OFFSHORE ENERGY CENTER HALL OF FAME

BOEM DEEPWATER GULF OF MEXICO HISTORY PROJECT

Interviewee:	Steven Wheeler
Date:	September 25, 2010
Place:	Houston, Texas
Interviewer:	Tyler Priest
Ethnographic preface:	Steven Wheeler hailed from Montana, from which he followed his father's career into the oil industry and eventually to Houston. Wheeler earned a degree in mechanical engineering from Texas A&M, and promptly joined Texaco in 1975. He spent twelve years with Texaco in the North Sea, where he was introduced to subsea production technology, and worked especially on several record-setting subsea tie-back systems. In 1988 Wheeler returned to the Gulf of Mexico, and helped form a team that projected Texaco's potential future in expanding into deepwater. After management declined to fund a program up to perhaps $70 million, Wheeler and others at Texaco used a smaller amount of money to begin setting up a joint industry research group, known as DeepStar. The DeepStar group is widely recognized as helping to advance deepwater and subsea technology rapidly in the early 1990s, and thus contributing to the deepwater boom that followed.

File 1

TP: This is an interview with Mr. Steven Wheeler for the 2010 OEC Hall of Fame. Interviewer is Tyler Priest. We are in Houston, Texas.

Congratulations on your induction.

SW: Thank you.

TP: Why don't we start with a little background. Where are you from, where did you grow up and go to school?

SW: I hail as my hometown Billings, Montana. I followed my father's career eventually to Houston as part of the oil industry.

TP: He was stationed in Billings before—

SW: Yes. He was part of the Exxon Corporation and came to Houston to—well, basically the oil center, so he came here from that. I grew up basically in Houston, went to Texas A&M, got a B.S. degree in mechanical engineering from Texas A&M. Believe it or not, then I went and joined a rival company to my father; I went to join Texaco.

TP: How did you choose Texaco?

SW: Well, I started off with them as a co-op engineer, and I was working a rotation system where I'd go to school a semester, work for Texaco a semester, and I joined them after graduating in '75. It wasn't too far after that that they said, "We have an assignment for a young individual to go to the North Sea and the U.K. and participate in some offshore projects there."

So it wasn't shortly after I had joined Texaco that I went to the North Sea. I got married there and eventually had four kids, because what turned out to be a thirteen-month assignment ended up being almost twelve years. So I didn't read the fine print when I signed on for that one. But it was really interesting, and there was where I got introduced to subsea production technology.

I was part of a project there, the Tartan Project. It was one of these good news-bad news stories. The primary field was not very productive and they needed to bring on supplemental production, and they aggressively pursued a subsea development program. I got to lead that program. We were bringing back production, and eventually turned it into a very successful project, but it was all subsea oriented.

TP: At what depths are we talking about?

SW: It wasn't giant depths. It was like 370 feet about 150 meters or thereabout. One of the projects that was very successful there, that was kind of a pioneer project, was Highlander. There we developed a field—at the time it was kind of record-setting. It was twice the offset distance that had ever been approached. It included remote gas lift of the wells, it included—

TP: What distance are you talking about?

SW: It was eight miles, about twelve, fourteen kilometers, thereabout. At that time, the furthest offset was like four or five miles, with the UMC there for Shell. To bring that back—and it was all downhill, and I don't know if you appreciate multi-phase flow, but basically when you go downhill, the gas and liquid separate. It forms a natural separator. So this was all downhill from Highlander to the Tartan platform, where we tied back, and we then put in a subsea separation system to separate the gas and the liquid and pump the liquid up to the surface and receive the gas, and flow that up. So that was the first time the industry had really used gas and liquid separation on the seabed to aid flow and to modify the platform processing requirements.

TP: What special challenges were there in developing this multi-phase separation?

SW: The pumping technology, the way we did it in terms of deploying the pumps in riser systems so that we could recover them from the platform without having to use divers or remote operated vehicles. We had to level-control the separator system and manage the slugs that came into it. So that was the principal technology.

What was also interesting, we flowed the production so low, in terms of pressure, that we avoided hydrates. Hydrates are one of the nemesis for deepwater, where you have gas and water mixing and they form an ice crystal similar to snow.

TP: Like the one that ballooned up the [BP *Deepwater* Horizon] top hat.

