[00:00:00] **Q:** I need to start by thanking you, but also to say a couple of things by way of documenting this. Today is October 14, 2020. My name is Keith [A.] Wailoo. I have the pleasure of interviewing Steven Chu for the Obama Presidency Oral History project. Steven Chu served as US secretary of energy in the [Barack H.] Obama [II] administration from January 2009 to April of 2013. This is our first and only session [read: two sessions were conducted] . In this interview, we will not be discussing or disclosing information that would otherwise be classified.

[00:00:40] I want to thank you, Secretary Chu. As I mentioned, it has been a while since we first talked, and this is an opportunity to hear more about your reflections on the period of time that you served in the Obama administration as secretary of energy. I thought I would ask, to start, at what point did President Obama ask you to be energy secretary, and why you decided to take on this role?

[00:01:11] **Chu:** I think he asked me in the first few weeks in December . I flew to Chicago [Illinois] . I was asked to fly to Chicago in the third or fourth week in November to talk to the president-elect about “a very important job.” And I said, “Well, I’m not really sure I’m interested in working in the government,” et cetera. [Laughs] But then I said, “How important?” And they mumbled, “Something like secretary of energy.” So I said, “Okay. For that, I will fly.”

[00:01:42] The previous president’s administration wanted to get me interested in being the science advisor, throwing my hat in the ring for that, [to] which I ultimately said no. I never wanted to be a bureaucrat. But I had been then director of Lawrence Berkeley National Lab [Laboratory] , in large part because of climate change. And it was a great scientific organization, nearly adjacent to [University of California] Berkeley.

[00:02:15] It was really in, maybe, the middle of December where I got the offer to be vetted. That’s about when it started. You asked about why. Well, we spoke for about an hour, one on one, just the two of us. Afterward, I was very impressed by him, and I phoned my wife and said, “If this guy asks me, I will say yes.” Again, very, very impressed with everything I heard, and I thought it would be a wonderful opportunity to, again, help with the climate change agenda. He said in this interview that it would be one of the two highest things in his priority, the first being healthcare, and the second being climate change.

[00:03:21] I have to tell you a funny story. I was put in a room. It was overheated. It must have been well over eighty degrees. I said, “Okay, it figures. He’s from Hawaii.” Then he walks in, and I stand up and shake his hand. And he says, “A lot of people are telling me you should be the next secretary of energy.” So I said, “Who are these future former friends of mine?” [Laughter] Sometimes I make jokes, and he just dismisses them. He continued— [laughter] so he didn’t do anything. I don’t know if he even cracked a smile. But then we started talking.

[00:04:00] **Q:** So it sounds as if the combination of his commitment to climate change and other impressions in that first meeting is what convinced you to take this seriously?

[00:04:12] **Chu:** Sure. He asked me what my views are on a number of things. Of course, renewables, but in addition to that, nuclear—so I just told him. Nuclear is not ideal, but it appears a lot better than fossil fuel, and there has to be a place for it in the future because it’s very hard to go to a hundred percent renewable any time soon. So we talked about a number of things. He nodded and asked me some questions.

[00:04:45] It was his—just willing to sit and listen, rather than telling me what he believed, which is a proper interview. But as we talked, I realized that there was very little daylight, if any. That was another thing that weighed very heavily on me, because I did not want to serve an administration—once you join an administration, you serve the president. And I did not want to be asked to do things I did not believe in.

[00:05:28] **Q:** Did you have any doubts at all? You mentioned concern about not imagining being a bureaucrat, for instance. Did you have any doubts about accepting the position?

[00:05:40] **Chu:** Well, I had a warm-up exercise, as director of Lawrence Berkeley Lab. It had about four or five thousand employees. If you’re the director of a national lab, it’s very different than being a president of a university. More of the direct responsibility falls on your shoulders. The Department of Energy takes the director job very, very seriously. It was, at that time, about a half-to-$0.6 billion-a-year budget. In hindsight, I realized that I actually had more administrative experience than ninety-nine percent of the people in Washington [DC] , because most people in DC don’t actually run large organizations.

[00:06:26] It was during the time, four and three-quarters years I was director of the lab, I learned how to be a bureaucrat, in the sense that there’s a lot of responsibility. You can get some of the rougher edges knocked off you, although I was very clear and plainspoken when I was there, and also as secretary of energy. That part of my personality was not going to change. But just the experience of running a very large organization, and all that entails, from the safety of the individuals in your lab who might get hurt running down stairs, to science issues where you work with the people and decide what it is that you wanted to work on.

[00:07:23] This is a lab, by the way, that has, in addition to the large number of people, it had about thirteen or fourteen Nobel [Prize] laureates as employees. But even more impressive than that, over thirty, maybe thirty-five, young scientists, either graduate students, postdocs [postdoctoral researchers] , or beginning-career people, who were trained at the laboratory—including myself. I was a graduate student at Berkeley, but I was a lab employee for the time I was a grad student and the time I was a postdoc. So if you think of a laboratory that’s going to train, let’s say, three dozen Nobel laureates, and you can get them interested in the science they’re doing, and, Oh, by the way, can it be helpful in climate change? That’s a tremendous asset.

[00:08:12] **Q:** Yes, yes. What about the political climate? Were you prepared for that aspect of the job, the politics of climate change, the politics of energy policy? Could you say a little bit more about what it was like to enter that world?

[00:08:33] **Chu:** Okay. I thought I was prepared, but not quite. [Laughs] I, for example, knew that money speaks to both parties. But I learned in DC very quickly that it is not only the lingua franca of DC; it appeared to be the only language. I’m just being cynical, but—certainly, it has to do—I formulated three golden rules of politics. It had to do with rule number two, which is get reelected. Rule number one was get elected. And in order to do that in American politics, you need campaign contributions. So that certainly had an influence on what people did and who their supporters were. But I did not realize that, in some instances, donors’ contributions also came with sheets of paper with bullet points that actually made it almost word for word into proposed legislation. So that was a bit of a surprise.

[00:09:48] Other than that, I did find, on the positive side, during that time, 2009 to 2013, that there were people on both sides of the aisle who wanted to serve the country. I, especially, was incredibly impressed with the Senate Committee on Energy and Water [read: Energy and Water Appropriations Subcommittee] . The four senators in charge there were outstanding. This was [Andrew] Lamar Alexander [Jr.] , Lisa [A.] Murkowski, Dianne [G.] Feinstein, and Jeff [Jesse F.] Bingaman [Jr.] . All of them great people. I got along—and they trusted each other. They actually began to trust me, or did trust me. That was fantastic, to see that.

[00:10:36] **Q:** Great. Interesting. It seems that you came into the position with a major economic crisis [financial crisis of 2007–2008] and also the goals of building an economic recovery, but also with stimulus. How did that affect what you could do or couldn’t do?

[00:11:02] **Chu:** To put it crassly, it gave the Department of Energy three or four billion extra from its twenty-five billion a year budget. But in addition to that, the Department of Energy was asked to give advice on many other things that directly were not in the purview of the Department of Energy budget. So with that money, there was a bigger opportunity to do a number of things.

[00:11:27] First, it was meant to be stimulus, so it really had to get jobs started. It had a two-year time line. One of the first things I did when I was secretary of energy is, I appointed a special advisor to me whose sole job was to make sure the money was spent, and spent as well as possible, given the time constraints and everything else. That was picked up by others soon thereafter, other agencies.

[00:12:04] There are some things, I think, that worked very well, and things, in hindsight, that we could have done a little bit better. Let me give you one example of what we could have done a little bit better. Weatherization. It was a very meaningful bill. It was to help poor people within two hundred percent—factor of two [phonetic] over the poverty line, but you were very close to the poverty level, living in very dilapidated, run-down houses without proper insulation, very uncomfortable. So we retrofitted them. In hindsight, the money could have gone a lot further if there would be more cost sharing and other things.

[00:12:47] But the major thing we did not do is, whenever you spend money, you have an opportunity to take data. The opportunity of taking data was—there were pre-investment tests of weatherization, how drafty it was, things like that—but taking data meant: What was the comfort level? How much was spent? How much was actually saved in terms of operational money? Things like that. And we had a treasure house, before and after, that we could have made uniform. One year into the program, I began to realize, Well, we missed an opportunity, but let’s start taking data now.

[00:13:31] The other thing that turned out—it was the biggest criticism of the Department of Energy, but one of the more successful ones was the loan guarantee program. Despite what opponents were saying—and opponents were not only on the Republican side; there were a lot of economists even within the administration who did not like this at all, because [that] set of economists were actually what I call the Jerry [C.] Rubin camp. [William “Bill” J.] Clinton, Bush two [George W. Bush] , Obama; they were all from the same school. They were essentially—they’re not quite Milton Friedman, but they were largely free market people.

[00:14:25] Wall Street was not touching large renewable projects at the time. It was deemed too risky, because there could be delays in construction, project construction, environmental opposition to wind turbines, to solar—there was environmental opposition to seemingly about everything. So what we started doing was, we started investing in very large wind farms, solar farms, things like that, which would not have been able to have been funded by Wall Street. They just wouldn’t. By very large, I mean hundreds of millions of dollars, sometimes up to half a billion dollars.

[00:15:02] But we only funded those projects that had offtake agreements that [were] a certain rate. Although we were supposed to be funding new technology, we bent a little bit and said, Well, it’s new in the sense of the size and scale, and it’s the state-of-the-art technology. And one or two times, it was untested at this large scale.

[00:15:26] By and large, those programs have paid off. There was a huge uptick in solar and wind. Solar prices were coming down, largely due to overinvestment in China, which helped. But it was the large, utility-scale things that really found a strong footing. It’s now much more a darling of Wall Street than the oil and gas industry today, and for the last half a dozen years. It would have not taken hold quite as fast. It would have been delayed five, even longer, ten years, if it weren’t for the fact that these very large projects, for the most part, were built on time and on budget.

[00:16:16] In total, we don’t know what the total cold losses of the—and then the automobile loan program. Our biggest loan, our riskiest loan, was to Ford Motor Company, for $6 billion. The OMB [Office of Management and Budget] decides on what the loan insurance would be. Now, what loan insurance is, is you have a loan for x amount of dollars, and you have to set aside as spent money in the Treasury to cover for losses of the portfolio. Each investment would have a certain risk. Legally, you couldn’t invest in anything that had greater than a fifty percent chance of not making it. And Ford came in at fifty percent. That means we had to set aside $3 billion.

