Oral History Interview of
Kishor Mehta

Interviewed by: Andy Wilkinson
January 20, 2014
Lubbock, Texas

Part of the:
Wind Interviews

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Interview Series Background:

In addition to interviews pertaining to the National Wind Institute, oral histories have been conducted with various individuals whose lives have been impacted by wind engineering in the Southwest. For example, interviewers have spoken with farmers and ranchers who witnessed the rise of wind turbines on their properties and adjacent lands, employees of electrical co-ops, and engineers who helped logistically create the large wind farms.

Transcript Overview:

This interview features Kishor Mehta, who discusses how Texas Tech University's reaction to the Lubbock Tornado of 1970 developed into the National Wind Institute.

Length of Interview: 00:45:21

Subject	Transcript Page	Time Stamp
Beginning of the program at Texas Tech; 1970 tornado	5	00:01:15
Interdisciplinary collaboration, beginning of the Institute for Disaster Research, how the first West Texas field sites for wind study were set up.	6	00:06:13
First building, early years of program, multidisciplinary work	7	00:10:55
National Science Foundation grant, setting up integrated graduate research and education program, getting the program approved.	8	00:15:39
multidisciplinary work to science research and problems of modern living, why such a program has to be rooted in faculty interest.	10	00:24:29
Cooperative mindset, collective good, next generation	12	00:34:00

Keywords
Lubbock tornado, research grants, wind tunnel, National Wind Institute, wind science

Andy Wilkinson (AW):

No it went straight to voicemail; I happened to look at it and saw that there was a voice--

Kishor Mehta (KM):
Yeah, no, I didn't leave the voicemail.

AW:
That's all right. When I saw that you'd called, I knew something was up. Thanks for taking the time; I know that you're really busy when you get here on your short trips in and out. Let me say this is Andy Wilkinson, it's the twentieth of January, 2014, I am in Dr. Mehta's office with him, and we're going to talk in the time we have available about the National Wind Institute and wind engineering and all things wind-related, I guess.

KM:
Sure.

AW:
Normally, I like to do a lot of questioning about background, but I think since we have such a short time, I'd like to just jump into the middle of it. One of the things that's really interesting to me is the development of this program at Texas Tech. If you could—I don't know if you'd like to start at the very beginning or--

KM:
Yes, I can tell you briefly how we got started. Really, the impetus came when we had the tornado of 1970 on May eleventh. It really did a lot of damage to the downtown area, all kinds of buildings—there were residences, there were apartment buildings, there were commercial buildings, there were twenty-story buildings, fifteen-story buildings, concrete silo. And of course, we were young and inexperienced, but one of the things in particular I realized, was it was finals time and I was grading the day it occurred, and next morning when I came to school, and I had some idea what had happened, is we'd normally try to test the structures in the laboratory—and we had just completed the new lab, so I had that in mind—but what I told the chairman is that normally we tried to test in laboratory, and that nature has tested for us. There's a lot of damage and destruction. Unfortunately, many people died and also injured, but there is an opportunity for us to look at the way different types of buildings have collapsed or damaged, and even though we have no control over them—it's not a controlled experiment—but the mode of failure can maybe be able to help us. It was something that was not really known what we would get from it, because we had not done that before. And he said "All right, we need permission to do that," because the area was cordoned off. But he was able to get the permission, and four or five of us actually—Jim McDonald, Joe Minor, Cliff Burke(?), Al Sanger and myself—we met and first we looked at the damage one day, but since it was extensive and it was at the local level—so not only we got the photographs and so on, but we got a lot of other data

that we could, to the extent of some drawings of the way the buildings were constructed and the type of buildings that were involved—and we were able to go back, even a week later, and get some more information with the photographs, and some of the concrete beams that had collapsed, which were very unusual. And I got the data for that from… because they were pre-stress concrete beams. They were constructed in Amarillo, and brought over here and put on the caps, on the support, but there was no concrete slab on top of it. So we spent almost a year in looking at what we had collected, and go back and get some of the details, and put together a report. We didn't realize it, but it was a mild storm, because the buildings were identified one at a time—what kind of construction, how they failed, what direction the wind would have been, what was the possibility of what the wind speed may be—we needed some back calculation of wind speed, saying that if they were designed in a certain way, at what wind speed would it take to fail, to make it collapse? In some cases, they would not collapse, what wind speed would it take *not* to collapse—what could be the maximum wind speed? So we put all that report together, and then it was almost a year, and we did get a National Science Foundation grant for that—I think it was about eighteen thousand dollars, which was a very small amount compared to the work that went in.

