Transcript

Speaker: Al Gore

Talk: The Climate Crisis and the Case for Hope

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Speaker 1:	00:00:04	Please join me in a very gracious and warm welcome for Vice President Al Gore.
Speaker 2:	00:00:11	Thank you. Thank you very much. Thank you. Thank you very much. Thank you. Ladies and gentlemen. Thank you.
Speaker 1:	00:00:32	Thank you for the very warm welcome. And I want to thank John Replogle for his very generous introduction. It's been a pleasure to work with John and his team at seventh generation. My colleagues, Peter Knight in Laila Precedent and I are going to be going over to the company later. I want to thank President Tom Sullivan here at the University of Vermont and compliment this university on its leadership and sustainability and the transition to a low carbon approach to the economics of this school. Um, it's an honor to be joined by Shap Smith, the speaker of the house, have a Vermont and I had the honor of earlier of being with him and the governor of your state, Peter Shumlin, who's attending to the aftermath of the Amtrak accident yesterday. Right now, I want to thank the organizers of this event, including especially Ashley or gain and all of the people who worked hard to make this a great occasion.
Speaker 1:	00:01:39	I have a personal friend who's visiting here, Serene Joan Jones who heads the union theological seminary and her daughter, Charisse is here as a student at the University of Vermont. There are a lot of distinguished guests that I am not going to have time or the knowledge to, to single out, but thank you so much. All of you for coming. I should mention being back in Vermont that this state is a leader on sustainability. I want to acknowledge two of my colleagues in the environmental movement who are, who are not here, but Gus Beth and Bill Mckibben are both

tremendous activists and I have a chance to work with them regularly and I didn't want to come to this state without acknowledging their great work. Okay. I'm going to show you some pictures and go through some facts about the climate crisis. And, I want to say at the outset that this presentation I'm about to give you is a little less than an hour, so just set your expectations, but set your expectations in another way.

Speaker 1: 00:02:57 You will see a during the first part of it, a lot of the damage that's being done by the climate crisis, but don't give into the temptation to think, oh, woe is us, because the whole last part of this is filled with hope that is justified. It's not an act of will we are going to win this struggle. We're going to win. We are winning. The question is how quickly we can win, because damage is, is building up and will have a cost later on, but be of good cheer. This is a, uh, this is a movement that is building and it's momentum all around the world. And I'll talk a little bit about that as we get going. So the first image is one that's well known to you. This images called earthrise. It was taken Christmas Eve, December 24th, 19, 68 by the first of the Apollo missions to go around the moon.

Speaker 1: 00:04:05 They didn't land, they were focused on finding a landing site. And this image came as a complete surprise to them. NASA has a online, the audio tapes, uh, they've matched to a recreation of the discovery of this image, and the astronauts were all focused on the surface of the moon looking for landing sites. And out of the corner of his eye, one of the astronauts, Bill Anders said, saw this image and said, wow, look at that. And then what followed was a scene similar to what a family goes through when they're on vacation. And somebody said, get my camera quick, do you have any color film? And they're loading it up. And in any way he snapped this picture. And within 18 months of this picture being seen back on earth, the environment, the modern version of the environmental movement had really taken off.

Speaker 1: 00:05:04 The first Earth Day was organized, the Clean Air Act. The EPA was established and worldwide consciousness was changed quite dramatically by this, by this image. This is the last picture taken by a human being personally of the earth from space. It was taken December seventh, 1972 on the last Apollo mission, which was the only one where the earth and the sun and the moon were all lined up. So you see the, the full disc of the earth illuminated. We have just started just in the last couple of months getting new pictures, uh, of this. Uh, let me go back one, of this image and I'm not gonna go back and tell you that story, but we just have, have turned on a satellite that's a

million miles from the earth at a point in space where it hangs between the earth and the sun its a very exciting story that we don't have time for.