[00:17:02] Solyndra [LLC] , which was picked by the career people in the Department of Energy in the [George W.] Bush era, was the first in line. OMB had put that risk at something like twelve percent. In hindsight, who knows? Nissan [Motor Company, Ltd.] also was a big loan. So Ford is slowing up because of COVID [-19 Pandemic, 2020-] , but they’re going to pay. Nissan paid. Tesla [Inc.] was a big risk. Without the loan, they would have gone bankrupt that month. Half the initial investors were bailing. Fisker [Automotive] did go bankrupt. But all told, the portfolio was much more successful—it may make a small profit, it may make a teeny loss, but to make a profit when you’re giving loans at three hundred basis points above Treasury, in those days, to invest in new technology—it was unheard of.

[00:18:09] **Q:** This is the ARPA-E [Advanced Research Projects Agency–Energy] program, or is this separate from—

[00:18:14] **Chu:** No, this is different. This was a loan program. There was one on advanced vehicle technology, so we helped Nissan with its Leaf program. We helped Ford design much more energy-efficient vehicles. By that time, remember, General Motors [Company] and Chrysler [LLC] had gone bankrupt. They were government owned. Ford planned a little bit better but was teetering on bankruptcy. They hocked their logo. That blue Ford logo? They put it in the pawnshop. [Laughter]

[00:18:44] So that was one of the things. ARPA-E was another—that was very different. That was a funding of research. But that was something, again, which was funded for the first two years on stimulus. It was curious, because it was proposed in a National Academy [of Sciences] study in 2005 called “Rising Above the Gathering Storm [Energizing and Employing America for a Brighter Economic Future] .” This was a very distinguished group of people, twenty, led by Norm [Norman R.] Augustine, the former CEO [chief executive officer] and chair of Lockheed [Martin Corporation] . It had—roughly a third of them [were] legendary CEOs or former CEOs of companies, a third of them university presidents, and a third scientists. I was in the scientist group.

[00:19:36] We met, and the charge, if I had to say it in two sentences, was: In the flat world of the twenty-first century, what could the United States do to stay economically competitive and bring prosperity? The answer was, invest in the US. Especially invest in the intellectual capital of the US, which was education. We did not pick out any particular technology or science, or anything, except one, and that was energy, because all but one person in the group—the one person was Lee [R.] Raymond, who was then chair of Exxon Mobil [Corporation] , who was against it—but everybody else felt that the challenges and the very scary prospects and risks of climate change meant that we should at least mention climate change as the singular thing in the twenty-first century that we have to pay attention to.

[00:20:46] In that report was recommended an agency like DARPA [Defense Advanced Research Projects Agency] that would take very high risks, that would have been run out of the Department of Energy, and that would create, essentially, within the Department of Energy, a new, much riskier funding agency, where instead of trying to fund incremental things, you would fund much more daring things that could really change the world, like GPS [global positioning system] changed the world, as an example.

[00:21:20] I was on the committee. That’s how I first met Lamar Alexander. Jeff Bingaman and Lamar Alexander called for this report, on the Senate side. And I was also sent to Congress to argue for it, in terms of authorization, to the House [of Representatives] . In this hearing of a couple of hours, I was there; a person from DARPA was there; a person from ARPA Homeland Security [Homeland Security Advanced Research Projects Agency] . You probably haven’t heard of ARPA Homeland Security. It flopped. And maybe one other person.

[00:22:10] **The question was:** Okay. You can see how ARPA could succeed. It had one customer, the military. Energy has a very diverse set of customers, mostly in the private sector, so how could you deal with that? In the end, it was decided that it doesn’t really matter who the customer is going to be. If you get the first people, it will succeed, if you worked out the logistics of reporting and everything else like that. A very wise conclusion, I thought, in this discussion of a couple of hours.

[00:22:55] I was also sent, as a member of the committee, to the Department of Energy to convince the then-secretary of energy, Sam [Samuel W.] Bodman [III] , to embrace it. By then, the Bush administration did embrace “Rising Above the Gathering Storm,” in a very serious way. It made the State of the Union address. There’s an interesting story there—but you must have many questions. In any case, when I got to the Department of Energy, Sam Bodman said, “I’d love to, but my career folks here don’t want to, so I don’t think I can push against them.”

[00:23:39] The new secretary of energy had a very different opinion about ARPA-E [laughs] —me, in January of 2009. It was interesting, because I was part of the discussions that led to the proposal, and I had a very clear idea in my mind how I wanted to do it.

[00:23:57] **Q:** Right. And it seems like the idea of innovation in the energy sector is also something that informed the staff that you brought with you. Is that true? The Silicon Valley [California] approach to thinking about energy?

[00:24:18] **Chu:** Yes. Very much, though, what happened is, there were a couple of people, my friends, who knew me as—I was a practicing scientist. I wasn’t a scientist who got older and became a dean, or something like that. I was actually in the lab doing stuff. They were a little bit surprised. But I started, actually, actively—that was another thing with President Obama. I said, “Look, I know that you would want me to appoint certain people, and things like that, and I can understand this. I would look at all of them seriously. But can you give me the right and authority to hire who I want to hire?” And he said yes.

[00:24:58] So hire who I want to hire. The chief of staff has to be politically connected. There’s no debate about that. But among other people, I wanted to attract to the Department of Energy technical people who were really good, who were, again, mostly practicing scientists, with a few exceptions, because it’s the practicing scientists who are actually just best. So I got on the phone and started calling up people I knew. It was a very simple pitch. I said, “Look, you were surprised I took this job. You can do it. Even if you stay for two, four, six years, that’s okay. We’re trying to save the world. Come join me.” About half of them took it up, people you never would have thought would work for government.

[00:25:51] **Q:** One other work environment, culture question, before we turn to some specifics of what happened over the course of the four years, is the existence of an energy czar [assistant to the president for energy and climate change] in the White House. How did that—I mean, I could see how that highlights the importance of energy and climate policy. On the other hand, it divides responsibilities a little bit. Could you describe a little bit about how that worked, how that enhanced but also perhaps complicated the work of energy secretary?

[00:26:27] **Chu:** Sure. In actual fact, government policy, and the execution of government policy, and the agencies, are not all centered in the Department of Energy. It’s spread out among many, many people. It’s [Department of the] Interior, Energy, even EPA [Environmental Protection Agency] , a number of agencies. So it was good, and as you say, it highlighted the importance that this is a big deal. And so can we get all the agencies to act in a coordinated way?

[00:26:59] The good news was, I don’t think any of us, the cabinet members or equivalent level to cabinet members, had this big ego. I never thought to myself, “Well, I’m the secretary of energy. I should be in charge of this.” [Laughter] So that was good. And there were a bunch of meetings. Carol [M.] Browner is a very competent person, and she was the leader of this. But in the last analysis, when push comes to shove, it’s the cabinet members who have the budget authority. So what it was really about was trying to say, “We don’t want to be crosswise against each other,” and to discuss and keep each other informed of what we were doing. I thought that was a good thing. But in the end, the decisions were coming from the cabinet, plus members of Congress and members of the administration who also had ideas. But policy is set at the agency level, in the end.

[00:27:59] **Q:** In terms of actual working relationships, the existence of an energy czar proved to be helpful in moving—

[00:28:09] **Chu:** Yes. Yes. I mean, it wasn’t as though people were going around gnashing their teeth, just another level of bureaucracy, “Why are we having these senseless meetings?” It was not like that at all. There were one or two times you would wish [laughs] , being a non-bureaucrat, that the meetings would be a little shorter. But it was a way of ensuring that there was communication, which I thought was, in large part, a very good thing.

[00:28:43] **Q:** Turning to the first year of the administration, it strikes me that there were a lot of agenda items, like the stimulus jobs, but also financial reform and regulation, cap and trade, and healthcare. Did you feel that the energy cap-and-trade issue—I’m just interested in your observations about whether that kind of agenda—it’s important to be ambitious at the outset—too ambitious? What’s the thinking that you carried into that first year?

[00:29:22] **Chu:** I think when President Obama got elected, as you know, as we all know, he carried the House and he carried the Senate. There was a euphoria. The wind was to our back. But then reality begins to set in. Then a decision was made in the first year to concentrate on healthcare. At which the president took me aside and said, “Look, I know I said energy and healthcare, but next year; energy is next.”

[00:29:54] By the end of year two, by the election in November of year two , you lose the House, and all of a sudden, a lot of things dramatically change. I think, in terms of talking and dealing with Congress on the energy side, the president was more hands off—in my opinion. I’m not a historian. But looking back at how people deal with Congress, I would say, LBJ [Lyndon B. Johnson] is probably the most effective person. He was not afraid of browbeating people with a very strong will. And I think President Obama was almost the opposite, very gentlemanly: “Okay, I told you the facts. You’re reasonable people. You’re going to come to some conclusion.”

[00:30:56] He was less connected with Congress than I would have hoped. In fact, again, a funny story. This was in the last year, or something near, two-thirds of the way through. I had a few private one-on-ones with the president. This was one of them where he says, “Okay. How are you doing?” “Fine.” The first thing I said was, “Have you seen the movie Lincoln?” Steven [A.] Spielberg’s movie. He said, “No, I’m going to see it in a private screening when Steven Spielberg is coming next weekend.” I said to myself, Aw, nuts. [Laughter]

[00:31:37] Because I remember this line in Lincoln where Abraham Lincoln says, “I am cloaked in the immense authority of the president.” He wasn’t above shaking down people. He wasn’t above offering patron jobs, postmaster jobs, things like that, to get the Thirteenth Amendment [to the US Constitution] . Remember how it closes, where Thaddeus Stevens, the abolitionist, crawls in bed with his mistress, and says, “We passed the amendment. The most moral man did immoral things to get it.” Something like that. I’m paraphrasing. Now, I’m not asking President Obama to do immoral things. But to shake down and use the power of the presidency to really garner votes was something I wish he had done more of. He was too much of a gentleman, too standoffish about that.