SW: Right. So you can appreciate it because it's even a more challenge in deepwater, but if you can get the pressure down, you can either keep the temperature high or the pressure low to combat those, because that's the functions that trigger that.

TP: That's why you had low pressure flow.

SW: We had very low pressure, and came in and we were producing it so low, in fact, if we had a leak on the system, we would producing the ocean. We would never have a leak really to the environment. So that was kind of, I think, the hallmark for my career in the U.K.

We did another project, which we even took that separation technology and miniaturized it and put it into a complete system itself. The company never really broadcast that one too much, but it was called Petronella, and that was another really world-class—small field, but world-class technology in terms of moving separation. In fact, the Shell's Perdido platform is using a system very similar to that in the deepwater. They've modified that design and they have applied it in deepwater. So it's kind of the first time that system—

TP: It's interesting, early technology was developed in the Gulf and transferred elsewhere, but subsea technology, which originally was Shell in the Gulf, but what really was commercialized in the North Sea. I mean, that's my understanding. Then brought back to the—

SW: Subsea technology for sure, and then brought back. So we were growing the technology mostly there. In fact, that's kind of how then shifted back to the U.S., in the fact that Texaco at the time inherited a great deal of Getty's offshore acreage as part of that acquisition, and a lot of it was in deepwater. They were trying to rationalize how to develop that.

TP: I didn't realize that. So that's where a lot of their deepwater portfolio came from.

SW: I don't think it was necessarily a company vision to go there; it was just something that was thrust upon them. So, they formed two specialized teams.

One was a facilities-oriented team; they called it the Deepwater Technology Acquisition Team. They were looking around the world as to where they had expertise, and so I was trying to bring back the subsea production technology expertise to that group. They had others that were in hydrodynamics and floating systems and everything else. It was a broad-ranging group, but I was focused on the subsea technology portion of it.

TP: So when did you come back to the Gulf?

SW: So that was late eighties, '88, I came back to the Gulf and we formed this team. They had a subsurface team also looking at the reservoirs and the geologic history and the reservoir properties that we were expecting. We put together this story, and said, "Okay. If we, as a company, were to go into deepwater, this is what it would take. This is what the portfolio looked like, this is the technologies that map over it the best." I asked for a very big price tag of funding, and at that time it was very significant. It was somewhere between 70 and 100 million dollars to evolve the technology we thought we would need to develop that portfolio, primarily in the Gulf of Mexico.

TP: You're really looking at tiebacks at this point, is that right?

SW: A lot of the portfolio was very small, so you had to have some big fields to create infrastructure, but then the small fields around the infrastructure became very commercial. So we actually mapped out centers or a hub.

TP: So it was a hub concept?

SW: It was an early view of a hub concept, of how to do that.

TP: I know Shell was developing a hub concept, but I imagine, anyway, it was about the same time, after they got their deepwater leases in the early eighties, but I don't know.

SW: They certainly had a hub concept. They were focused on kind of big elephants at the time and large TLP-based systems. Then from that, they said in the future they would step out from—we had viewed it as the way to even map into exploration and how to prioritize the portfolio. We took this story to senior—in fact, it was kind of funny, because we started out with the line managers, and we said, "We want $100 million in funding."

They said, "Well, we understand the need, but we're not going to sign on."

TP: Was it a study? Did you do a big study? Was there a title for this?

SW: We did a big study, and what was really interesting is, we were searching, as part of those studies, what are the commercial metrics that we need to make in order to be successful. At that time, the reservoir people had this very pessimistic view. They were going after big resources so that they had enough reserves, but their well count to access it was just way out of proportion. So we did some studies that said that, "Here's the rate you need to achieve, here's the recovery for well bore you need to achieve, and if you can't do that, it doesn't matter how big the field is because you'll never get your commercial metrics to the point where you will yield an adequate rate of return." So that was kind of eye-opening. What was scary is they had never seen metrics like that in terms of offshore production. At that time, Shell's big fields started to come on line, I think Auger and Mars, and they actually did have some wells that met those metrics.

TP: They made the discoveries in the late—we're still talking about the late eighties, right?

SW: Right. So we had a more optimistic view. So when we rolled this up from level of management, eventually I had the opportunity to go to corporate headquarters and present the story myself to the chairman himself and explain it.

TP: Who was the chairman at the time?