AW:
Yeah.

KM:
But that gave us a starting point, and I would say that that really is the beginning of our program—we called it Institute for Disaster Research.

AW:
One of the things that strikes me, when I'm interviewing other people related to the program, is the—I don't suppose it's unheard of—but it's still fairly unusual to have the different disciplines involved and over such a long period of time. How did that occur?

KM:
Yeah that came a little later on, as we found out that the tornado damage is something that is not known in the technical literature. So we did some additional -- when there was a tornado in Plainview, then we sent a team over there. And I believe the first team where we got other than just civil engineers, Richard Peterson, meteorologist, was when the tornado occurred near Omaha, Nebraska. And he went with Joe Minor, and tried to assemble what type of tornado may have been—or what may have been the intensity—because by that time, Dr. Fujita had assembled the Fujita scale that he was using. And we tried to see if that was appropriate scale, or what the wind speed range that were assigned for each F-scale were reasonable. And so this is where it actually started, and then later on there was some more -- we set up a field site, not for tornadoes, but just the ordinary wind—because there was quite a bit of work being done in wind

tunnels, but even the wind tunnel people had realized that it was very difficult to test low buildings, one and two-story buildings in wind tunnels, because of the turbulence. And we said we have high winds here, so why don't we set up a field site. So, actually, the very first field site was set up in 1975, by a graduate student. We didn't have any instrumentation, we didn't have any money to do things—he kind of constructed his own building of sixteen by sixteen, and had instrumentation—minimum, like just four load cells, the entire roof was supported on four load cells. And I was his supervisor, and he did a great job in assembling kind of a side story. There was no digital data collection at that time, it was all analog. But in order to analyze, we needed to digitize it. And we said all right, our computer center can digitize for us. Well we found out that there was some discrepancy, or incompatibility with the seven-track and nine-track. And I don't understand the details, but all I know, that we couldn't do it here. So the graduate student was very enterprising—he was from Korea—and he found out that there is a place in Austin that can digitize from a nine-track that we had collected. And he had contacted somebody, and the person there with this company was willing to do it for us. So I told, Soo Yu Kim was his name, I said Kim, take the data that we have on the tape, pack up in the car, go to Austin, and see if you can get it digitized. And he went there, and it took them, I think seven to eight hours to do it. But he got it all done and came back, and so we had digitized data. And we presented that paper I think to national conference in Colorado, and there was a lot of discussion on that. To some degree, controversy, because what we were getting was not what they had obtained in England in terms of spectrum, but both of them were right it turns out in hindsight. But that time anyway, they felt that what we had obtained wasn't good data—and we kept saying well, what we have obtained *is* good data. But it turned out that both of us were right, there was just a different way of doing it.

So there was a starting point on the field site—and the reason for mentioning that, is because in 1980s then we submitted a proposal to the National Science Foundation, [we] said, can we set up a field site, because we have natural wind. The first one we did, we did literally on a shoestring. This time they said okay, they can give us some money, and so we constructed a building—and the building was actually donated to us, it was a metal building—but the students assembled it, they put it together, a big building. We put it on railroad tracks so we could rotate. The reason for that was the instrumentation was very expensive at that time, and so we instrumented it only one corner. And by instrumenting that, then depending on what wind direction was coming, we could rotate the building. It required three, four persons to do it, but the students were enthusiastic. And at one time on the weekend, even my daughter came in and helped push that building around. So there are a lot of stories behind it. But where it went from there is we submitted a five-year project as a cooperative project between Colorado State University and Texas Tech University, to do what they would do in wind tunnels, we were doing it in the field, and try to compare. And with the field data, after validating and checking it, it's actually the field data, as long as it's properly collected. So they had to tweak their wind tunnel in order to try to measure, and that has made major impact. That's where the real multidisciplinary work started, around '87. So not only we had atmospheric science involved in that by that time, but also economics, and we had faculty

from mechanical engineering looking at computational components of it, and a faculty from chemical engineering, interested in how if the wind is coming out, if the air is coming out of a building, how it will go out, because the turbulence—how the wind is flowing over a building. So that's where really the interdisciplinary work got a major impetus, even though we started doing it in mid-seventies.