Speaker 1: 00:06:06 This image is a really important. It embodies an important insight into why the climate crisis is the problem that it is. When, when you walk outside of this building and look up at the sky, it seems like a vast and limitless expanse just goes on forever. But actually from the vantage point of space, uh, you can see what the scientists have long known. The atmosphere is so thin. It's a very thin shell of air surrounding the planet. If you could drive a car at normal highway speeds straight up in the air, itd take about five to seven minutes to get to the top of the sky when you couldn't really breathe without oxygen anymore. And why this is significant is that that space is much smaller than we imagined. So when we put as we will today worldwide, a hundred and 10 million tons of heat trapping pollution into that space, it mounts up.

Speaker 1: 00:07:17 We now have a global policy of saying to the large carbon emitters, and actually all of us are part of the issue, but we say to the large, large polluters, you have a problem disposing of your gaseous waste. Just dump it into the sky. Let's use it as an open sewer free of charge. Just dump everything you want to up there and don't worry about it. Well, that's, that's a problem. This is the basic science, and I'll run through this. You all know this a very clearly. The energy from the sun comes in the form of sunlight. It slices right through the atmosphere, and warms up the planet and there's a natural layer of greenhouse gases which traps some of the outgoing infrared, uh, which is a good thing because when that's a trapped, then it keeps the temperatures on earth within a range that's conducive to human life and has given rise to the whole web of life that we're a part of on the earth.

Speaker 1: 00:08:31 So that's a good thing they call the earth the goldilocks planet. It's not too hot like Venus, not too cold like Mars. It's just write like a baby bears pourage. Uh, and uh, the problem of course is that we are now relying on fossil fuels for 85 percent of all the world's energy. And when oil was first discovered a little over 150 years ago, coal was already being burned in relatively small volumes and nobody really knew, actually the scientists had begun to worry about this earlier, 100 years ago, but nobody really intended what has unfolded since then. But we're burning all these fossil fuels. And so this line of heat trapping ga sses, the natural one of being healthy, thickens and as it thickens, more of the outgoing infrared is trapped and so the temperatures go up. That's the problem. Sorry, this clicker is a

little erratic this morning. Okay. Like power steering here one. What I'm trying to show you is that wait a minute.

Speaker 1: 00:10:02 Fossil fuels are not the only source. You don't have to worry about a absorbing all of this. But it's important to note that agriculture's a big part of the issue. Also land transportation. Landfills, we can get methane from landfills. A few communities are more, more should we're starting to get methane leaking from the frozen Arctic as it, as it falls out. The permafrost contains a lot far as far as so, but the main part of the problem is the burning of fossil fuels. That's really the main part of it. All these causes have to be addressed, but when we address this one, the rest will begin to fall into place. You can see that with the industrial revolution, it really began and after World War Two, it really started taking off and with the globalization of the economy and the development of emerging economies like China and now India, we're seeing it really take off.

Speaker 1: 00:11:06 This is the real big part of the problem and as the CO2 increases, the temperature goes up. This is just an illustration on a 2000 year scale C02 temperature. They correlate precisely you can take, we can take it back now a million years through the ice ages, and what's going on now is completely off the scale and needs to be addressed. The cumulative amount of manmade global warming pollution now traps as much extra heat in the atmosphere as would be released by 400,000 Hiroshima class atomic bombs going off everyday. It's a big planet, but that's a lot of times every single day.

Speaker 1: 00:12:03 That's a conservative calculation. Believe me, if the denial is, could pick a hole in this and say, no, that's wrong. Jim Hansen, who led the team that did this calculation don't know what they're talking about. They've never been challenged. it actually is a conservative calculation. So this is the only complicated slide on a set of slides I'm going to show you, and those of you who are better at statistics than I am, will know this is a bell curve. So let me just spend a moment explaining what this means. This is a, the distribution of temperatures on the earth as they were during a, a so called normal period. The 30 years between 1951 and 1980. It's for comparison purposes, the blue represent cooler than average days back in the era when I was born. The white are normal days and the red are warmer than normal days. And this is the bell curve. And in the 1980s during the decade of the 1980s

Speaker 1: 00:13:14 that shifted. Let me go back one there. Okay. During the decade of the 19 eighties, the distribution shifted, so you get a lot more warmer than average days and you get the appearance of

extremely hot days in statistically significant numbers. Then in the 19 nineties, it shifts further and the extremely hot days grow. And you can see that warmer days and extremely hot days now dominate the distribution. And in the last decade, what you get is the extremely hot days globally are now more numerous than the cooler than average days. The extremely hot days are now 100 times more common than they were just 30 years ago. So this is a big difference, by decade. The last decade was by far the warmest decade ever measured. Last year was the 38th year in a row warmer than the 20th century average. And the 14 of the 15 hottest years ever measured have been in the last 15 years. The hottest of all is going to be a this year. That's gone up to a 98 percent probability that a little more time left in the year. But you know it's all but certain. Now the, the previous record holder was last year, so this is beginning to have a, a big impact.