SW: At the time, Peter Bijur was kind of the real mover shaker at the time. They liked the idea, they wanted to pursue the technology. They just didn't believe that Texaco on its own had the financial resources to develop that across the—and

then have a lot of the technology float out into industry. So their remit to us was, "We want you to pursue it, but we want you to mobilize the resources industry to make it happen and share it." Because really it needs to be something that across the industry to be successful we all need to—

TP: So they suggested that?

SW: They told us that's what they wanted, yes. So I came back and I started working with Curtis Burton, who is in my group there in our Central Offshore Engineering Group, and we mapped out several strategies on how to mobilize, because we were aware that most of the other majors were interested in the same technology; they just didn't have a vehicle to establish a cooperative way of getting it as well.

So we talked to them about forming a JIP, and this is where a paradigm shift started to occur. They said, "Okay. Tell us specifically what you're going to do and what the cost is and what our ticket would be, and then we'll make a decision to join or not."

We said to them, "Well, if you join, it gets us more money, and, therefore, we do more work. So it depends on whether you join or not as to what we do." None of the oil companies could buy into that. If we didn't have a very firm program that was very definitive as to what they'd get for exactly what price, they wouldn't join.

So I went back to Texaco's management and asked for a pot of money to set a foundation program, and then after setting the foundation program, I went out and started to sell tickets to it. The tickets were at 10 percent, meaning that they could sit at the table, they could get at all the technology, they could have equal rights to Texaco in terms of deciding how the technology is, which technology is selected to work, and here was the core program. And they bought into it. In fact, I sold thirteen tickets at 10 percent each, so I became a profit center. They all said that, "Well, oh, my goodness."

So after completing the first phase, I took the three tickets that were left over that we had made a profit on, and I said, "Okay, that's the core nucleus for the next program," and Texaco put up the same funding again and progressed that as a firm program where everyone could buy into it. But all the money that was—

TP: So there were ten operators to begin with, in Phase One of what you call DeepStar?

SW: There were twelve operators and the MMS bought in as a ticket.

TP: So what was the price?

SW: The price was $100,000 per ticket. We guaranteed a million-dollar program, whether anyone else joined or not.

TP: A million dollar in seed money or funding.

SW: In seed money.

TP: Funding to develop technology.

SW: Since then, that paradigm has grown into a more cooperative relationship, where we all realize now we put our money on the table. From that, we collectively decide what we can do with it. So the program is now operating on that principle, but it took like four phases to get us there.

TP: What can you tell us about the rock soup or stone soup anecdote?

SW: Curtis Burton, I'll have to acknowledge him for kind of thinking of this. We also said, "You can put money on the table or you can put technology on the table," and we would accept both as a remit for getting into the program. What we also said, "If you're going to do a big study and you're going to do it because it aligns with where you want to go, you do the study, let us just look over your shoulder on it, and then you can contribute that as a participation fee or at least a supplemental fee." So we were asking all the operators to contribute nuggets of information that we could all build on and align on as important, and helped us coalesce as a group. We were trying to consensus-build on what is important and what is the way to approach deepwater. So technology studies were very helpful in that regard.

So the rock soup part came by—Curtis had this analogy of the Russian soldiers in World War II that were, unfortunately, not having provisions and having to provide for themselves for food, would come into a village, would set up a pot, offer the villagers the opportunity to participate in a community meal, if you would, if they contributed something to the pot. So that was kind of like us with the vendors and the other operators, asking them to come contribute to the pot. Now, the humorous part that Curtis and I thought about it, is some villagers came in and threw a rock into the pot because they didn't have anything else to throw in. I think we got a few rocks in the initial days into the pot. At least everyone sometimes looked and said, "That's not of much value to the rest of us, but we still accepted it as you want to be part of the program." Since then, I think everyone has contributed very significantly to this community pool, if you would, for technology, and it's come a long way since then.

TP: The point is to get the contractors to do research on technologies, so they know what the operators are interested in, is that right?

SW: I guess this is from a historical view back into the late eighties and early nineties, where the oil companies were not really happy campers at that time, and they were in a downsizing, outsourcing mentality. The groups that they downsized and outsourced and cut budgets on were the research groups. Their view is, why do research if it can't build a competitive advantage out of it? We'll just the force the vendors and the contractors to evolve that technology. But we weren't really giving them guidance. We weren't really giving them much funding to help them, and to a great extent, they were willing to undertake that role if they could align with what industry really wanted, and if there was some degree of consensus that would build a degree of standardization around it. Otherwise, they were reluctant, or they would pursue their own pet solutions, and a lot of them came up with really marvelous pieces of equipment but couldn't sell them, simply because the other parts of the development that require to be in place at the same time weren't there. So even though they had matured their technology, the other elements of the chain, if you would, weren't there, and so the functionality of that system never matured.