[00:32:44] **Q:** Right. You mentioned being pulled aside, and the number of—how many times did you have these consequential conversations about matters of energy policy, et cetera?

[00:33:00] **Chu:** I think there were a few. One of them was not a quiet pull aside. It was where there was a big disagreement between me and his financial side of the house, Larry [Lawrence H.] Summers especially, and it had to do with the loan program. So this was a meeting in the Roosevelt Room [of the White House] . He just sat and listened, and sided with me.

[00:33:31] There was another time with the chief of staff where—it was then Tim [Timothy F.] Geithner’s [Department of the] Treasury. Again, they were cut from the same cloth, both of them, and they just felt that it was too much government getting into business, that the private sector should take care of it. And again, things like loans. There it was [William M.] Daley, who was then chief of staff. Go in, talk for an hour, hour and a half, and leave. What I did not realize is—I was just a scientist, so I didn’t realize that Geithner had gone to see Daley before the meeting for about an hour, and then after I left, Geithner went to see Daley after the meeting. Didn’t matter. Daley took my side. [Laughs]

[00:34:26] **Q:** Can I ask you, what, in your view, was the winning argument? That is to say, what is compelling about the loan program, in your view, that won the day in that conversation?

[00:34:39] **Chu:** The fact that it was actually instrumental in drawing in a lot of private sector money. And then you tried to de-risk—by that time, it was getting mature, and we figured out how to not do Solyndras; when you see companies beginning to go downhill, you make a very hard decision, because there are milestones and things like that. Solyndra, after half the money was dispensed, there was a fifty-fifty chance it was going to go downhill, because of the large number of solar-company failures around the world, again because of overinvestment in China. There was a surplus.

[00:35:18] I remember a conversation with the loan people, and they said, “Well, yes, it might go bankrupt, but it may be a finished factory is better than half a factory.” And I made a mistake. The reason things were collapsing—I didn’t deeply appreciate it was collapsing mostly because of overinvestment. A finished solar factory, due to overinvestment, it’s not going to be used. And so I think that helped me gain insight as to what’s going on. I had to personally sign for every loan. That, plus the constant criticism, keeps you on your toes. [Laughs]

[00:36:08] With Fisker, we cut the losses. It looked like it was going to bankrupt, despite political pressures. People from Delaware calling me up and saying, “No, no, no. You can keep this alive. There are Chinese investors that are looking around it, and they may invest in it.” I said, “Look. Let me tell you, I’ve seen this before. I’ve become a little jaundiced. There are going to be two Chinese investors. They scare off the competition, because they come with huge bags of money. At the last minute, they’re probably going to pull out, because they’re going to wait for Fisker to go bankrupt and get it for a nickel on the dollar.” Which is exactly what happened. I was trying to explain this to the senators from Delaware: this is not going to happen. It’s going to go bankrupt. Maybe we can save some of the remnants. But that’s, again, part of my learning when I was there.

[00:37:09] **Q:** You mentioned the Senate Committee on Energy and Water [Energy and Water Appropriations Subcommittee] . You just mentioned involvement in conversations with senators, as well. And earlier, you mentioned President Obama’s slight detachment. Did you feel that you were doing a lot of the work of engaging with key senators, or is that just part and parcel of the job?

[00:37:33] **Chu:** That’s a very interesting thing. Because usually the way most presidents operate is, they want to get the marching orders coordinated from the White House. At year two or three, I forget when, but there was a coalition—I think John [F.] Kerry, [Joseph “Joe” I.] Lieberman, and I’m trying to remember who the Republican is. It may have been Lamar Alexander, but it wasn’t. There was a bipartisan group. And I would meet with them. I would not ask permission from the White House. [Unclear] would like to talk to you. Again, they knew me as a technical person, a nonpolitical person. What should we, the United States, invest in, in order to deal with mitigating the risks of climate change? This is about building up industries. This was also still about jobs, as well, and prosperity. And they said, “We’re not getting clear signals from the White House. They’re not really engaging us. So we want to hear from you.” I said, “Look, I’m not speaking for the White House. But if you want to know, this is what I think,” da, da, da, da, da. So a couple of times, they would do this. That was, again, one of the signals I was getting by the time I was secretary, that the White House wasn’t as engaged as they should have been.

[00:39:10] **Q:** Interesting. So could you talk a little bit about—for the sake of posterity, decades from now, no one will know what the phrase “cap and trade” means. So I wonder if you could describe that, but also explain where that fit in the legislative priorities of the administration and your role in it, and the experience of going through that political conversation.

[00:39:39] **Chu:** Yes. Okay. Aside from inventing better widgets and innovation that get into the marketplace because they’re just superior technology, you also need policies to guide investments. In particular, you also need policies to guide polluters. There are several ways of doing that. One way is to just regulate it, like the EPA. It’s illegal to dump direct chemical sludge into a river or into a lake, and if you do it, you’re going to get fined. There’s another way of dealing with bad behavior, and it’s to tax it. Now, if you consider drinking bad behavior, then you just tax it. You tax cigarette smoking. You tax things like that. There are two forms of tax. One form is just directly tax it, and get direct revenues into the government, and then you can decide what to do with the revenues. The other way is to create a market force.

[00:40:48] Cap and trade is a more market-force-driven way of doing it, which says, We want to decrease carbon pollution. We can put it on a schedule, and then each year, nominally, the amount that you’re allowed to emit goes down. But we’re going to use market forces, so that if you’re one company, and you’re another company, and you say, “Okay, you’re getting a tax on this,” but it doesn’t make as much sense for me to retrofit or do something here. Maybe I can have my carbon credits and give it over to you, so that market forces would make it much more efficient.

[00:41:30] The economists, at first, really liked the idea of the free market making a wiser decision than just brute-force regulation or brute-force tax. But cap and trade required some discipline. What it required, mostly, is that you have to decide how much allowances you’re going to give, and you have to have enough courage to knock it down, year, after year, after year. And so it didn’t work, in part because the companies got in there and lobbied for a higher cap. It happened in Europe, and it happened in California. And there wasn’t enough discipline to put on the screws to actually make it go down. Because as you make the amount of carbon emitted go down, in a more macro sense, it made it more costly, and it would spur more innovation and more investment.

[00:42:27] So there were a few experiments done. Europe started it, and it went up to thirty-five euros a ton of CO2 [carbon dioxide] but very quickly went down below ten, and below ten, nothing would happen. I’m still convinced, below thirty—as technology gets better, thirty is going to become a threshold. But to really get it going, sixty to a hundred is where it needs to be, at least within a few decades from now.

[00:43:00] And it has fallen out of favor. China actually has some version of that. But I now support the idea—I was ambivalent when I was secretary of energy, at least at the beginning, but now I’m very much in favor of a direct tax, but revenue free, no additional income to the government. It goes right back to the people who pay the tax. And since a tax on energy is a regressive tax—it affects poorer people much more than richer people, because a larger fraction of their income goes into energy, electricity, gasoline, you name it. So it should undo that.

[00:43:46] **Q:** In terms of operationalizing this, that is, translating some of this into policy, it does seem as if there was movement in the first year, and signs of success in the House. Could you tell us a little bit about just how that played out, and your involvement in moving legislation, and how it came apart, in your view?

[00:44:12] **Chu:** Yes. As I recall, then-congressman [Edward J.] Markey was one of the leaders in the cap and trade in Congress at the time. Lots of discussions with him, his staff, others, as they were designing the cap and trade. Whenever you do legislation, you’ll be talking to the industry that gets affected by it, the lobbyists associated with those industries. But also wanting to know—from a neutral, technical point of view, the Congress and the Senate would come to the Department of Energy.

[00:44:52] Because very early on, I established that I’m not political. I’ll give you the technical advice and where we think the lay of the land is, technically. Which was good, because during the time I was there, I think I was regarded more or less—the Solyndra stuff was high theater. It was attack dog stuff that everybody knew [laughs] wasn’t actually connected with any deep reality, especially after they subpoenaed truckloads of material and found nothing. But in shaping the legislation, really, what are things to watch out for? What policies? How might it affect certain industries? Those things we talked about. And then it moves from the House to the Senate, and it got stalled in the Senate.

[00:45:56] **Q:** It seems that Senator Lindsey [O.] Graham’s original sponsorship of it—and then at some point, I think in April, decided to withdraw sponsorship. Do you have a sense, in retrospect, as to why those positions shifted, and why this failed in the Senate? Were you involved?

[00:46:23] **Chu:** I was, again, talking—I don’t think it was Lindsey Graham who was the third person. But I don’t remember. Anyway, during the time I was there, Lindsey Graham and I got along. Nuclear energy was a big part of his state, and I was supportive of that. I thought, at the time, he acted in a very sensible way. I couldn’t understand what he was facing in terms of—I wasn’t close enough to him to say, Lindsey, why are you doing this? So it was not like that. Very different than today, I might add. [Laughter] This is, like, a total stranger. Who is this guy?

[00:47:17] In any case, in those days, I think you needed sixty percent to do anything in the Senate. Anyone could raise their hand say they wanted to filibuster. And in those days, you didn’t even have to show up to filibuster. You’d just raise your hand and say it. I wish we could go back to that for Supreme Court confirmations, but never mind. [Laughter] There were a few things that that was very good at.

[00:47:52] **Q:** Yes, yes. Interesting. But once that legislation failed, how did that change the energy policy, from your perspective?

[00:48:04] **Chu:** I think after that, and especially after the House and then the Senate two years later, there was a realization that you’re not going to get any legislation on putting a price on carbon. That was out. By the time the House was over, that was out. What you could do on the edges in terms of research and things like that, you could get Republican support for research, because that would lead to innovation, which would lead to technical things, and prosperity, and things like that. But not on the regulatory side.

[00:48:55] There was another thing that was started in the first year among a few of us. Peter [R.] Orszag, me—I’m just remembering [phonetic] . There were two or three others—who paid attention to something that most people didn’t realize at the time—this was in 2009—which is called the social cost of carbon. And what the social cost of carbon is, is it tries to put a price on, if you’re going to pollute, it’s going to have some adverse effects on society that are going to be sprouting [phonetic] in different places. What would be the cost to society if there is carbon pollution, which leads to climate change? It’s a very hard number to pin down, because it’s crystal ball stuff. Then, how do you evaluate this?