AW:
Did you encounter any difficulties administratively and organizationally in putting the different disciplines together?

KM:
No, actually at that time we were able to do that pretty well, because the resources were available from the National Science Foundation. As long as the resources are available, then it is not difficult for faculty to be able to tell the chair and the deans of the colleges that this is what they're working [on], and it's appreciated. The difficulty comes in when the resources become tight. It's just like anywhere else, when the budget becomes tight, then people start looking at [it], saying, is it worth doing it, is it a combination or not? And I'm going to lead that discussion into—and I know I'm going fairly fast forward—but in 1998—we started this interdisciplinary work in '87, we had National Science Foundation funding, and that was a total of ten years. And, admittedly, some faculty would come in, and others would go out of the program, but I was the P.I. [principal investigator] for it, so I stayed continuously on that. And just about the time when that was ending, or before that ended, we had a cooperative program, or Windstorm Mitigation Initiative funding coming from National Institute of Standards and Technology. And that allowed us to continue with interdisciplinary work.

Around late-nineties, '98, '99, we submitted a proposal for two NSF for either program—integrated graduate research and education -- with the idea that we have been doing research, it makes sense to set up a curriculum for the multidisciplinary work. That had administrative difficulty, for two reasons: one, in the National Science Foundation, in that particular program, is primarily [a] fellowship for the students, not the faculty. So the faculty had very little resources to provide input. So when the faculty would go to a department chair saying, I'm teaching a course for the either program, the chair said "Well yeah, but we also have to teach the courses within our own program that we are committed." And so that created some difficulty for the faculty to be able to teach in that. The second reason was that the students were multidisciplinary, and hence it was difficult for the department—from administration point of view—that they graduated from their department. Because what we did was, we set up a Ph.D. program in wind science and engineering, that didn't belong to a department.

AW:
So the wind science and engineering was non-departmental, it was--

KM:
Crossing the department.

AW:
Yeah.

KM:
And the degree program is non-departmental, there is no department for wind science and engineering. But, when we proposed it, we got approval from College of Engineering, we got approval from Arts and Sciences, through their committee, we got approval from the Graduate Dean—everybody knew that we were doing this, and it was considered to be unique program—there is no other Ph.D. program in wind science and engineering in the country. And deans were telling me that the coordinating board is not approving any new Ph.D. programs. And I said fine, I think this is unique, I think we have a good chance. And ultimately when it was submitted to coordinating board through by the Board of Regents, through the normal process for any Ph.D. program, it went to the board, the board staff had looked at it, and they even had consultants come and take a look at it, and the staff made a presentation. I had gone to Austin, the staff had made a presentation to the coordinating board—somebody from coordinating board said "Wind program, a unique program is natural for Texas Tech University, I move that we approve it." And within five minutes, that degree program was approved.

AW:
That's pretty amazing.

KM:
Yeah it was very satisfying--

AW:
Yeah.

KM:
To see that. Even though there was cost involved by the university, there was cost involved by the state to get the thing going, but we also had some funding from National Science Foundation that helped. So that got us a start, and that really is—to me—that's the true interdisciplinary, multi-disciplinary work, when you really have students coming from that program, and they're required to take courses—it's a curriculum—so they're required to take courses across the colleges. And then they're required that their Ph.D. dissertation also having interdisciplinary component. And then the committee we made said that it crosses different colleges. And it's still

ongoing, with some difficulty, because it is not a department. And so the funding for that doesn't come automatically.

AW:
So every time you need funding, you have to go present a case for it.