TP: Who were the chief contractors that we're talking about here? The J. Ray McDermotts and the drilling contractors? I guess the whole array.

SW: It was primarily the subsea equipment manufacturers, the Camerons, FMCs, Akers, and, well, Bico [phonetic] at the time were pursuing work. Plus, you would have equipment manufacturers that were looking at pumps and valves and new sensors and things of that nature. There were chemical companies that were evolving chemicals of really elaborate design for functionality, a lot of them dealing with hydrates. We were rationalizing, well, our approach to that, the chemical demand, the cost for these chemicals kind of made the project uneconomic, and so we were pursuing other ways of separation, other types of solutions that wouldn't rely on chemicals.

TP: So it was mainly focused on subsea equipment manufacturing and engineering, not so much the big TLP designs and things like that?

SW: No. It was more the smaller component manufacturers that to some degree were in isolation and they didn't have a vehicle to communicate to industry and solicit awareness of what they wanted or have really a chance to come out and explain how their product helped us achieve our goals. To a great extent, we had a great disparity of what was important on how to approach the deepwater development.

TP: I was reading one of your OTC papers, where you talk about the systems engineering approach, rather than sort of random components.

SW: Right.

TP: I can see the component makers need to know what kind of systems that they're building components for.

SW: I tried to help craft a little bit of the architect of why we needed a system to communicate as an industry. A lot of others really did a lot of the heavy work about identifying the technology issues, but what the systems engineering effort tried to do was look at five systems from a functional perspective. A lot of times when you do technology work, they have the two "why" questions, like why do you want to do something. Then when you answer that, they say, "Well, why is that important?" So they have a why, why thing. But really when you get down to it, the basis for that is that it's a fast map. A fast map is a functional analysis

system technique, and it looks at how you address those functions and it kind of explains why you do something and explains the how you do something. A lot of the vendors have the how, the technology, and a lot of the oil companies have the why, the business perspective, and they just didn't have a way of communicating that. So by analyzing these systems as systems, we showed how that you build components and you make decisions in certain ways on how you accomplish things. Like how you moor a rig on the station, how you would drill a well, and you have multiple choices on how you do that. What we did is try to show here is the solution that's formed the conventional approach, and then here are competing solutions that if they had certain gaps closed on them, would be very competitive and maybe in some cases even more cost-effective than what the conventional approach is.

So it helped us understand here's the conventional approach, here is the string of technologies that come together to make it work, here is the competing solution, and here is the string of technologies that need to make it work. Then we could go have the actual vehicle to communicate to the vendor community of how to fill the gaps, where the gap was, at least from the oil company's perspective. Whether it was right or wrong, it's what was viewed as a consensus that it was a gap, and what needed to be filled to make that solution work.

It also helped establish a value system. A lot of times when you get into technology work you come up with a widget, and you say, "Well, what's this worth?" Well, on its own, you can't value that very well. The value comes from the solution that it offers and how much better that is to the competing solutions that already exist. In some cases, you just offer a different solution that really isn't any cheaper at all, and some cases may be a little bit more expensive, in which case you'd have to say the technology has very low value.

TP: But you don't know what the market is.

SW: Right. And sometimes it changes. So there were a lot of things that wrapped up into that systems engineering, and that paper was trying to say, well, now that we understand the gaps, we need to figure out a way to get industry to cooperate a little bit more effectively. We need to get the vendors to realize that if they want to be successful, they have to look at what we were calling complementers, those that come together and support their solution, their technology, their equipment, that collectively form a solution set. Then we needed to show them what their competitor was, to say, "Okay, here is the competing solution, and if you can't offer a better solution than that or a lower cost solution, we're probably not going to buy your product, whether you have the technology and it was mature and refined, it doesn't matter, because we have a solution that's already more cost-

effective than that." So there had to be a benefit there, and someone had to realize what the benefit was, and we had to have a way of communicating that more effectively.