Speaker 1: 00:15:07 Let me get this signal to work. Here we go. Last month was the hottest August ever measured and it was the 366 month in a row above the 20th century. Average last July was the hottest month of any time ever measured with instruments in world history. And the heat alone has a big impact on people. Plants especially, it's beginning to hurt crop yields, people, animals, plants, and ecosystems. In South Asia there were thousands of people killed just by the heat and India and Pakistan this summer. And when you get to the heat index in Iran, one day this summer, the heat index reached 165 degrees Fahrenheit. This is extremely dangerous for vulnerable populations, including the elderly and infants. And global warming is increasing nighttime temperatures more than daytime temperatures. So people don't get a respite at night.

Speaker 1: 00:16:29 I'm just going to do this manual here, a germ all over Europe. Peak record. So we're broken this year lots of places in France and the UK and Germany, the Netherlands, Belgium, et cetera. So on a global basis, more than 90 percent of all this extra heat energy goes into the oceans, about 93 percent and ocean temperatures are rising quite dramatically. That there are new instruments that make it possible to measure ocean temperature at, at all depths that's new of the yellow line. Now they know that the so called paws was never really taken seriously by the climate scientists, but now they know that it was just that it's, if you include oceans with the atmosphere, has been no pause at, at all or a foe pause as one of the scientists calls it This is, this is for real.

Speaker 1: 00:17:34 And the warmer ocean temperatures have a number of consequences. First order consequences. When you had the

super typhoon Haiyan a little over a year ago, that the typhoon crossed ocean areas were much warmer than normal and it became the most destructive typhoon ever to make landfall. Thousands of people killed 4 million homeless refugees as a result, some of them still not a backend to homes. Pope Francis a blessed be his name, uh, went to the Philippines immediately after high on and talked about the climate crisis. And of course he was just in the US on that amazing visit, spoke to the UN, the congress at the White House and has made to the climate crisis, uh, one of his top priorities. And one of the points that he has made to the scientists have long tried to point this out. He does it much more effectively. The poor and disadvantaged are the ones who are hurt most by the climate crisis, uh, in our own country.

Speaker 1: 00:18:47 A little over two years ago, a superstorm sandy cross to ocean waters that were nine degrees Fahrenheit warmer than normal in that part of the North Atlantic. The resulting storm devastated to New York and New Jersey is the coast of New Jersey, the subways and one of the, when, when the movie an inconvenient truth came out nine years ago, one of the most criticized parts of it by the denialists was an animated sequence that showed the nine slash 11, the World Trade Center memorial site vulnerable to a warm ocean water coming into it from the east river and the Hudson River with a combination of sea level in storm surge. They said that's impossible. Well, the Hudson River downtown Manhattan was literally pouring into the ground zero site.

Speaker 1: 00:19:49 So here is the second order some of the second order consequences of the warming oceans the linkage between hotter ocean temperatures and extreme weather events are, all storms are different now because of the climate crisis. They used to say that you can't link any individual storm to global warming. But now the leading scientists are saying no, that's the wrong way to say it. Every storm is different now because of global warming. Some people use the example of hitters in baseball taken steroids and the next time one of them hits a home run. Can you say that home run was because of the store steroids? Well, it depends on your definition of terms. You can say that the all time record was broken by a guy taking steroids because he took steroids and that, that is kind of what's happening with these, uh, with these storms.