[00:49:49] At the time, it was thirty or forty dollars a ton. I personally thought it was too low, and so I was part of a nerdy little group to actually look at how economists and others tried to make this evaluation of what the social cost would be. Now, why is this important? It actually weighs in to regulations, like efficiency regulations. The Department of Energy did the energy-efficiency regulatory part of the government. Whenever we put in a regulation, we had to prove that that regulation would be cost neutral or save money. It couldn’t be viewed as an additional financial burden on the American public. But having even a modest social cost of carbon means you can go a little bit more aggressively into energy efficiency. But energy efficiency is the floor. You can’t sell appliances, you can’t sell this, you can’t sell that, unless it has a certain efficiency. I worked with EPA, Lisa [P.] Jackson and I, on Energy Star, which was a market pull. What I was saying is, Energy Star actually—more and more consumers were looking at Energy Star refrigerators, appliances, and make some decisions based on that. It’s voluntary.

[00:51:29] My quibble with Energy Star is, it didn’t keep up. And eighty-five percent of the TVs were Energy Star compliant. Well, what good is that? This is like everybody getting As at Princeton [University] and Stanford [University] . [Laughter] You want it to be a badge of honor. I thought one quarter of them could be Energy Star, but it shouldn’t be a half, and it shouldn’t ever be two-thirds. And then there was an “Energy Superstar” they wanted to start, which was modeled after the Japanese program.

[00:52:04] We began to do policy things that are largely invisible, that would begin to shape what was going on, and hopefully in a longer term, so it would outlast me, it would outlast the Obama administration, to really keep track of what’s right [phonetic] . Another thing that I thought was very interesting was, when we were negotiating with the automobile—this is ’09. The bottom had fallen out. I wasn’t in charge of bailing out GM [General Motors Company] and Chrysler, but I was with Ford. And discussions, again, with the financial people—Treasury, Larry Summers, and others—about how hard we should press them, and what we should do. I said, “Now’s the time to press,” number one.

[00:52:52] I got a call from Carol Browner, who said, “What do we do about electrical vehicles?” Because you can argue that most of the electricity is generated by fossil fuel. I said, “Look. It’s going to be a decade or two before it really takes off. And if we’re not much cleaner by then, we’re going to be in big trouble. Give them incentive. Give them as much as you can possibly give them in mileage standards. Not based on something about what the state of affairs is”—where, at that time, still the majority of electricity was coal, followed by natural gas.

[00:53:31] They gave them a huge plus up, which gave the automobile manufacturers an incentive to invest in electrical vehicles, for two reasons. They might have thought that it might be something in the future, but they could also get credits for their fleet average. If they get a hundred miles a gallon on an electric vehicle, they can sell more pickup trucks. In hindsight, it turns out—I don’t know if you know this—but Tesla has been making a profit. Do you know where a large fraction of the profit comes from?

[00:54:03] **Q:** No.

[00:54:06] **Chu:** They’re selling their electric vehicle credits to other automobile manufacturers.

[00:54:10] **Q:** Oh, I see. [Laughter]

[00:54:12] **Chu:** Which is good, because I want Tesla to succeed. So this is an invisible policy, which had a profound effect. I said, “No, give them as much—and this is why.” And Carol said, “Yes, that makes a lot of sense.

[00:54:26] **Q:** Could I ask you about that? That’s a wonderful anecdote. It’s a great story. When she called, is this something that you just came up with as you were talking on the phone, or is it something that you required a little bit of, like, “Let me look into this?”

[00:54:42] **Chu:** No, no. Right on the phone. Look, I was living energy as secretary of energy, climate change, things like that. I had an appreciation for what incentivizes people and companies. You don’t learn that in physics classes. That’s an intuition.

[00:55:08] **Q:** It also sounds like you were trained as an economist of energy, as well. Not formally, but implicitly, to be able to talk a little bit about the way in which incentivizing electrical car production in the future should be played out. So this raises a broader question that I had. I had two questions; one about that nerdy little group that you described [laughs] and where it came from, because it’s part of that story about invisible places that policy gets made. Maybe I’ll go to that first, and then I’ll pose my next one.

[00:55:50] **Chu:** Again, most people—John [Y.] Hung may have been part of that group. I’m trying to remember. But Peter Orszag was the organizer. And then there were other economists who were pretty conservative, and they used these models for assessing things. They’re all look-back models, which is one of the things that—if you look at all projections of economists using these models, they’re look-back models. But if you’re at an inflection point where technology is about to change, they break down. So that was one of the things.

[00:56:29] Again, it’s still hard. It’s still being debated. What is the social cost? It’s still about thirty or forty dollars a ton. How you do that is also—it’s not purely quantitative because of forward-looking risks. There’s always discount rates, and if you discount at five percent, compounded yearly, you make no allowances for something that’s going to happen a hundred years from today. It’s gone. [There is] big debate in the economic world about what the discount rate should be, whether you stake a standard discount rate or a standard investment, that we’ve seen over even long-term investments—long term would be twenty, thirty, forty years. No one makes an investment for a hundred years.

[00:57:25] Nick [Nicholas H.] Stern thought that he had an anomalously low discount rate by most economists’ standards, of half a percent, or something like that. From the mainstream economists, he was soundly booed, because that made no sense. The mainstream economists said, “No, no, no, there’s nothing that can be discounted that slowly.” Another person—I’ll remember his name, maybe. He died recently, a couple years ago—who said Stern was right for the wrong reasons. There should be two levels of discount. One is a normal one, and one is a very long-term thing. But the other thing that—and this is what Nick Stern argued—that if you go into [phonetic] really bad things, a hundred years from now, you can’t really do a discount rate.

[00:58:22] I was following the literature at that time. I was reading the papers. So I guess, in that sense, yes, I was becoming an economist. And what are the uncertainties? You can’t—it’s not like physics. You can crunch numbers and find an answer, and there’s no equation. I still think that society has never had to deal with something that the worst effects would not even be a hundred years from today, it would be two hundred or three hundred years from today. It takes about a hundred years to even reach the equilibrium of the damage we’ve already done. It’s like you’re light skinned, expose yourself to get tanned all the time, and get sunburned a couple times, and then forty years later, you’re getting skin cancer. Or thirty or forty years later, you have heart disease, stroke, or lung cancer from smoking. You’re building up damage over a long period of time.

[00:59:25] The time scale of the climate damage is at least fifty years, because the oceans are cold, and the top water mixing and the bottom water mixing is slow. So until the surface of the earth warms up, you’re not going to see the full effect of the greenhouse gas. This was not appreciated by the public. I spent a lot of time when I was secretary of energy, before I was secretary of energy, and after I was secretary of energy, trying to get the public to understand that this is not rocket science. If you have a glass of water, and you’ve got a couple ice cubes in it, the glass stays cool until the ice cubes melt, even though heat is going in. You’ve got a cold ocean. Anyone who has scuba dived or snorkeled knows you go ten feet under, and suddenly it gets cold. You go down two kilometers, and it’s a few degrees above freezing, all year. So these are things that just— [groans] . It’s very, very risky.

[01:00:35] In this little nerdy group, we talked about these things. We talked about the models and what they were using. I had a—within the Department of Energy, there’s a part of it, it’s this [unclear] Energy Information Agency [read: Energy Information Administration; EIA] . It was set up during the oil crisis of the ’70s to keep track of fossil fuels and what’s going on in the United States and the world economically, how much is being—it’s just a database. Then more recently, I think maybe with [James “Jimmy” E.] Carter [Jr.] , maybe before or after, they started to start to dabble in renewable energies as well as fossil energies. So it was this huge economic analysis of forecasting what was going on.

[01:01:25] I remember when fracking [hydraulic fracturing] was just turning on, the head of the EIA said, “Well, we think the price of natural gas, it’s down really low, but within half a year it’s going to go up, and it’s just going to climb back up.” I said, “No, it’s not going to do that.” And he said, “Well, how do you know it’s not going to do that?” I said, “Because all you have to do is—forget about the models. The models are looking backward.” What I can tell you is, instead of on one pad, it’s horizontal drilling and fracturing. They’re not getting one well. They’re getting two wells, five wells, six wells. They’re getting better at keeping the stuff open with the proppants. The technology is improving dramatically. Because you sink the first couple wells, and then they deplete much more quickly than normal natural gas, but the technology is getting better so fast, it’s going to stay low for a while.

[01:02:22] The next year, they came down, and said, “This year, it’s going up, or the next year.” I just went up and said, “No, no, no, no, no. You’re not listening to me.” [Laughter] The year after that, he says [laughs] [unclear] . I said, “Good.” I said, “Why don’t you go and find out where the technology is today and where it’s heading?” Because that, in large part, will help you make a better economic forecast.

[01:02:46] **Q:** Did you find that there were—

[01:02:50] **Chu:** But they’re not—

[01:02:52] **Q:** I was going to ask, did you find that there were places in the administration, during your time there, where the technical expertise that you have in addressing these kinds of issues got traction, and there were other times, as the example you just gave, where people are just not listening?

[01:03:12] **Chu:** I think in something that’s clearly very technical, it got a lot of traction. An example is when Fukushima [Daiichi nuclear power plant accident, Fukushima Prefecture, Japan, March 11, 2011] happened. The president wanted to know, what did John [P.] Holdren and I think? We were two physicists who know about nuclear. We did not have to think about it, or debate, or anything. We said, “Wait a minute. Don’t panic. Let’s figure out what’s going on.” People in the White House wanted to know, should we order an evacuation? And both of us said—we had a long consultation, going in [unclear] and huddling with teams, and we said, “No, don’t do that. Because evacuations can be very dangerous. Let’s figure it out.”