Then it became a way of refreshing, and every year we could come back and say, "Have these gaps been filled? Is the solution set workable?" Then when it got to the point where someone deploying it, DeepStar didn't quite get into the deployment mode. It spent a lot of its money on rationalization: What's the best way to approach something, where are the gaps, what in the industry is happening. So, DeepStar, whether people realize it or not, although it didn't have a big technology budget, it had a tremendous influence because all the operators were sitting at the DeepStar table and all the vendor community is sitting at the DeepStar table discussing with DeepStar money what should be done through their studies and work, would take it out now to other JIPs and other consortiums and other industry activities, and there would be the vehicle for application.

TP: So just looking at the funding of each phase doesn't really capture the leverage that it had.

SW: The influence, the influence and the leveraging of it, and, to some degree, it became a little bit of an architectural way of doing things, where we would say, "This is the best vehicle over here to approach something, and let that group do that, and here's another group over here. Here's a gap that no one is working on, and we'll put our money there." That way we could help promote across the whole industry an awareness of what's taking place and what needed to be filled and what needed to be reinforced, if you would, to move forward.

TP: So the phases refer to funding phases to it?

SW: Right. They usually were eighteen months each, about, and that's where we would sign on. Then every year the membership would renew, buy tickets, if you would, for the next phase.

TP: So was there a lot of cycling of different companies into and out of DeepStar or do you basically have the same core of people?

SW: It was the same core. I guess what was also occurring at that time was there were becoming fewer participants, not in terms of companies pulling out, but through the mergers. Mobil was merging with Exxon, Conoco. The mergers were dropping the participation level considerably. Of course, now a company twice the size comes to the table, but they would buy just one ticket. So that posed a little bit of a challenge to kind of keep the funding up. The major oil companies weren't dropping out as much as merging together.

TP: What was a sort of annual budget, and how did it evolve or grow?

SW: The core program where we talked about was a million dollars, and after that, it grew consecutively. I think we were doing like $7 million programs after that.

Since then, I've made several visits to the government and said, "Okay, well, when you look at the leveraging capability and the awareness capability—." I know the MMS likes to interface with DeepStar because it gives them an opportunity to understand what the issues are, what the challenges are, and what the industry is doing about it. I was talking to the Department of Energy several times to say, "Well, it helps to some degree make a master architect of where we want the industry to go." They were spending lots of money on clean coal, and maybe that isn't the way we ought to be spending money, maybe deepwater.

The point of that was—and I think this is one of these awareness issues as well—is although deepwater had resources, it's expensive to get at. I think it was Professor Economides had the term, I think it was called activation index, which was basically the cost that you need to invest to get production initiated. In the Arabian Gulf or the Middle East, to a great extent it has a very low number, but in the Gulf of Mexico for deepwater it's a very big number from the amount of exploration money you have to plow in, the development cost, the infrastructure building, and then production. Although you can make economics out of it, if you have a big enough resource, it was a challenge because the activation index was very high.

So the point was, if someone could help invest in the infrastructure, kind of like our highway system, to some degree, the amount of effort, the amount of risk goes down considerably, the amount of investment would go up considerably, and production could grow considerably in the domestic U.S., helping to cut some of our deficit spending. Since then, it's evolved a bit to where they have—I'm trying to think. It was the RPSEA [phonetic] Program and the RPSEA is using DeepStar as one of their vehicles to help decide what technology to support. So DeepStar's budget, on its own, I don't quite know what it is now. I think it's probably in the order of 7 million, but they also manage on behalf of the RPSEA

program and the government, I think like another nearly 20 million, I think is the dollar budget that they work on. So it's grown considerably. Again, they're not using their funds to evolve technology and do demonstration projects or qualification projects. It's more architecture definition, gap identification, solutions and kind of a system approach.

TP: A way of developing signals, right, signals to contractors on which direction to—you talk about pathways.

SW: Yes. That's part of the solution sets, these chains of technology that form a solution set, and it's a pathway in a decision tree. You say, "Well, we went a certain way and we made these decisions, and these are the technologies that support it." But there are numerous ways of doing things, and numerous alternatives. There are some that we haven't even created or thought of yet, that we haven't worked on.

TP: So is there a designated director of the DeepStar, who spends a good part of his or her time on that?