Speaker 1: 00:21:02 And it is largely because the water cycle is being profoundly disrupted. We all learned as kids that the water vapor comes off the oceans and it's in the air and then it falls as precipitation onto the land and rushes back to the sea through the creeks and

streams and rivers. So all of that's being disrupted as the heat in the ocean increases, the amount of water vapor going into the sky increases significantly. We now have between four and five percent extra humidity worldwide because of global warming. And the warmer air holds more water.

New Speaker: 00:21:53 And that means that when the storm conditions release the moisture, there is much more that comes down. And this is a storm in Montana, you can barely see this barn and the distance and enormous amount of precipitation being released, not all of the moisture that that falls to the ground originates in the part of the sky directly above where it falls. These storms reach out off in 2000 kilometers and funnel the moisture to the point where the storm releases it. Somebody said to me, if you think of a bathtub filled with water and you open the drain, obviously the water rushing down the drain doesn't come just from the part of the tub, directly above the drain. It comes from the whole tub. And these basins of water vapor in the sky are filled with a lot more water vapor now. So when the drain is pulled, when the storm conditions release a downpour, much more of it falls. This is a recent image from Nebraska. And if you watch how this unfolds, this town is getting dumped on a not Nebraska. This is Tucson, Arizona, sorry, watch. When the downpour, it just kind of splashes up.

Speaker 1: 00:23:17 It's really incredible. And I have lots of images from people with cell phones in the middle of these storms and not going to show you those this morning, but this is happening all over the world. And it's causing all these new floods and landslides from a year ago in Pensacola, Florida. Two feet of rain in 26 hours a day. This same storm moved up the coast of North America, one later in Baltimore. Somebody's cookout and cell phone.

Speaker 1: 00:24:09 We have built this is just from three weeks ago on the border between Utah and Arizona cable or watching their neighbor.

Speaker 5: 00:24:33 So this was Houston, Texas at the end of May, Houston, Texas in the middle of that city. Within two days they got enough water to represent the entire flow of Niagara Falls for two and a half days right in the middle of Houston, Texas earlier this year because they have ever seen. And believe me, I've done thousands of these around the world. Every day on the, on the news, it's like a nature hike through the book of revelation. You're, you'll see a warehouse down here, my body on the other side with oil.

Speaker 1: 00:25:42 So the aftermath, you've had some experience in Vermont of course, but you know, just three days ago in Guatemala, 300

people were killed by this mudslide in Santa Catarina Panola, great tragic event. This was in Calabria in Italy in August.

Speaker 2: 00:26:06 This was last month. This was just two days ago. And southern France. Can, these MP 16 killed and the funding, the festival in Cannes be canceled a, this was earlier in the summer in Tibilisi. I show it because you don't often see a hippopotamus. And the former Soviet republic of Georgia, this was a central Europe a year and a half ago, six countries, uh, so called hundred year flood.

Speaker 5: 00:26:45 This was in China two years ago. 6 million people affected by this flooding. This was just three weeks ago in Japan. All time record funding. You remember the roof rescues during a hurricane Katrina in New Orleans. This was what was happening in Japan. The middle of last month. You'll see rooftop rescue here. And as it goes by, you'll see the people waving the white flags of distress in the building next door to come get them before their house goes off. So in 2011 here in Vermont, a virtually every town and city was hit by a tropical storm, Irene. It had been a hurricane. It was not even a hurricane when it came up here, but the amount of moisture involved was a completely unprecedented. And the statistics show that here in Vermont, the rainfall's been going up dramatically for the last half century and particularly for the last 15 years. So your governor at that time, so we didn't use to get these that are storms weren't like Costa Rica. They were like Vermont. This was just a few days ago in Portland, Maine. Und of course you've been watching the news events in South Carolina where they have had a four days ago, it was a 500 year flood. Then it became a thousand year flood. Now the water's still rising in some areas. They got two feet of rain in parts of the state over a three day period. A lot of people have lost their lives tragically and another dam broke just a last evening and some of you have been following on the, on the newscast.