[01:04:08] Then, with the resources of the Department of Energy, you can start airlifting things, and sniffers, and try to help the Japanese figure out where the clouds were, where the pollutants were, and things like that. It was very helpful. Then, also, again, because I’m particularly nerdy, there are all these things about radioactive plumes going up and carrying the short-lived isotopes, like iodine, going over across the Pacific [Ocean] , landing in the United States, on the West Coast and Hawaii—already, Hawaii and Alaska were picking up some of this stuff, because you could pick it up from very low. I looked at this and said, “No. Come on.” On average, these things take x number of days to get over there, and most of the iodine would have decayed. So you have to remember, iodine has a short half-life. So here’s a cabinet member telling some people, “Wait a minute. What are you doing?” [Laughter]

[01:05:13] Really scary, and this was a bad thing for the Department of Energy. As we were making decisions, and projections of plumes, and where it would be going, it turned out it wasn’t ending up—early data I was looking at said—again, I would look at the data myself. It was looking like it wasn’t going where they were thinking it was going, and we’re picking up—there was just within—Fukushima is on the coast, but there was a little valley going up. So I called up the guys at [Lawrence] Livermore [National Laboratory] , who were doing the modeling of the wind and how it would spread. And I said, “What model are you using? What’s going on here? You seem to be missing what’s going on.”

[01:05:57] They said, “Oh, it’s validated here, or there. We use this to validate plumes when we’re doing—even in underground testing in Nevada, you have a little bit of radioactivity that squirts out, very small amounts, and above-ground testing, and these are models that have been validated a long time.” And I said, “That’s great. The topography of Nevada is very different than Japan. Did you put in the topography of Japan in your models?” “Uh, no, sir.” “I think that would be a wise thing to do.” [Laughter] It’s got a lot of mountains and hills and valleys. You validated it on a flat place in Nevada? Give me a break.

[01:06:41] Then I said, “Oh, by the way, the same models we’re evaluating, in case you had, let’s say, a nuclear dirty bomb event in a city.” And I said, “You’d better go back, and you might want to start looking at those things, as well, because, like, in San Francisco [California] , there are nanoclimates in San Francisco.” If you know San Francisco, you know that in the early evening, there’s a cold finger that goes across the Golden Gate Bridge and goes directly into Berkeley, and leaves North Oakland alone. So North Oakland can be five degrees warmer than Berkeley, or six degrees warmer. I said, “There are all these nano- and microclimates that you want to be aware of. And you can use historical data.” I’m saying, “Come on, guys. This is embarrassing.” [Laughter]

[01:07:38] **Q:** Another place where this probably showed up is in the Deepwater Horizon [oil spill, Gulf of Mexico, April 20, 2010] . Could you describe a little bit about your own—both personal, but also the Department of Energy’s engagement with that? And that happens at a particular time in the legislative discussion about energy policy.

[01:08:01] **Chu:** Right. That was, I think, in mid to late April of 2010. There’s the Macondo [Prospect] blowout. The thing explodes. Deepwater then drifts, and sinks a day or two later. A huge disaster. Lots of uncertain information as to what’s going on. After a week or so, I made a crazy suggestion, because in this—it’s a mile deep from the surface of the Gulf of Mexico to where the wellhead was, and then another mile and a half. When the thing blew up, there was an explosion, and Deepwater Horizon then drifted off to maybe four or five degrees [phonetic] , sank, and the drill head snapped. No one knew what this set of valves was. It’s about two and a half stories tall, called the blowout prevention platform. Nobody knew what was happening. All you could see was underground pictures of oil and gas coming out pretty fast. And what was the state of the valves? They had very little instrumentation on that.

[01:09:15] So I said, “Maybe you could use gamma rays to”—it’s just like X-rays, where X-rays can penetrate, and you can look at your teeth. Gamma rays have deeper penetrating energies. Cobalt 60 was a great gamma ray source, because it was used in hospitals already. So it could go through this much steel, a couple inches of steel. So you take a dental X-ray, except you use gamma rays, and you expose them on one side and look in the back end. There’s this huge platform with these valves coming in. And the valves come in, and there’s another thing that comes in the back of it and locks it in place. There’s pneumatics that push it here, and then it locks in place.

[01:10:03] There was no readout of how much the valves had closed. It was poorly designed, to say the least, because you could have a low pressure—you could have just a visual readout. So they were sending ROVs [remotely operated underwater vehicles] down there, squirting hydraulics day after day after day. The guys at BP [plc] , they, kind of, laughed at that: “Oh, God, this guy, Chu. He’s from Berkeley Lab. That’s where the Hulk got his dose of X-rays and became the Hulk. So he’s got gamma rays on the brain.”

[01:10:42] A day or two later, they said, “You know, he may be right. There may be a way of doing this, of using gamma rays.” I didn’t tell the president. Maybe my chief of staff did. I’m not sure. But somehow, word got back to the president. So after a cabinet meeting in late April or early May, I forget when it was exactly, he goes up to me after the meeting and says, “Chu, go down there and help them stop the leak.” I said, “Okay.” [Laughter] So I go back, and I say, Well, how am I going to do this?

[01:11:20] My answer was not as a bureaucrat. My answer was as a practicing scientist. The last thing one wanted was some commission that could go and study the damn thing. You wanted to stop the leak. So I said, “Okay, if I can assemble a half dozen really smart, out-of-the-box thinkers, and go down there, and help them, maybe with the diagnostics.” I didn’t know, really, what to do. So I thought about it, talked to a few other people, assembled a list of people that I wanted to call and enlist them. Then, I think the next day, I called them. And I said, “We’ve got this national emergency. I’m not sure how we can help, but I’m looking for really crazy, out-of-the-box thinkers. I’m not looking for petroleum engineers.” BP had access to a lot of engineers. “I’m looking for crazies who are out-of-the-box thinkers and are quick learners.” And that was my list.

[01:12:25] Dick [Richard L.] Garwin was one of them. Someone recommended Garwin. [I] said, “Yes, I know.” He was described by Enrico Fermi as the smartest man Fermi ever met. That’s pretty high praise. And so I—“Yes, but he’s eighty. Does he still have all his marbles? Is he still clicking? I’m not interested in some famous guy. I’m interested in someone who’s”—and he said, “No, no, no. He’s still very sharp.” So I called up him. I asked [Arunava] Arun Majumdar, the head of ARPA-E and a friend of mine. I asked a couple of people. Every one of them said yes. I called them up personally, and every one of them said yes, or they said, “Let me check. I have to get someone to take over my teaching,” or, “I have to ask my wife if it’s okay.” Da, da, da. But I said [phonetic] , “Fine. Call me back today.” Oh, by the way—they called me back and said, “Okay, I’m in.” And I said, “Great. First meeting tomorrow, 8:00 a.m., Houston [Texas] .” And they all showed up.

[01:13:40] We started by thinking of diagnostics. Then a week or two later, there was something called a top kill. Oil was gushing out. I don’t know if you remember this. A pipe had gone—Deepwater drifted off and sank. This big pipe had kinked, and out of this broken pipe, oil and gas was gushing out. And so what they thought is, there’s subsidiary lines in this—think of this—two-and-a-half-story column, massive set of valves. There are other lines on the side of it that were independently controlled. There was only one pressure gauge in the whole thing, and it was erratic, so we didn’t know what was going on. So we said, “What is the state of the blowout prevention platform? Is there any way of, let’s say, injecting material on the top to actually overcome the oil and gas coming out?” So that was the strategy.

[01:14:37] Once you could hook up these lines, which were still operational, to something on the surface, then you have a little loop, and you could put pressure gauges in it, where you actually have pressure management. So I said, “Great. You’re going to try throwing stuff down”—“stuff” as in junk, little foam pieces of rubber; actually, one of them was golf balls; pieces of plastic; mud; everything. One by one, there was a game plan. I said, “Great. But every time before you do the next test, if it doesn’t work, if it doesn’t stop, use the remotely controlled valves and measure the pressure across each section. It will take ten minutes. You can shut off this valve, measure the pressure, shut off this valve—isolate each in turn.”

[01:15:30] After the first attempt, it didn’t work. It’s like two in the morning in the control room. It didn’t work, and they went to the next one. I threw a temper tantrum. I said, “Wait a minute. You guys promised me you would make these measurements, and you didn’t. And you’re going to make these measurements, or I’m going to get on the phone.” Admiral [Thad W.] Allen was also there. He backed me up.

[01:15:56] None of it worked. But the pressure managements were the first thing that gave insight into what was happening in the valves. It was very clear most of them had not closed at all completely, and things like that. They came back the next day and said, “Okay. We’ve analyzed the pressure. We think the well is damaged. We think the valves are this.” The well is damaged, meaning, in the explosion two and a half miles deep, there was enough explosive force that, in the steel casing that goes down there—you drill a hole, you sink a steel casing, you backfill with cement. Underwater, you have to have double casings. If the explosion was bad enough, it would have either pushed out the poppet valves, the pressure release, so it doesn’t fracture the whole casing, or else it would just fracture the whole casing.

[01:16:52] If the well is damaged, and you could seal up on top, that would be bad news, because then the pressure from the reservoir would actually leak out through the casing. It’s underground, remember. One mile deep starts the ground, one and a half miles deep is where the well head is, where the pressure is. It would leak up, and it would go to the surface. Then, all of a sudden, the pressure in the well equals the pressure one mile deep. That would be very bad news. So having the well be damaged was—it meant you could never seal the well on top. So how do you stop it if the well is damaged? You go on the bottom, and you drill an intersecting well. And then at the place where it’s into the reservoir, you put in stuff, and as the stuff rises, the weight of the stuff you put in, what’s called drilling mud, then has a density such that it’s the force, and that stops flow off [phonetic] . But that would take two and a half months.

[01:18:02] So they said, “The well is damaged.” And I said, “No, I’ve been thinking about it too.” This is no committee, no nothing. It was just a couple of us. And I said, “No, I don’t think so. I’m not convinced. It could be either way. This is why.” They said, “Okay.” They come back the next day and said, “I think you’re right. There’s no convincing evidence that it’s damaged or not.”

[01:18:34] There were many, many instances like this, where after [unclear] [laughs] , and they would give me all the data, and our little team, all the data. In the end, it turns out being head of the Department of Energy was really good, because there came a thing where, again, the well could be damaged or it couldn’t be. But if it wasn’t damaged, you could maybe put something on top of it and seal it. But you first had to get rid of the broken pipe and all this other stuff. So what happened is, they figured out a way of getting little hydraulic things—you know, the flange that the pipe was—we’re talking about, like, two meters in diameter. Everything was big. It’s not like a little kitchen pipe. They unbolted it, which is great, because it means you could take it off, and you could actually seal it with something hard. Because other than that, you would have to put something that wasn’t loose fitting, and it wasn’t—

[01:19:35] Once you got this thing off, you say, “Oh, my gosh, we can get the thing off. We can design another ceiling cap.” It’s a mini blowout-prevention platform instead of a bunch more valves. They were quickly designing this within BP, and a company that they also hired. After that failed attempt, I told Admiral Allen, “From here on in, BP is not to make a move unless we approve of it.”