SW: I was with Texaco until the merger with Chevron. I chose to leave the company at that time, and I've since joined Exxon. I'm part of Exxon Mobil's development company. So I've lost track of exactly where the program has gone since that time, because Exxon Mobil, because of their own internal research efforts, which are really quite significant, have elected not to participate in DeepStar. They were in the early years, but since then they're one of the few companies that pulled out. So through that corporation I don't have access to DeepStar information. But I believe Chevron has kept it going from the early Texaco days. They've appointed an individual, and his role purely is to manage the work program for DeepStar and Chevron.

It used to be that Texaco would fully absorb all the administrative cost, beyond its ticket, and that was almost as much as the program cost it was itself. Since then, we've kind of rationalized that administrative burden was pretty hard for one company to carry. So it's now part of the overall cost of the program is the administration effort, hosting meetings, other activities, funding the projects, writing the contracts, issuing the purchase orders, those kinds of things.

TP: Are there other things that you wanted to get to?

SW: Well, I guess one of the things that we—this is my little soapbox, I guess. We as an industry suffer a little bit because when it comes to technology funding, we tend to do it on a project-by-project basis, meaning the project team rationalize what they want to develop, they rationalize the technologies that they think are the right ways to do that, and maybe there's a small piece of technology here or there that can help them do that and they tweak it, but all of our technology work in that manner is very incremental. It's not grand plan, moon-shot kind of things. It's "I can make a pump a little bit more efficient." "I can make the [unclear] cost a little cheaper." Some technology that incrementally improves the world but doesn't change it.

One of the things I was hoping that DeepStar could do is not only rationalize technology on the incremental basis, but rationalize the business model that underpins it and help us appreciate where the changes are there that we could now formulate new technology and really make this paradigm shift of how we do things. I've been behind the scenes trying to promote that a bit. It's a hard sell. We're kind of deeply rooted in incremental, and the moon-shot kind of stuff is really hard to sell. But I think there are some really interesting ways to do it.

A lot of that, if you get into these fast maps and actually understand the decisions we make and why we make them, it could be a different business model for Deep Water. In fact, we were actually trying to do a little of that. I think Curtis Burton called it the inchworm approach. Just to give you an example—and we talked a little bit about this activation index being one of those challenges. The other one was reservoir risk. Historically, we would have a discovery, we'd come and appraise the discovery to the point where we fully understood it, then we would build a production system usually fixed on it, platform-based, and produce it hopefully in an optimal manner.

In deepwater you have a discovery and you're aware that you have probably a pretty significant resource but you don't know how big it is, you don't understand the fluid properties or probably its producing characteristics, and so the natural inclination is to come and drill another well and absorb that data. But when you start talking, you know, 150, 200 million dollars a well and then a lag time of a year to absorb it, and then go drill another well, 100 million dollars and absorb the data, then go drill five or six more wells and this spans out now twelve years, you start to build a business model that—

TP: It's not sustainable.

SW: Well, it's not sustainable. A lot of times when they get to that, say, "Okay, we understand the resource," they shift back to what they call point-forward economics. They say, "Going forward from here, if we build this, it will be commercially attractive," and so the projects go forward. But when you look at historically the money they've invested and the time lag, particularly from a discounted perspective, it becomes very challenging. So if we look at that from a business model, we have to say, "Okay. Well, if that's our model, how can we make this compete with other resources around the world that are less demanding on that kind of thing?"

So we came up with this inchworm approach that said, have a discovery, appraise it just enough to know that you can put in a minimal investment, get production started, the production has to be significant enough to get a return on your initial investment, but it may not be optimal for the whole field. If you knew at all at the time, you know. If you knew exactly what that was at the time, you probably would maybe do something different, but if you fully understand the resource, to come up with optimal development you're back into our old paradigm of a model.

The inchworm approach was one of those techniques, where you get production started and you get an understanding from the reservoir of the production qualities and the resource, and you're getting the cash flow from it, from that you can make your next investment decision and grow that infrastructure a bit more. If it looks still good, you keep growing. So you kind of inchworm your way into it rather than this full-scale optimal development up front.

TP: Subsea is easier to do this approach with than the big—

SW: It's scalable. It's scalable, and that's why we kind of felt the subsea technology lended itself significantly versus TLPs or SPARs or things like that, where if you knew optimally about the field, maybe that would be the solution. But if you were to go approach it, to say, "I don't understand that and I don't want to spend seven years and a billion dollars trying to understand the reservoir and optimally develop it," it turns out in the big picture a much better solution to incrementally put in subsea wells. The investment is in the well, not in the infrastructure as much, and as you drill these wells, you can keep adding until you've reached optimal development of the fields. So that's just an example of how you start taking a business model and turning that back into technology needs again.

