynote speaker, and for me the moment of truth was on an airplane. Now I spend a lot of my time on airplanes so most of my moments of truth are on airplanes. But I was on an airplane and I was flying from London to Australia. For those of you who have been on flights like that, you know they are very long and very, very boring. In order to pass time you tend to read or watch a movie or sleep. After a while you're pretty groggy and you just kind of drift in and out half-asleep, half awake. Well at one point I was drifting and I noticed this woman was bending over me taking my Diet Coke glass away from me. But I was groggy and kind of woke up and looked at her and she was just this vision of loveliness. I, being groggy, looked at her and said, "Where have you been all my life." And she said "From the looks of it sir, I'd say for about half of it, I wasn't born."

Now that I've proven my qualifications for being here what I would like to do is talk about what all of you are talking about here. I think that there is something very fundamental going on in this line of technology and the thought process that goes into it. In fact I would probably go so far to say that for our industry, and I hope to have the opportunity to extend this beyond the energy industry, but for our industry, it might be the most important philosophical and practical area of investigation going on today. It is fundamentally changing the nature of our industry. Enron has been taking advantage of this technology in the thought process to fundamentally change our industry.

I had a bunch of slides and I was going to go through examples of *real options*, which has become quite the thing for people to talk about these days. In fact, I knew it was probably at the mature end of the product lifecycle because Business Week is writing an article on it now. They wanted examples, so they came to Enron because they heard Enron uses *real options* and they wanted lots of examples. They kind of caught me off guard because I don't think it is so much specific examples as it is a way of thinking about business, and a way of taking advantage of some of the very fundamental changes

occurring in technology to change the way you do business. So rather than go through those examples, and I've got oil refineries and ways you can go about changing a slate and by making investments of some kinds give you more alternatives than you would otherwise have. Examples of power plants that can burn natural gas or can burn oil or coal and the value of that, the ability to switch and why it is important. Examples of nodes on networks of electric or gas transmission lines and how having access to those nodes gives you alternatives to moving product in ways that could not have been moved otherwise. There are lots of those and I sure you're going over those today and you'll see those. Instead I thought I'd back up from it just a little bit and try to give you some thoughts about how I think this is changing the fundamental nature of the industry. Let me see if I can share this with you. It's kind of half-baked at this point; I've just recently been thinking about it and let me see if I can just start the discussion. I would be interested in any feedback that this group has. I spend a lot of time talking to investors, investors in our stock. Investors have a very long time horizon when you're talking about structural changes in industry. It's kind of like "what's happening this week" they may go to the quarter, but that is kind of rare. Anyway, I had to think further than that and that is what I would like to share with you today. Since I don't have an opportunity to do this very often I would sincerely appreciate any comments that you have and if you think this makes any sense.

Let me talk about evolving structure of industries. I think industry structure has changed and we (pointing to a member on the Main Table) were talking about Boston. I was in Boston going to Harvard Business School back in the late 1970's. Boston was in a bit of an economic recession at that time, which I guess had started in the 1920's as the textile industry had been leaving this part of the country for the South. However, it really turned around because Ronald Reagan spent a lot of money in the defense industry, which gave it a boost. But then why is Boston doing so well today. I think the reason Boston is doing so well today is there is something called *intellectual capital* that is being created through the education in this city. And I think in the future that is going to be critical to the growth of wealth for all of us and I think it will actually impact the way businesses are built. I'd like to give you a view of what I think might be happening to the fundamental structure of business and not just in North America, but around the

world. It is certainly happening in our business and let me see if I can describe to you why I think that real options are critical in this. I would also like to comment on one thing, Enron in some ways is an intermediary. Most people don't know that and a lot of people have said that the advent of the internet will eliminate intermediaries, that all people will be able to go directly to the source of what they are looking for and they will not need someone to help them do that. I'd like to comment on that too because I think its fundamentally wrong. I think that the answer is the opposite of that, and I think it goes back to industry structure.

Let me start on industry structure. Ford Motor Company in 1910 was an example of a new wave in industrial organization. Ford Motor Company was a fully integrated automobile manufacturing company. In fact, they owned forests where they cut down trees, to run through their sawmills, to put the floorboards of their model T's. They manufactured their own steel to put it into their model T. I think at that stage in the industry's development that was an appropriate structure, because you needed to have all the pieces because there was a lot of risk in the system. You were trying to make automobiles and if you couldn't get the boards or the steel, you stop making automobiles. The only way you could manage that risk was through backward integration and forward integration, control both sides so that you can deliver what you said you were going to deliver to the consumer. Along comes Toyota. Toyota is a fundamentally different industry structure. Toyota does not own forests. Toyota did not own the companies that made the radios for Toyotas. Instead Toyota went out and searched the world for the lowest cost, highest quality radios and the lowest cost, highest quality steel, and the lowest cost, highest quality tires, etc. They sourced all those items and they packaged them to meet some need that they identified in consumers. That is a fundamentally different industry structure than that full-integrated structure of Ford Motor Company. I would argued to you that it is a fundamentally superior structure from a cost stand point, because the odds that my forest has the cheapest trees in it at any given moment in time is about zero. If I have the ability to go out and search the world for the cheapest stuff and every single component of the package that I'm developing has the cheapest source I'm going to create a cheaper final product for my customers. Toyota was in the automobile manufacturing business, but let me take you to the energy industry, the industry that I