Speaker 1: 00:28:40 It's been leading the news and just got submerged, but they very seldom make the connection between all of the extra moisture in the air that's caused by man play that global warming, Saturday with Charleston wedding date on record. And now the concern is whether rivers and creeks in this area might overflow the rivers are rising. I'm going to skip through that. So as this process continues, again, we're still putting 110 million tons every day into the atmosphere. And as this continues, this process intensifies even more just to recapitulate what this does is put extra water vapor from the oceans into the sky. The warmer air holes, more water, so the downpours and the resulting floods are increase. Now, to add a new element,

the snowpack melts earlier in the year. So you get spring flooding and you've been getting that phenomena here in Vermont. And there are longer intervals between the downpours, making the droughts even worse. And during those intervals, the same heat that puts the water vapor from the oceans into the sky also sucks the soil moisture out of the land. Some people think it's counterintuitive that you get more floods and more droughts, but that's exactly what happens. And to move to the drought of part of the story and hold on, the hope is coming in the largest city in the western hemisphere San Paulo has had an historic drought for some time now. 140 cities in Brazil had been rationing water, uh, protests in southern Africa. This has been one of the worst droughts in history. This is a woman going for water and they have to drill deeper and deeper of the Korean Peninsula, both careers in India, a multiyear drought. And here in our country as of today, 97 percent of our largest state is in drought. Almost half a in the most extreme or exceptional form of drought. This is one of their large reservoirs a few years ago. Here it is. Now the snowpack is officially zero percent of normal. Again, you hear these 500 year lows, that's because they don't have measurements going back farther than that. This is really in effect unprecedented and where you have drought and high temperatures. Not only does the soil dry out, but the vegetation dries out and there is an exact correlation between high temperatures and the incidents of fires and no matter the original spark of the fire, the spread is driven by temperatures.

Speaker 1: 00:31:40 This is a 2000 homes destroyed in California last month for interstate highways have been disrupted in the last month. This is, this one is interstate 15. People's homes and livelihoods destroyed. This was in Chile last year, the largest fire they've experienced in Valparaiso. Really an incredible devastation. Australia is a fire is a country that has a lot of fires, but the firefighters have said this is unprecedented. Nothing like this has ever happened. I was there a few years ago and the firefighters organized themselves. They came up on stage after the fires they referred to as black Saturday. They met with the scientists and they said, we've never experienced anything like that. You may have heard on the news, the California Western firefighters are saying the same thing. This is different. We'd never been through this kind of thing. They organized a relay race across Australia, stopping in every town to try to educate people about the need to confront and solve the climate crisis.

Speaker 1: 00:32:47 The biggest fires. This was a few years ago, but 55,000 people were killed in these historic fires in Russia and Central Asia. And the reason I'm showing this to you is not because of the loss of

life, but to make this connection four months later world food prices reached an all time record level for the second time in three years, a 60 countries had food riots and the political instability that resulted. Here's a food riot in South Asia and South America. This one's interesting at the peak of the food prices, it was a food vendor in Tunisia who set himself on fire. And that touched off the Arab spring. And the connection between the climate crisis and political instability is a little bit like the connection with extreme storms. You're going to get these, some of these events anyway, but they're enhanced and some that wouldn't have occurred, do occur.

Speaker 1: 00:33:49 And in this case, the political instability in these countries that have a tough time in good years, all of a sudden the extra stress of the climate crisis disrupts things, their reports from the Pentagon and from NATO. And I'm going to skip all that, but I want you to focus on one example in Syria. Here's a farmer who had 400 acres of wheat. Now it's all gone. There was a climate related extreme drought in Syria, 2006 to 2010 that destroyed 60 percent of the farms in Syria and 80 percent of the livestock and drove a million and a half climate refugees into the cities where they collided with another million refugees from the Iraq war. And the internal documents released by wikileaks have these conversations between officials in the Syrian government saying, this is going to cause an explosion. We can handle this. Things are getting out of control.

Speaker 1: 00:34:50 And yes, there are lots of other causes for the gates of hell opening in Syria, but this underlying phenomena of a climate related extreme drought was the, was the fuse that that touched off the explosion and the client, the refugee crisis, again, there are refugees from civil wars, there have been in the past, will be in the future, but we have seen predictions. This is from the Department of Defense, specifically warning of a refugee crises as a result of climate disruption.And again, there are many causes for this human tragedy unfolding in Europe now. You think that'll work better?

Speaker 3: 00:35:40 Thank you.