TP: How has that model evolved and become implanted in the industry? Or has it not, in your view?

SW: I don't think it is. I think when we do things, most management, most project management want to see that resource fully—

TP: Project management.

SW: Yes, project management. Want to look at a fully defined reservoir, that when they develop it, there's no disappointments. Really, I mean, if we start rationalizing what's the capital redeployment, meaning I started developing here, oops, it doesn't work. I'm going to pick up my facilities, which are now mobile and redeployable because they're not platform-based. You have a floating system, subsea well, equipment of that nature and redeploy it onto the new asset, and I've lost the well. Okay, I can't recover a hole in the ground, but there's new models on how you can—

TP: That was the model behind the development of Mobil drilling to begin with.

SW: Yes.

TP: Instead of drilling exploration wells from a fixed platform, you had to be able to redeploy in case of a dry hole, in the early days. I mean, it's a much different world, much different scale and technological challenges are different, but some of the same questions were being asked.

SW: Yes, and with floating systems and subsea systems, I think that opportunity is much greater. Then when we get back to technology work being supported by development projects, well, first of all, they have very tight timelines to achieve their goals and objectives. It's hard to do things of a very grand nature, and it's all pretty low risk, incremental oriented. We need some way of implementing a

new business model, and some kind of a way of a demonstration project that would show here's how that would work, and help everyone realize it a little bit.

I've been trying to sell that. It's a very hard sell and maybe it's not even achievable. I know in some regions of the world, maybe if you went to West Africa or some other region, you know, just the nature of doing the business and the relationships you have to have with the government, and the requirements they have on how you do development doesn't lend itself to these kind of things. I realize that, but somehow we have to take a more holistic view of technology and how it supports the business more than just the project than we do now. Let's put it that way.

TP: Also how it supports just general operating procedures. I don't know if this was the problem with *Deepwater Horizon*, but it seems like there's got to be a higher level of systems engineering and systems-level safety management. I mean, these are big, complex facilities and projects, and there's got to be an integrated understanding.

SW: We have to understand the whole system. I think that's part of the risk nature of the business. In other words, we do the best we can to the extent the technology is mature enough to let us do it. After that, you maybe get a little close to the edge. Sometimes events like that occur simply because you're too close to the edge. Maybe this isn't the case this time, but a lot of cases we design as much safety in there as we can, and after that, we have to say that we will have to operate with some risk, a little bit more risk than what you would maybe do in an onshore plant or facility, just because of the nature of the storm events that come through.

TP: You're never going to eliminate that risk. Did you interface personally with MMS through DeepStar? That interface, is it mainly through their technology assessment and research organization?

SW: When DeepStar forms a phase, they have committees. We have technology projects but we also have standing committees. The committees, to a great extent, are the same per phase. The technology projects that underpinned each committee changed considerably. There was one committee that was focused on government and industry programs, like API and things like that, so we had an ongoing relationship with the MMS. The whole point of that was we wanted them to see why we're gathering, what we talk about, what technology, what we

view as risk, what we view as challenges and how to deal with that, and so we engaged them. There was a specific committee to do that. So I didn't do as much with MMS directly.

TP: I'm just interested in how their regulatory program evolved as the subsea technologies evolved, because they have to keep up with the industry.

SW: They wanted to better understand the challenges of the industry and how we were approaching it, and what was safe and what was maybe less safe than what they would like it to be. Let's put it that way. To some degree we tried to build even on behalf of API. A lot of the recent API codes and standards have evolved from DeepStar. They were written in DeepStar committees and offered to API as a finished product, then to go through a little bit more evolution through the API committees, but they were pretty well finished products.

TP: So they're recommended practices and standards came out of API.

SW: Not all of them.

TP: But some.

SW: Some of the recent ones, and because it was harder for API, particularly in the mid nineties, to get the resources, because as people downsized, they just didn't have the ability to interact with API committees as well as they used to or had historically. So DeepStar kind of filled the gap there, I think. We're writing new specs and codes and standards for kind of the frontier area, which were not part of the API portfolio specs and codes, which were more conventional.