[01:20:09] My little team said, “You don’t want to do this, Steve, because if you do that, you’re going to assume some of the responsibility.” I said, “I don’t care. If something goes wrong, I’ll for sure get fired, but based on the best evidence at the time, I’m okay with that.” Bureaucrats actually don’t think that way. [Laughter] Hide behind a committee. And I didn’t have a committee. We never took a vote, by the way. We just discussed things. In the end, I said, “Don’t worry about it. It’s on me.” But they’re smart people, and I just wanted to listen to what was going on. It was a back-and-forth, and there were arguments. Not emotional arguments; more intellectual arguments on what was going on.

[01:20:59] Anyway, going back to this. I said, “Great.” They gave us the blueprints, so I looked at them, and I said, “Okay. We’re going to get the guys at the weapons labs to see, is this designed well enough?” This was around July fourth. I remember that, because I called up the director of Los Alamos [National Laboratory] and said, “Look. I’ve got a job for you. I wanted you guys to—we’ve got this new design. We’ve got the thing off. We know what the pressure is at the bottom of the well—at least what it was initially. We want to know whether this was designed properly, and what are the risks, and what’s going on.” And he says, “Well, sir, you know what day it is today.” I said, “No, what day is it?” He says, “Well, it’s the Fourth of July.” So I said, “Oh, okay. They’re probably at picnics. Well, wait until six o’clock, and then give them a call.” [Laughter]

[01:22:05] For the next three days, which they were probably pulling all-nighters, they went over the design with a fine-tooth comb and came back with two recommendations. First, it was under-designed. Given the pressure of what we knew the well had, you take the known pressure, and you don’t have to multiply it by a huge—you just, worst case, [unclear] if the pressure is still there. It was designed according to American Petroleum Institute standards. I was also talking to other oil companies, and they were saying, “No, no. You’ve got to use thicker steel, because they’re designed to yield strength.” Let me tell you, when steel begins to yield, it’s like an aneurysm. It doesn’t lead to any good [Laughs] . It plasticly deforms, and then it could rupture later. This is a big deal, because it’s a blight on the entire oil industry. It’s like when a nuclear accident happens. It affects the entire nuclear industry. So if this wasn’t good enough—affecting the entire oil industry.

[01:23:11] I said, “Fine. You’ve got to do this, this, and that.” Huge debate about pressure gauges. They wanted one pressure gauge, and I said, “No, no, no. Five. Here’s where I want them.” “No, no, no. One.” So we had a knock down, drag out with the CEO of BP, who finally said, “Okay, look. Give him three.” [Laughter] “Give me two, three pressure gauges. Not one, just a compromise.”

[01:23:42] The other thing, which is even more serious, was, the blowout prevention platform is vertical. Remember, I said the ship went off and sank. It stretched the drilling pipe from vertical to forty-five degrees. Now, this is square of two longer, like a rubber band. When it was being stretched like this big rubber band, the platform tilted two degrees in bedrock, and then there’s a swivel head, which is a gigantic, one-and-a-half or two meters, elastomeric joint, that was pulled over to hit the stop another six degrees, and it was stuck in that position. And then the thing sank.

[01:24:31] The guys at Los Alamos said, “You know what? You don’t want to put this thing on top of this, because two degrees plus six degrees, that’s eight degrees, and it weighs enough that it could rip off the elastomer. If it rips off the elastomer, I’m sorry. You’re never going to seal the well. You’re going to have to wait for the relief well.” So, “Thank you very much. Go back to BP. Here are the calculations on that. Here are the calculations on yield strength.” They got to me a day later, and they were very impressed. They said, “These are really good calculations.” And they said, “You’re right. You’re right about both.”

[01:25:13] [Laughter] And so [unclear] we started doing the calculations, and I said, “Yes, it’s too risky. This elastomer—the weight could have tipped it.” [Unclear] you can think of a way—and they figured this one out—how to straighten it. So what they did is, they have this two degrees plus six degrees, and they put these little hydraulic things, lots of them, with the ROVs, these submersibles, remote, and they put it in, and you pneumatically pump, pump, pump, and they straightened out so it went to the middle. And now it’s only two degrees. And the calculations say, two degrees, you’re safe. At eight degrees, you’re not safe. Okay?

[01:26:02] Again, this is an example of, “Boy, they actually needed us.” We prevented them from doing a few tragic things, and also the fact that you could look at sealing the well. There were lots of nail-biting adventures when we did finally seal it, arguments here and there. Again, one of them had to be adjudicated by Bob [Robert W.] Dudley, the new CEO, who is a great guy. It was a very bonding experience, actually, between Dudley and me, because some of his other senior VPs [vice presidents] were against some of the things.

[01:26:45] I met him years later, four years later, at an Oslo [Norway] energy conference [Oslo Energy Forum] . He said, “Yes, remember that time when the hurricane was coming, and we didn’t have enough data to know whether the well was damaged or not? And what are you going to do? Do you open up the valve and let it leak, because all the ships had to clear out, or do you keep it sealed?” There, my group of advisors were at a fifty-fifty split. They just said, “No. Under no circumstances. It’s too risky. The well still could be damaged. Let it.” I, and I think one or two others, said, “It’s worth the risk.” So I said, “Okay. We’ll keep it sealed. I think we’ll keep it sealed.” It was nail biting.

[01:27:42] It was fun. I spent half my time in Houston, and half I would come back. Some of the cabinet members would look at me, and some people at the Department of Energy said, “Steve, this is incredibly stressful. What’s going on? You look happy.” I said, “Yes, I am happy. I’m solving a technical problem. This is what I love to do.”

[01:28:15] **Q:** There are so few, I would guess, such satisfying technical problems as Department of Energy secretary, right? It’s a pretty amazing story.

[01:28:26] **Chu:** There were really good—I mean, in choosing what to invest in, it was really fun, because I hired such good people. But they would want my advice. So they’d say, “We’re thinking of financing this, this, and this.” And we would sit down and have these critiques for an hour or two. The career people were just aghast. They had never had a secretary of energy who was willing to sit down, and listen, and brainstorm. Because I was an active scientist. And I love learning about stuff, so they loved that, too. It was a great job. I loved the job.

[01:29:11] **Q:** Can I ask you just one last question about the impact of that Deepwater Horizon oil spill on drilling policy, other issues? Was there a ripple effect from these kinds of crises, or was it just technical, solve the problem, and then move on?

[01:29:34] **Chu:** Yes, great question. I think the hope was that you learn from this, to have blowout prevention platforms with only one pressure gauge is ludicrous; that you could easily design things on the low-pressure side, so when valves go in and something goes across, that you cut out in the metal, that you can just see optically how—because it’s a wedge thing, so it will tell you exactly how much the valve is closed. So there could be things that weren’t designed into this.

[01:30:14] It was astounding. I toured—I think it was the manufacturer, bought this company called Cameron [International Corporation] . And I toured, so I learned about blowout prevention platforms and everything. Who is the—then-head of Exxon Mobil, who then became secretary of state [Rex W. Tillerson] . He goes into my office and tries to convince me that BP is an anomaly, it’s a very risky company, Exxon does things in a much more responsible way, blah, blah, blah, blah, blah. And so I said, “You’re probably right. From what I’ve learned, BP did a lot of things in a very risky way, not according to industry standards.”

[01:31:03] Not regulation, but practice. Like, remember this double well liner? Usually what happens is, you have these stops where there’s casings, so that if there’s an oil leak in between the two steel tubes, it would stop in these stops. Because there was a great concern, in the well, that maybe the oil and gas was leaking around in the annulus, the space between the two concentric rings. I learned that industry standards in deep wells underwater, you actually have these stops. It costs more money, but you need to do this. They didn’t. They took the cheapest route possible.

[01:31:52] So there are many, many things that regulations—here’s an opportunity to increase the regulations, make the blowout prevention platforms more reliable, things of that nature. There was a National Academy of Engineering report that detailed—after all this dust had settled, it detailed many of the recommendations. We thought that these were going to sail through, and industry actually stopped most of them, or they got them rolled back over the next ten years. It’s now 2020. This was 2010. Well, after eight years, because the reports were coming out a year or two later. Very sad.

[01:32:43] **Q:** Just looking at the time, I think we have about twenty minutes left, so I wanted to—you mentioned Oslo. And maybe you can say a little bit about the US energy policy, particularly climate mitigation policy, in relationship to international relations, working with other nations, the tensions between developing countries and the US, and the role of the Department of Energy in these—in Copenhagen [Denmark] , in the UN meeting there [United Nations Climate Change Conference, December] ; in Oslo. If you give me a sense of how you navigated those international waters.

[01:33:38] **Chu:** That’s where working for President Obama was great, because it was very different than during Bush two. President Obama did feel very strongly about the risks of climate change. It doesn’t have to be proven. It’s just risky business. And Copenhagen was a bit of a disappointment in the end, because in Copenhagen, the developing countries still said to developed countries, “It’s on you. You’re the ones who did all the pollution. You’re rich. You should take care of it, and you should also give us money so that we can help adapt and mitigate, as well. But we’re too poor.” So there was a stalemate. Despite hopes, it didn’t lead to anything real in Copenhagen.

[01:34:47] As things continued, things were going—what really happened, I think, is Obama and Xi Jinping actually decided they’re not going to have a rerun of this in Paris [France] . Those two said—I mean, there are three major players. There’s the EU [European Union] , there’s US, and China, in terms of the economies of the world. But those are two-thirds, three-quarters of the entire economy of the world, at that time, something like that. And EU was already on board, setting policies in that general direction. But the US was not, and neither was China.

[01:35:32] China has the advantage that a lot of people within the high-ups in the administration are technically trained. They’re engineers. Up until Xi Jinping, in the previous—they have these ten-year governments, five-plus-five-year governments. In Jiang Zemin’s time, and in Hu Jintao’s time—that’s twenty years—about seventy-five, eighty percent of the highest-level government leaders were trained as engineers. I wish that the United States could have fifty percent [laughter] or thirty percent trained as engineers and scientists. So in China, it’s a very, very different thing. Yes, it’s a one-party, now dictator system, where there has not been a lot of discussions about, what are some facts, and what is evidence? You know, you get very quickly beyond that.