Speaker 1: 00:35:44 Again, what we have seen thus far is predicted to be just to the beginning of what is likely to come. And we, we need to arrest of the causes of this crisis. Here's the president of France who was hosting the climate negotiations at the beginning of December, uh, in the next 20 years. So we're will see millions drought, sea level rise, a devastating storms and the, and the, like. Some countries have already begun the process of abandoning their homelands several years ago, Kiribati put a

new line item in their national budget fund to purchase a new country and they have bought a land in Fiji. Fiji has been very accommodating, but these people are leaving their homes and there are a lot of low lying island nations in the Maldives. So the, the then president held a cabinet meeting underwater to try to get the world's attention to this crisis.

Speaker 1: 00:36:52 So the top 10 cities at risk, we are a coastal species. The percentage of humanity living within 100 miles of the ocean is just extremely high by population. The cities that are most at risk or Calcutta, Mumbai, a Daca and Bangladesh and so forth as measured by assets at risk. Uh, the number one city is Miami. I was in Miami for three and a half days last week, training another 1200 climate activists from 86 countries. And the training coincided with the supermoon, which meant that it coincided with the second highest tide of the year. When I got to Miam this is what I found in the streets of Miami Beach.

New Speaker: 00:37:46 Sunny Day flooding, there has been any rain here. The, the ocean comes up out of the storm sewers and the governor have been going on for them a while now, the governor of that state climate denier. I just picture him sloshing through this thing. I don't notice anything. Do you notice anything? I mean, there were fish swimming in the streets in Broward County, Fort Lauderdale, Delray beach. It's really quite astonishing. The number of cities and parts of countries that are vulnerable to sea level rise is really amazing. The insurance industry has noticed this, uh, and are making some areas already uninsurable. Number three on the list of cities with assets at risk. A New York Slash Newark, New Jersey. You think of it as anyone, but the water has a direct pathway. One hundred $29 billion in real estate assets alone that's vulnerable. Bangladesh. Here's the way it's playing out in Bangladesh right now. These people in the southern part of Bangladesh have always been vulnerable to these ocean based storms. And they've grown use to rebuilding their lives every 20, 25 years, now they have to do it every six or seven years, so they can't do that and they're moving and India has just completed the largest metal fence in the world along its border with Bangladesh and the refugee crisis.

Speaker 1: 00:39:21 And there's beginning to be, I'm not going to say instability because Bangladesh is stronger and more resilient than that, but there's trouble. There's trouble brewing. The climate reality project took a shipload of scientists and activists to Antarctica. We took the environment minister of Bangladesh with us because some of the water melting in Antarctica is coming up through the greenland. The seawater is coming up through the

		freshwater aquifer colonizing the soils here. And this is in the Nile. Delta have 40 percent of all of Egypt's agriculture's in the Nile. Delta salination. That's a problem in south Florida as well. We don't have time to go through all of this. South Africa sea level rise is an, is not the same everywhere in the world. There are three complicated reasons why in some places it's enhanced and the east coast of North America is the mid, the mid America is particularly vunerable
Speaker 8:	00:40:30	So I've only gone through some of these elements of the cost of carbon. Again, it bears no price. Now a CEO to is invisible, tasteless, odorless, and has no price tag outta sight outta mind, 100, 10 million tons a day, but the consequences are mounting up. By the way, a VPIRG here in Vermont is organizing a petition drive to try to get a price on carbon. Here you have great leadership from your governor and others, but this petition drive is really important and I hope that you will support them.
Speaker 1:	00:41:14	We really do need to put a price on carbon an order to put a price on carbon. We have to put a price on denial and the political system. We're at a turning point and in a history, there have been civilizations that made the wrong choice. This time it's global and we have to make the right choice. Now, here is the really good news and it's genuinely exciting. We need to make it happen faster, but we are seeing a dramatic progress. This is what I was referring to earlier, put a price on carbon and markets, put a price on denial in politics. So this is related to win. Just 15 years ago, the leading experts said that by 2010 will get 30 gigawatts of wind capacity. We've beaten that estimate by 12 times over. This is really exciting progress and you can see the tremendous, instill increase in the installation of when, of course, the reason is partly because the cost has been coming down so dramatically and there are now enough windmills in aggregate to power every home in the state of California. The amount is growing dramatically on a global basis. We have enough wind power potential to equal 40 times the world's energy use annually. So this is a tremendous resource. Thank you. Burlington, Vermont being the first city in America, the 100 percent renewable.
New Speaker:	00:43:02	That is fantastic with Burlington leading the way. Now some other cities have followed your lead. Greensburg. Kansas was destroyed by anf five tornado. They decided in rebuilding to do 100 percent renewables. Aspen, Colorado just announced last month in 2017, a Georgetown, Texas. We'll add the, the mayor of Georgetown, Texas made this announcement. He said, now I'm about the farthest thing from Al Gore you can possibly imagine, but this just makes good economic sense. And my