KM:
Present a case for it, and when we submitted it to the coordinating board, I had put together a five-year plan, because they required that. And I had committed the university, and everybody in the university had signed off on it. So we had some funding from the university for five years. Now we are beyond five years, so we have to generate our own funds through the fellowship, or through assistance-ship. And wind energy—which is relatively new—fits in there, because whether you're doing Ph.D. dissertation in one type of wind, or another type of wind—whether you're considering it for the damaging wind, and the structural engineering, or whether you're considering beneficial wind, and the structure of turbines, and the fatigue and so on, and the economics of it—that's a natural—and even electrical engineering has also gone into it, because it relates to generating electricity, so it's natural that they have some component in there. So it really has become a true interdisciplinary program, and over a period of time, when we have graduate students—and most of them actually have gone into industry—some with a government agency, couple of them into academics, but most of them have gone into industry. And I can't help but think that as we continue to go on, these unique individuals, and they were hired by, there's one with IBM, and one with a big insurance company—they want people with interdisciplinary, to be able to either assess the risk, or if it's a wind energy company—be able to assess the economics of it, or be able to say what kind of spacing should we use, what kind of climate they need, to know how much energy they're going to get.

AW:
And I would think that the success in placing students in jobs like that would be to the benefit of this kind of program also.

KM:
Very much so, I think that that speaks a lot—two things—one, it speaks a lot for the program, and as the years go on, these are the people who are going to be supporting—in some manner—the program, as long as there's good continuing research, good types of problems that are being worked on, good types of facilities—and we have the facilities now, that's by any standard unique for anywhere in terms of wind hazard, we have a vortex facility, wind tunnel facility, field site, and two-hundred meter tower, and wind energy, where we have turbines and two-hundred meter towers. And, not to mention the radars [inaudible]. So you put all those together, and if they all work—and they do work together, it's not *if* they work together, they *do* work together—the potential for faculty and students to do research is unique.

AW:
Is it safe to say that this may create a model for other areas of study in the university? In other words, could this interdisciplinary kind of program be replicated, or is it unique to wind?

KM:
I believe it needs to be replicated in some other areas. Now, admittedly, you need the areas where there are interdisciplinary work needed. We still want to continue doing the core in each of the disciplines there, we'll recognize discipline. But as the national research continues—and this is where right now I'm at the National Science Foundation. The National Science Foundation is promoting multidisciplinary, interdisciplinary research. We set out two solicitations in last three years that I have been there. We specifically require that the proposal has to have minimum of three co-P.I. representing different disciplines. And the two different program solicitations that have gone out—one for the hazards. And it can be wind hazard, it can be tsunami, it can be wildfire, it can be earthquake—but the minimum requirement there was that they have to have three different disciplines work together. So soil science, atmospheric science, or earth science, and engineering. And the other one that has just gone out relates to infrastructure, interdependency of infrastructure. For example, if our water pipe leaks, we have to dig up the street to get to the water pipe—is that what we want to do twenty years from now? Can we put the water pipes, or the streets, in such a way that they can be managed much more easier? The interdependency of the two. Or in order to generate the electricity, we have to have water. In order to get the water, we have to provide pumps that will bring it—so if the electricity doesn't work, then a lot of other things stop. Transportation, in the urban areas particularly—and Hurricane Sandy pointed that out to us—in urban areas, if you don't have electricity, you can't do anything.

AW:
Yeah.

KM:
The buildings are forty stories high, apartment buildings—where are people going to go on thirtieth floor? They can't go up and down. They have emergency generator, but that works very slowly. And New York City had experienced exactly that, when their power was gone like five days—it was very difficult for them to manage.

AW:
Yeah. How does a university move forward in discovering these sorts of areas, and building these interdisciplinary programs?

KM:
I think the universities need to look at—rather than the universities saying that this is what we should be doing, the deans and the president saying "Let the faculty decide on that." Because it's the faculty that's going to be doing it, it's the faculty that stays in the university on a long-term basis, deans and vice presidents, presidents, are very good to facilitate, but they're not always long-lasting. Not because they get a better opportunity, or they move—it is that type of position. On the other hand, faculty, once they have a research program going, they don't want to go. Because if people working with the wind area and the wind facilities right now as an example, if they go somewhere else, they don't have that facility, and it would take them ten years to build it, if that's what they try to do. So it's natural that the faculty would stay at a given location longer, and the faculty are the [ones] really dedicated and doing the work. So the faculty needs to be able to decide what area we should work. And, admittedly, with some help from administration—but this is how the university should decide that, okay, we should have four or five—doesn't have to be twenty, just four or five programs that are interdisciplinary, provide an administrative structure, that will nurture the interdisciplinary. And one of the ideas, my personal idea, is that it should be set up in a system that should not depend on the personality of the administrator.