TP: Because a large number of API members aren't operating in frontier areas.

Are there other things you wanted to get to?

SW: No, I think you've touched on my hot spots.

TP: Can you talk about what you've been focusing on in recent years? You've been with Exxon for how long now?

SW: I've been with Exxon for about nine years now.

There was one other maybe interesting point. I'm supporting ExxonMobil, and I've just been recently assigned to a project in the offshore Atlantic, east coast of Canada, and it's an interesting project. It's kind of an ice region, and it's building on subsea tiebacks to infrastructure that exists there. But one of the things we were having was a team meeting, it was an alignment meeting where the development team was coming together for the first time, and we had a facilitator there as we tried to rationalize our visions and goals and objectives for the project and what we would like to see happen, said something as I reflect on, that would be a vision that I would also carry over to DeepStar. What this facilitator said was, "Think about what you want to have accomplished, what are the things that are important to you, what do you need to have happen, and formulate plans on making that happen, because if you don't, what will happen, you may still have a successful project, but it will be an extension of history that will get you there. It won't be that you visualized where you want to be and actually proactively progressed that work in that manner."

TP: You'll be taken there through inertia.

SW: Right. That's kind of it. That's maybe another way of putting it. It's inertia, history, course of events, what would normally evolve will evolve, and you may be successful, but it probably won't be—

TP: Won't realize your vision.

SW: You won't realize your vision. But the point was, if you don't have a vision, that's what will happen. I said, gee, that's what DeepStar was doing. We were trying to create a vision of what could be and what needed to be, to make deepwater development really stand out and compete with the other portfolio of opportunity for the industry. And the more we mapped that vision out, the more we understand what our goals and objectives are, the more likely they are to

become reality. It needs a master architect, to some degree, setting the vision, driving the view of how we progress, and DeepStar was doing that.

TP: I guess you're not involved with it now, but do you think it's still doing that?

SW: I think it's still doing that. It's maybe venturing out into maybe Arctic issues a little bit more now, or at least there's some discussion as to whether it should, but they're still mapping directionality. I think they're getting into a little bit more work on actual qualification of equipment, but a lot of it is understanding where they want to be, how mature technology is, communicating the gaps and providing this overarching organization to help from a higher level manage it, if you would.

TP: It's interesting. I didn't think about it in terms of, to some degree, disintegration of the business in the eighties as a result of the downturn and the outsourcing of research and all that, and then the need for some kind of coordination mechanism, and DeepStar fulfilled that.

SW: It got us to the point where we were hungry. [laughter] We got into the village and Texaco put out the pot, and said, "We're here. We're going to cook it. We're putting in all the energy to cook it, but we need everybody to throw something in the pot, and if you can't throw it in, at least look like you are." I think it was very successful for that, and it needed someone to do that, manage and organize, get it going.

TP: Why would you think Texaco? Is it because of certain individuals, including yourself, or it had something to do with the company and where it was at the time?

SW: I think it was our vision, primarily mine's and Curtis, to say we can go, we can mobilize the industry, we can help be an architect for making it happen. I think Phil Wilbourn, our manager, helped us a little bit in the fact that not everyone in Texaco thought this was a good idea and we're spending money and we could deploying it elsewhere on other things, and so Phil did a lot of blocking, shielding, back-protecting, if you would, so we could focus on moving forward.

So, in a way I'm very proud of Texaco because that's not—the big T stands for thrifty.

TP: Stretching the penny.

SW: Yes. Stretching the penny. But they stepped up to the plate and their management said, "We want to do this. We can't do it ourselves. We don't think it's right that we fully do it ourselves, but we can be a catalyst. So we give you the mandate to go make this happen." And they supported us, big time, and we've had lots of times to go back. I personally wrote a report to the chairman how we're getting on and where we're going, and is this going to be successful and are we going to get to chief internal objectives as well.

TP: Who came up with the name DeepStar?

SW: It stands for deep water staged recovery. I like to also think that's it's putting Texaco's star out there into the deep water, but maybe it has different meanings to different people.

TP: It sounds like a science fiction novel.

SW: Yes, it does.

TP: You know, like the Star Wars. I guess it was the death star, but—

SW: Darth Vader, yes.

TP: Well, I think we can probably end there. Do you have anything else to add?

SW: I don't.

TP: Thank you for your time, and congratulations again. Have a good time tonight.

[End of interview]