[01:36:46] What I think the huge breakthrough was, was to get China to say, “Even though we’re a developing country, we should also be much more aggressive and also work towards saying we’re going to limit our carbon emissions, we’re going to cap it, we’re going to bring it down, and we’re going to invest heavily in it. And we are not asking for a—” They actually played the game very well, in terms of getting a lot of money into China for energy investments. But they actually said, “No, the developing world has to be a part of this solution. We can’t say we’re going to do nothing about it and leave it to the developed world, the OECD [Organisation for Economic Co-operation and Development] countries, to do this.” And that was the huge breakthrough.

[01:37:29] **Q:** What was your involvement in those kinds of international conversations, as the secretary?

[01:37:45] **Chu:** This is again more of—I don’t negotiate with heads of state, so this is more of—as the head of an agency that has technical chops, what’s going on? What are the risks? Again, when you’re doing policy, you have to have a view on what could happen five years, ten years, twenty years from today. And how much it’s going to cost really depends a lot on where you think technology is going to be, what do you think the cost of cleaner energy is going to be? Because that all is in this grand political compromise.

[01:38:32] I was definitely not of the opinion that we have all the technology we need, [that] all we need is the pollical will, and it will be taken care of. When I hear stuff like that, it’s just—no. We heard stuff like that from twenty years ago, that we have all the technology in place, and we only need the political will, and it’s just not true. Even today, in order for the United States, which is very rich in solar and wind, relative to the rest of the world, to get above fifty percent renewable, not on a capacity basis but on an as-used basis, is nontrivial. To get to eighty percent is really nontrivial. You need energy on demand, and so either you have energy on demand because of energy storage, or you use fossil fuel, which is a form of energy storage; it’s just stored a hundred million years ago. But you can’t turn off the lights; you can’t turn off the factories. You can’t turn off those things. Again, the Department of Energy would say, “Okay, this is what we think is coming down the pipe. This is what the costs are now,” et cetera. So that folds into how you make a plan.

[01:39:58] Believe it or not, it should fold even more into how you should make a plan going into the future. Let me give you an example. I was surprised, personally, of the cost of solar, how quickly it dropped. And I was optimistic. I still think solar and wind will get lower cost by twofold from today. The technological runway is not—I think batteries—I know this because I now do some research in batteries, and I’m also on the board of a battery company—that within five or ten years, we’re going to have a battery that—the cost is one thing, but the other major factor is, how fast can you charge? Suppose you had a $25,000 car that could go three hundred miles, but you can charge 150 or 200 miles in five minutes. If you had a battery like that, the whole conception of how electric vehicles get deployed is different.

[01:41:07] Even when I was secretary of energy, I said, “We don’t want to use public funds to build charging stations, one or two, in front of the mayor’s office, which gets huge political support. This is ribbon cutting, TV time.” And well-meaning people said, “Well, how are you going to do this? You need charging stations. You can either put them in public parking spaces or wherever. You can’t put them in company parking places. You can’t do them at home.” And I said, “Let’s wait. Maybe you can get a fast-charge battery.” They’re saying, “When is that going to happen?” I said, “I don’t know, but let’s not spend hundreds of billions of dollars, or tens, on that.”

[01:41:51] Now I think it’s within five—I’m at a company that we have a battery that is 3C charge. That means in a third of an hour, it charges to eighty percent capacity. It’s not in mass production yet, but we’re shipping out samples. Okay, eighty percent capacity means—and the charging is very nonlinear. It goes like this. So for the first half or two thirds, it’s one third of the time. This is just one of several companies. I’ve been telling people for the last five years, this is the last really big thing. Five minutes, six minutes. I give talks. If the battery lasts longer than a human bladder, the show is over. You’ve just got to make your battery last longer than the bladder. Because by the time you’re discharging yourself, if you’re half full in your car, that’s okay. Then you can go to a service station model. You can slowly replace the diesel and gasoline pumps with electric chargers. You run a couple megawatts through the service stations. Very, very different.

[01:43:07] So I’m very optimistic. I try and do that [phonetic] . Very optimistic about—I realized years ago that cobalt is just not—it’s too expensive. Nickel, maybe, but cobalt—just way too expensive, and the formulation getting down—your cell phone is cobalt oxide. You can do that in a cell phone. Right now, the EV [electric vehicle] batteries are two, three percent cobalt, instead of, like, a hundred percent cobalt. And you’ve got to get rid of it. So now I’m collaborating, and I said, “Look, we’ve got to get rid of all that stuff, even nickel. Sulfur. No one’s been able to make a commercial sulfur battery.” I said, “Yes, but if you can get it, it’s going to change the world.” So this is what I’m going to work on. I’m not going to work on minor things.

[01:44:08] **Q:** Yes, yes. Can I ask you a couple more questions? One about the—you commented on the fact of watching advances roll back in the subsequent administration. And I wondered if you had reflections on the legacy of the work that you did in the administration, in the Department of Energy, and what has endured. What’s the groundwork that you were able to lay? And maybe it was in the first two years, or maybe it was in the entire four years, that have enduring implications for energy policy [crosstalk] —

[01:44:49] No, it’s the entire time. Great question. Policies. Policies are tough, because the EPA, especially, but also in Energy, you see this rollback. And safety things. Safety was [Department of the] Interior, by the way. Oil safety is an Interior policy. You can roll back policies. But once you get a technology that is becoming economically competitive on its own standing, and can stand on its own legs, you don’t roll that back. As an example, wind farms and solar farms; it’s now a better investment from Wall Street’s side than an oil refinery. And so because you can build them on budget, on time, they work, the technology is getting better and better—hey, you can’t take that away.

[01:45:42] Every time you do something in research that leads to an innovation and leads to lower costs, and that you don’t need a subsidy for it, you win. Now, invariably, at the very beginning, you need to subsidize many, many things. So on that point, I’m very comfortable with it. You can’t roll back that. The genie is out of the bottle for good. So I feel very good about that. The oil safety regulations—again, it’s Interior and EPA, but it’s going to oscillate. It’s going to go back and forth, depending on which regime is in office.

[01:46:28] And then there are these older—something we didn’t get a chance to talk about is ethanol. There’s the forward-looking energy efficiency. Could you describe a little bit about ethanol politics in your time in office?

[01:46:44] **Chu:** I always viewed it as a farm subsidy. And it was a farm subsidy. The technology for how carbon neutral was it, was getting better and better, but it was like taking a fundamentally non-great idea and making it almost marginally okay, maybe. But not really. Which is very different than sugarcane, which makes a lot of its own fertilizer, and is a perennial, so it’s not having to be planted every year, so the plant pops up. So very, very different.

[01:47:26] The hope was that you could go to cellulosic ethanol and use all the waste products of agriculture, the wheat straw, the rice straw. Half the corn stover you have to plow back in the ground for fertilizer reasons, but the other half you take. Wood chips, all this stuff. When I was secretary of energy, we started research into how to break down this very hard, recalcitrant—I mean, the microbes don’t like to eat this stuff, because it was designed by nature so the microbes don’t eat this stuff. If you’re a plant, you don’t want microbes to do that.

[01:48:09] Progress has been made. It’s still not economically viable. It’s harder, because at the time, we were hoping it would be a hundred dollars a barrel, maybe going to $150 a barrel. Right now, I see forty or fifty dollars a barrel for the next couple decades, maybe forever, because demand is actually going to peak and go down. And when the fast-charge batteries come along, it’s really going to plunge. So what’s left are airplanes and long-haul trucking, and things like that. Again, it’s a technology that—we still need an alternative fuel, especially for airplanes. Liquid hydrocarbons is the fuel.

[01:48:59] **Q:** Was it fairly clear to you after the election for the second term that you were not interested in continuing?

[01:49:10] **Chu:** No, I was. My wife wasn’t. Sometime after the election—I don’t remember whether it was December or something like that, late November, early December—she said, “You know, Steve”—she hated DC, because the only people in DC who wanted to talk to her, wanted to talk to her to get to me. She did make good friends. She’s British, and so she made good friends with the ambassador, then-ambassador, to the United States from Great Britain, and his wife, but very few other friends. So she had four grandchildren from a previous marriage living in Stanford [California] , growing up, and she would fly back every month to go and visit them for a couple days, go to all their birthdays. She takes grandmothering very, very seriously.

[01:50:06] She said, “Steve, no one’s irreplaceable, not even you. [Laughter] I’ve had enough. I’m going back to California. I hope you join me.” She doesn’t claim she said it quite that way. [Laughter]

[01:50:30] **Q:** That’s how you heard it.

[01:50:31] **Chu:** That’s how I heard it, I claim. After that, I met with the president and said, “Look, I’m sorry. Even though Congress is not on our side now, I still think there’s a lot to be done, but I have another boss, and she wants to go back to California. So I’ve decided I’m [unclear] .”

[01:50:58] **Q:** Do you think that the work that you did in the first four years laid the groundwork for things like the later energy legislation? Is that a completely different story, like the Energy Efficiency Improvement Act [of] , or do you think of it as, the first four years is its own thing, and then—

[01:51:19] **Chu:** No, it’s a continuum of things. I think you go in there, you serve your time, do what you can do when you go in there. And Ernie [Ernest J.] Moniz picked up the ball. But actually, I picked up the ball from Sam Bodman, who was serving in a Republican administration, but there was not much daylight between Sam Bodman and me, either. And so with Sam Bodman—who was trained as a chemical engineer, by the way, before he made a fortune in finance—me, and then Ernie, you had this thing where—and I’m an energy-efficiency fanatic. This is the cheapest, best way to save money.

[01:52:00] I used to give talks all the time and say, “Look, long before I was worried about climate change, I wanted to save energy, because I’m fundamentally cheap. I hate throwing away money. [Laughs] So I don’t care if you—why do you want to throw away money? The free market economists would say, these energy-efficiency guys, they don’t understand. Are there twenty-dollar bills on the floor waiting to be picked up? No. The free market—” Then I started to joke, “How many free market economists does it take to change a lightbulb?” And the answer is none, because the free market would have taken care of it. You didn’t need to change it.