AW:
In the president's office or the dean's--

KM:
Right.

AW:
Right.

KM:
They're very good at the facilitating, the nurturing, but if it depends on a given administrator that he or she likes it because that program is there, when they leave the program, either it dies, or doesn't really make much progress. If you have a group of faculty doing it, from different colleges and different departments, and go over a given problem—and there are many problems like that—then—and if it is set up as a system—that there is an entity, some administrator in charge, so if one person leaves, the second one comes there—it is their responsibility to look after the program, and make sure the program makes progress. And if the program doesn't make progress, then we should delete it—five years it doesn't make much progress, it has not done much, it can't get the resources from outside as well as providing general resources—then we should get rid of it. But that's how the nurturing of the programs will work. And the National Science Foundation is—through—I got program. It was the goal of the National Science Foundation to nudge the university to look at interdisciplinary programs. Right now the two

solicitations that I've talked about, those are important problems for the country—how to prevent natural hazards from becoming a disaster. We will have natural hazards, we will have tornadoes, we can't stop them, we will have hurricanes, we will have earthquakes--

AW:
Excuse me.

KM:
So we can't stop them, but if we can prevent them from becoming a disaster, major damage—they'll be some damage—but if we can prevent them from being major damage, then we are ahead. And in order to do that, we need the help of engineers, we need help and good research from earth science, which includes atmosphere and soil or earthquakes. And we also need input from the social science, from political policies, from how the people are going to be helped. If you want to save lives, our warning system should be set that people will heed to it. Or you should figure out a way of investing, so that people will have shelters. Or we should have some manner of putting our electrical grid in such a manner that we won't lose electricity more than five hours, or more than twelve hours. Anytime you lose electricity more than three days, the additional economic losses are very high. You can manage it until about ten to twelve hours.

AW:
One thing—and we're probably nearing the end of our time— one thing that I've heard over and over again from people I've talked to about this program was that the personalities in the program were a very important asset, and they all lead the list with you. And they talk about your willingness, and the willingness of Minor, and McDonald, and Peterson and others, who were involved early on—your interest in working together, and not participating in the turf battles that we all hear talked about. How do we go about fostering more Kishor Mehtas in these programs?

KM:
That I don't know, I don't have an answer to that. But if the university would treat the faculty evenly, and nurture—it's good to have competition, but also competition can destroy things. So if the colleges, the deans, start thinking in terms of, if it is good for the university, it is going to be good for colleges. If the chairs of the department start thinking that if it is good for the college, and the university, it is going to be good for the departments. If that thought is put in place, that culture, then I believe we don't have to get new people—the people will be willing to do it, if they're treated fairly, they will be recognized fairly, and simply promote the idea—provide some incentive. If you work together, yes there's more incentive; if you don't work together, it's not that we're going to say no, but you don't have those additional incentives. And I guess that's the only way I can think of.

My personal approach was always—people say sometimes "Well there is a piece of pie, how are

we going to divide it?". My way of looking at it, there are opportunities where we can make the pie bigger, then dividing is not a major problem, as long as you can see that you can make it bigger. That philosophy, we were lucky to get state funding on line item in the first two years, or three years we got all the faculty and I said look—particularly young faculty—submit the proposals to the state. The state used to have a program where they would fund certain projects—I forgot the name of it, but anyways—and I said I'll fund you from this money that we have received, one month of your salary, if you promise that you will write a proposal to the state to this program. And give me one page what your idea is, and I had three people who are not writing the proposal, including me, who made a decision of okay, these five are more prone to be successful then the others. Any of them, there's no way of knowing, any of them can be successful, but, it was a matter of making judgments. They had to relate to wind, because we were using the wind money for it. And we had five of us go in there, and I think a couple of them were successful, and which is what you need—is to provide incentive for the faculty, and the students to be interdisciplinary, to promote that. If they can do it, I think we'll have the program. And this culture needs to change, really nationwide—not just at Texas Tech. But Texas Tech has an opportunity to make progress in that direction, because we have had faculty—admittedly, they have retired, and so on, now—but there is a model that is set up, and the model actually is continuing. The wind program, right now, is National Wind Institute, is making progress better than ever—and we were focused on hazard, and when the wind energy came in because of realizing that we need renewable energy—and wind happens to be a natural resource here—so there is a very strong emphasis on energy. And both of them survive together—it's not just this or this. And ultimately it is wind, and wind is a natural resource that we're going to have. And so there is a lot of research development that still can be done in that area, and it will never go away.