know best. All of the companies are vertical integrated, rigid asset intensive structures. Look at the local electric utilities they have a generation facility that they moved on transmission lines, to distribution lines, to the customer. You look at Exxon, the Exxon and Mobile merger, two dinosaurs come together to make one really big dinosaur. I'm sure the fat reserves will keep them going for a while but sooner or later they are going to have to rethink the way they do business. In the oil business, fully integrated structures, they have produced it, they piped it some place to a refinery, they refined it, piped it some place to a gas station and they sell it to the consumer in the gas station—fully integrated rigid structures. What we do in our business is try to break up that vertical integration through what we call a horizontal approach. We look for those interfaces, those linkages, between where someone is making something and transferring to the next level down the line and we try to cut in across all of the companies on a horizontal basis. We find some area that we can be a cost or scale leader in and provide that service to all players. Now if you are Exxon for example, you produce natural gas, and you sell it to a pipeline or an end use customer. We try to get in the middle of that. What we bring to the table is a service to our customers. What our customers want to buy in natural gas or what they want to buy in electricity is real simple. They want reliable delivery. There are only two ways to give them reliable delivery. One way is have a bunch of redundant assets, a bunch of extra gas fields, extra pipelines, and extra power plants. The other way is to pool up lots of different alternatives for serving those customers and if you have a good portfolio of those options, you need fewer assets per unit of the liability. Simple financial theory, in fact portfolio theory—you can take away non-systematic risk by the way you structure your portfolio's supply agreements and market agreements. It's cheaper, significantly cheaper than the old structure. Why wasn't it done before? It couldn't be done before because you need information. You need communication. You need the analytical techniques that you all are talking about here today.

I'll give you a real world example of how this works and why I think it is going to be the superior structure in the future. You have all heard about shocks in the electric business last summer. Last summer there was very warm weather in the mid-West and some power plants were down. And wholesale prices for electricity, which is typically about \$20 a megawatt hour, went to \$7000 a megawatt hour—that's a lot of volatility.

In that kind of environment one way of dealing with that is to have a bunch of power plants lying around just in case. What we did is a year ago, we believed there was volatility, and because there was volatility we could calculate how much we could afford to spend given our assumption of volatility, to prepare ourselves for that volatility. We could calculate how much we could do to put together alternatives so that if we did have prices go up or down we could have triggered action to mitigate. A lot of other people in the industry were not thinking about it that way. So we invested in things, like getting generating sites. We started permitting through local governments to see if we could get the environmental permitting process going so we could move faster. We had engineers designing power plants just in case. We started buying turbines or getting production options for turbines so if something happened we were in queue. Sure enough, the summer prices went up a lot. When you're in that kind of environment our customers need power. They needed power then, they needed power this summer, they needed power next summer and they needed power the summer after that. We were in a position to deliver as we had a bunch of options in our portfolio that we were able to exercise and thus sell them power. We were able to sell the power more cost effectively because we had all the pieces in place. That is going to be the wave of the future. It's going to be using brains, computers, technology, and pricing theory to understand what the alternatives are and then positioning yourself for those alternatives. That's where *real options* come in, and its powerful stuff. In our business, the gas and electric business, we are 8% of the gross fixed investment in North America. If you use this technology and this capability I think that number should be 3%. You're talking about enormous wasteful use of resources across the continent because people aren't thinking about things creatively. They are not willing to understand risks and take measures to mitigate that risk and have options available. It's going to have a huge impact, but I think it is going to be more than our business. I think it is going to be all across the world. Going further into this industry structure argument. What we are trying to do is get customers. First we find out what the customers want, then we make sure that we have locked up strategic logistic assets that make it possible for us to deliver it to them. Not a lot of assets, just strategic assets, scarce assets to deliver to those customers, and then we make markets. We make markets of all the different components of an electric supply agreement,

whether it is a location difference, a time difference, or a price difference. We make markets in all those. We source from markets because those markets in aggregate will be cheaper than some linked vertical integration of the past. That is what we do and I think that that is the model of the future for all of us.

The customer is king. Figure out what the customer wants and then figure out how you package it cheaply, not how you make it. There are going to be some people who make components and they are going to be good at making components. Farmers are good at growing corn, natural gas producers are good at producing natural gas they are not real good at this other stuff and they don't have the money or the expertise or the interest in developing that capability. Let them produce, let the customers buy, and let some people package those pieces together. Whether you are Toyota or Enron, the same thing applies. I'll hypothesize that there will be an industry structure that is going to be created shortly where instead of these traditional industry structures that we've seen, General Motors, Exxon, US Steels, etc., what you are going to find is that there is going to be different groupings of people. There will be some people that are customers, and there are going to be some people that are suppliers that actually make something, and there are going to be some people that are packagers. Then there is going to be a network that ties it all together and the network will be a logistics network and an information network.

Which brings me to the next piece, the need for intermediation and the need for intermediaries. Does the Web eliminate the need for intermediaries? Quite the contrary. There is a lot of data out there—a lot of information. There is also a lot of risk out there and you need someone that is going to step in and interpret the information and data, understand what the alternatives are, and take the risk to ensure you are going to deliver what you intend to deliver to that customer. There are going to be four types of companies in the future: customers, suppliers, packagers, and network operators. Right now, that is going on inside big companies. In the future I don't think it will go on in big companies because I don't care if you are Exxon, you don't have the scale. Therefore I think it is going to be a fundamentally different kind of industry in the future. That is a view of the world and why this stuff is so important. I think you saw the application early on in the financial industry where you had highly fungible homogenous

assets, it is easy to deal with then in those terms. You are seeing it move into our industry, which is kind of a hybrid industry, where you are dealing with a commodity that is fungible, but we have lots of assets that are heterogeneous. You need to think about different ways you can value those, but I think it will move forward from here to making soap. I think that can happen in the future and the same technology, the same mathematics, the same thought process will work in that business as it works in foreign currencies. This is big stuff and we are certainly interested in all the work that you have done, all the theory and research that is going on, because it is changing our business.