[01:52:47] But in fact, it doesn’t. It doesn’t. Energy-efficiency standards never will enter into the cost of the product, the first thing. As an example, I gave public talks when I was secretary of energy. Cable TV. There were these set-top boxes that were warm, in those days, really warm. If they were in closed cabinets, it was hot. And I said, “With a hard disk, they would be forty watts. Forty watts, on all the time. Don’t think they turn off. When you push the thing to turn it off, they only turn off the display. They leave the entire electronics package on. They leave the hard disk spinning.” I said, “This is ridiculous.” And I said, “They’re forty watts. It should be four-tenths of a watt.” How did I get four-tenths of a watt? I looked at all the remote control things where you really turn it off and stand by. All you need to have on was a little light sensor that says when you tell me to turn on, I can turn on.

[01:53:51] Then I said, “We’re going to have regulations.” And then the DVD [digital versatile disk] and cable TV lobbyists come into my office and say, “You can’t do that. You need these things on all the time, because there’s a program,” and things like that. I said, “Wait a minute. See this? Quartz oscillator. The battery lasts two years. You can actually have a quartz oscillator to wake up, and it takes five minutes to program at night, and then turn itself off. Don’t tell me you have to leave it on.” Never had they had a secretary of energy that said, “No, no, no, no, no. That’s just bullshit.” [Laughter] I didn’t use the word “bullshit.” I said, “No, I’m sorry. You don’t need this. But I tell you what. I’ll be willing to make you a deal. How about four watts instead of four-tenths of a watt?”

[01:54:40] You know what they did? They waited for me to leave, because Ernie Moniz was not that fanatical. He was great, by the way, in the Iran negotiations. But he doesn’t like to get in the weeds and stuff like this, and I love getting in the weeds.

[01:54:57] **Q:** Fascinating. I just found myself wondering how your joke about free market economists changing light bulbs went over with Larry Summers.

[01:55:09] **Chu:** Oh, you know, he and I, we crossed swords, but we actually respect each other. I went to his going-away party. He left after a year, year and a half. And he invited me to play golf. Then, I was still playing golf, and I played with him twice. I said, “Larry, we don’t always agree, but I enjoyed it.” Because sometimes we’d get in these arguments in the Roosevelt Room, and everybody else would just stand back, and we’d be [laughs] arguing with each other. Because Larry does not like to lose an argument. But they said, “God, you’re the only person that he would actually lose to, and he’d have to listen to you. What’s going on here?”

[01:56:00] But he said some sensible things, too. So I said at his going away party, I said, “All right. I’m sorry, but even learning more and more about it—I’ve decided I’m going to learn about economics.” So he said, “Remember the time we first played golf on this course in DC, and we had a caddy.” There’s a foursome, and he got a caddy. I was lining up to make a putt. And he said, “You were going to putt, and the caddy says, ‘No, not there. Go this way.’ [Unclear] these long, curving putts.” He said, “Do you remember what you did?” And I said, “Sort of.” He said, “You didn’t take his advice. You putted exactly where you were lining up. And the ball ended up exactly where he said it was going to end up if you putted going that direction.” And he says, “Listen, there must have been at least a hundred IQ [intelligence quotient] difference between you and him.” So then he said, “You know, you’re a smart guy. You think you can learn economics. But sometimes, experience matters.” [Laughter]

[01:57:16] **Q:** Great story.

[01:57:18] **Chu:** It was very funny.

[01:57:20] **Q:** That’s great. Well, I think I have exhausted two hours without a break, which I was told I should offer, but I didn’t, because it was such a great conversation. I hope you’ll forgive me for that. I want to thank you again for this. Anything that we’ve left off the table, that we haven’t touched on, that you feel like it wouldn’t be complete unless you mention?

[01:57:47] **Chu:** Oh, I haven’t really thought about this. But I think, yes, there’s something. I made this quip about how I was the first scientist in a cabinet position. But I was not the only scientist. Ernie was a scientist; he was a scientist. Long ago, he became a director of stuff. And one of the things that I hired back and got to be head of the Office of Science was a friend of mine, William [F.] Brinkman, very distinguished, National Academy [of Sciences] , Princeton professor for a long time after Bell Labs. He became vice president of research at Bell Labs. And I said, “Come back and run the Office of Science,” which he did until I left. There’s a number of people that said, “I’m here because you’re here. If you’re leaving, I’m leaving.” So that was [unclear] said, “No, no, no.” A couple of people did stay, but a lot of them did not.

[01:58:57] During this time, he said, “You know, you’re different than me.” I said, “Well, how is that?” He said, “Because you’re still a practicing scientist.” When I came out, I said, I’m going to start life as a new assistant professor at Stanford—because I had no laboratory, no space, no nothing—and I’m going to do new research. I’m not going to do what I did before I was secretary of energy. And he said, “Because when you hear about a problem, you actually think about solutions to a problem. When I hear about a problem, I’m thinking about, who are the people you can get in contact to who are true experts?” And he said, “There’s a difference.”

[01:59:37] That’s not to say that I can’t get a hold of experts, because as a scientist who has some respect, you can actually get on the phone and call anyone you want, which I did quite often. But there is a difference. So to have—but I’ll [unclear] the next scientist. Someone steeped in evaluating information. But it’s good to have a few scientists, as well, in the real centers of power, not as an undersecretary, not as an advisor, like the science advisor, head of the OSTP [Office of Science and Technology Policy] , because that’s an advisory role. When you have budget authority, it’s very different.

[02:00:20] As I said before, I wasn’t interested in being an advisor. I am an advisor—except with this administration, I’m not. But in previous administrations, I would be called to advise. In the oil crisis, I was called in with two or three other scientists, and we spent a whole morning, ten to one, or ten to twelve thirty, with George W. Bush. I was talking about alternative fuels and things like that. But to have a US government that had at the very highest levels, who have real authority, not just one, but three or four, scientists—it changes the way you look at information. It changes how you evaluate information. And it would be very good. Scientists or engineers, I don’t really care. Someone who is in some hardcore quantitative thing, dispassionate and data driven. It can help lift things from, “This is your opinion and that’s my opinion,” to, “Hey, let’s go out and get the data.”

[02:01:30] I would hope—I don’t know if it’s ever—and my hat is off to Obama, because I don’t do politics. I didn’t know him. He chose me. So that was a first. So when I told him my wife was going back to California and I had to [phonetic] —and there were a lot of people in his inner circle who thought I was a bit of a pain in the butt. [Laughs] I said, “Look. I’m the first scientist cabinet member. I know a lot of people are advising you not to do it, but do it again.” And he did.

[02:02:24] **Q:** Yes, yes. That’s great.

[02:02:26] **Chu:** I think it served him well.

[02:02:28] **Q:** Hopefully it’s also guidance for the next administration.

[02:02:37] **Chu:** I think so. I think if—well, it depends. If [Joseph “Joe” R.] Biden [Jr.] gets elected, I think he will do that.

[02:02:49] **Q:** Great. Well, Secretary Chu—Steve, if I may—thank you so much. Great to chat again.

[02:03:03] [INTERRUPTION]

[02:03:04] **Chu:** —because you’re the only health policy. You may or may not know, but since the middle ’90s, I started to swing heavily into biology, in, like, 2000. And now, aside from batteries, we also [phonetic] figured out how to get lithium out of seawater, so there won’t—but in terms of health and things like that, there are so many things that I think could be done. And in health in general, and technology in general, but also, even in just the immediate emergency, for preparing for the next pandemic so it doesn’t become a pandemic. Because where we are today versus twenty years ago and a hundred years ago is lightning different. Jet planes make the vector spreading so much faster.

[02:04:02] **Q:** Yes. I think one of the challenges, I would say, is that this pandemic in the US [COVID-19 Pandemic, 2020-] has revealed the underfunding and impoverishment of a real public health system. That is, all the things that we talk about as necessary to mitigate the adverse impact of a virus. Whether contact tracing, PPE [personal protective equipment] —but just having an infrastructure that allows you to manage a public health calamity is just—that’s the wake-up call, in my view, that we’ve depended heavily on developing a medical system or a drug development system that deals with problems after the fact, but this calamity highlights the importance of having a system for managing a disaster as it’s unfolding. So it’s like the equivalent of having the expertise to manage the Deepwater Horizon. It’s not just—anyway. Don’t get me started, because, of course, it’s not my interview. [Laughs]

[02:05:08] **Chu:** Yes. But, no. Also the disparity in healthcare between poor people and rich people. Many, many things. But I’m constantly reminded that clean water did more for public health than just about anything. These are cheap, drop-dead stupid things that we knew about for a hundred years.

[02:05:33] **Q:** It’s true that the way that we manage health through things that are—it’s back to your theme of invisible things, like fluoridated water, or niacin-enriched bread, the kinds of things that really have these large—

[02:05:54] **Chu:** Golden rice.

[02:05:55] **Q:** Exactly. Really significant. That’s what I mean by thinking about health and how you advance it, how you preserve it, rather than just thinking about when we get sick, what do you actually do? We have a system that really privileges the after-the-fact reimbursement system for healthcare, mostly for upper-end healthcare, and the commitment to things like immunizations, which have these negative implications for people who are stressed socioeconomically. So hopefully we’ll turn the corner on this one.

[02:06:37] **Chu:** Maybe. I hope so. It’s just, like, you have to do adaptation and mitigation for climate. No doubt about it. But a lot of the mitigation is going to be a hell of a lot cheaper than having California now perennially burning up, the Gulf states, Florida, perennially under floods. And the Midwest. These things—that’s another surprise. I did not expect to see the stuff I’m seeing while I was alive. So it begs the question, when was I going to see? After I’m dead. But never mind that. [Laughter] The fact that it’s come on much faster than I thought twenty years ago is a little stunning to me.

[02:07:26] **Q:** It’s pretty scary stuff, yes.

[02:07:29] **Chu:** And it’s still being denied.

[02:07:30] **Q:** From the highest levels, as well.

[02:07:37] Well, great to chat. I really wish you well. And hopefully, it’s not another twenty years or thirty years before we have a chance to chat again.