AW:
One last question—what should I have asked that I didn't?

KM:
Well I think the goal and the reason for the success, in my opinion, now that I look back particularly since I'm gone from here—the reason for the success of this program has been that when we started, for whatever reason, we didn't know that, but we had a chemistry of working together. We were not building turf, particularly between Joe Minor, Jim McDonald, and myself—and Ernie Kiesling, who was the chairman, nurtured that. He didn't always work with us, but as chair, he was helpful in pulling it together. And so that chemistry was—since we didn't build the turf, it worked. Now, admittedly, Joe Minor, for his desire and so on, left in mid-eighties, and Jim and I stayed with it, and Jim retired about the same time I did. And I think the key there was, for us to realize that we need somebody else to be in charge. If they won't do it the same way we did it—but if it is to survive, then the next generation has to take care of it, and the next generation has to. And they were nurtured, but they need to be charged to realize what

can be done. And so I feel very good about it, to leave—I actually retired from a tenure-track position in 2003, even though I've been here and involved, and connect with the people, and so on. But Andy Swift took over from there for several years and he developed the wind energy program, and then he just stayed where wind energy education became important, so he got involved in that. And John Schroeder has taken over, and is nurturing with the young -- so that literally there is a second, and a third generation doing it, and that has survived. And the new generation of faculty coming in are willing to do a little bit different than what was being done before. You can't continue to do the same thing on a long-term basis, not in research. If you don't morphose yourself into something different, and relate it, then the resources won't be there—it won't be as challenging, it won't be as much fun. And so this is where it has happened—I think those two things, is—fortunately, we had good chemistry, and we realized the time has come for change. Joe Minor actually had taken the lead starting 1970, and he left in '87, and then Jim had taken the lead some, and then I had taken the lead later on, and then it turned over to Andy, and then to John. So when you think about it, it has become a natural progression of it, and that's what makes it work. And now the young faculty, they're working with it enthusiastically, and that's what you need. I have enthusiasm, but I don't have the energy.

AW:
I understand that.

KM:
Yeah, it's just natural.

AW:
Well, I know you've got other things to do, I'll have other questions, but we can talk about that later. Thank you so much.

KM:
Oh my pleasure, I'm sorry that we had to work it out.

AW:
No, this has been a great interview.

KM:
I'll be glad to answer questions, I'm glad to talk to you on the phone now that you know how your questions are, and so on. So if while you're pulling things together and so on, if you know, I wish I asked him what happened in the standard-making, or what happened in how did we do the tornado work more, or--

AW:
Yeah, well I'll have some questions about that. I think I told you when we met earlier, that I was a policeman in Lubbock in 1970.

KM:
At that time.

AW:
Yeah.

KM:
Yeah.

AW:
And it was very unusual—I'd seen tornados as a kid on the farm, and I'd never seen one in a city before, and it was *such* an almost other-worldly experience--

KM:
Yes.

AW:
To go into a place that you knew quite well, and now you knew it not at all.

KM:
Yeah, yeah, right.

AW:
The damage was very interesting.

KM:
It was unique, it's something that we don't want it to happen again, and kill that many people—and really destructed lot of lives. But, without disturbing anything else, we were able to make something good out of it, and that certainly has paid off. And when we did it, did we it know where it will go? No. But that's the way research is—you don't know what you're going to be doing ten years from now, fifteen years from now. But then, again, you make progress and you look at—and over everything else, you educate young people from along the way, and the model work they do, and what you have provided them, is what makes work fun.

AW:
Good.

KM:
Okay.

AW:
Thank you.

End of interview