reaction is that works for me, pal. That is fantastic news. This is 100 percent wind, a community rockport, Missouri and California has voted to get 50 percent from renewables by 2030. Vermont has a goal of 90 percent by 2050, which is really inspiring green jobs. You've had an increase in green jobs here year over year. An 88 percent increase a nationally. This is by far the fastest growing category of new employment. This is a really fantastic the number of jobs globally. A closing in on 8 million now this is a solar pv. Now, let me show you a comparable of figure here. Wait a second is. I'm missing a slide on this. Excuse me one second.

Speaker 1: 00:44:43 Yes, I am sorry about that. Hold on a second, we're going to fix this.

Speaker 3: 00:44:53 Okay. Hang on.

Speaker 1: 00:45:05 Okay. Thirteen years ago, 13 years ago, the projection for solar energy deployment, one gigawatt per year by 2010 when the year 2010 came around, that projection was exceeded 17 times over last year. That projection was exceeded 48 times over this year. That projection is on track to be exceeded. 60 two times over. This is an exponential curve and it's the most exciting development in technology in the world today. These installations of photovoltaics are taken off like a skyrocket, and of course, again, the reason is the cost is coming down so dramatically. Not only the silicon but also the case in which it's built, the cost of the installation, the capital costs, the business model. Now there are companies that will come in many states and say, here's the deal, we'll put solar panels all over your roof. Your electricity bills will go down 20 percent the next day and it will cost you.

Speaker 1: 00:46:19 Nothing will do it for free. That's a pretty good deal in four states, including the state of Florida that's made illegal. You can only buy solar electricity from the coal burning monopoly utility, and they're trying to do that in, in other states, the Koch brothers and their minions, don't get me started. This is a really very, very exciting in Nevada. They just bought this cost. Many of you don't follow these kilowatt hour prices. This is a stunner. People never thought that would be possible. Yesterday, there was an article in New York Times about the three of the largest hotels and in Las Vegas, so trying to get off the grid entirely and by all of their electricity from solar and these utilities are trying to lock them in.

New Speaker: 00:47:18 So the big bankers around the world and investors are saying this, the trend is very clear. We're getting a off grid solar now, I

told you that my firm and I came here partly because of seventh generation. It was the initial reason for this trip is says seventh generation. I've only been in the business world for 14 years. One of the things that I've learned is that in business, when you have a new product or service that's competing with, uh, an old product and service, it seems to matter if the cost of the new product is more expensive than the alternative or cheaper than the alternative. Who Knew? It's a little bit like the difference between 32 degrees and 33 degrees or zero Celsius in one degree Celsius. That's not a difference of just one degree. It's the difference between ice and water and in markets the difference between more expensive than and cheaper than is markets that are frozen up and markets that are liquid with investments flowing toward the new, more attractive alternative.

Speaker 1: 00:48:32 So is there any precedent for such a rapid adoption of new technology where everybody knows about the computer chips story, Moore's law, unbelievable. A flatscreen TVS. But let's look at a more mundane technology. Mobile phones in 1988 and t commissioned a study by Mckinsey to go all around the world. This was a, this was at a time when those first big clunky mobile phones you, you guys are most of you too young to remember this, but I'm not a. and I'm an early adopter. I thought that thing looks so cool. I wanted to walk around, show my friends. Oh yes. I'm having a telephone conversation even though I'm not connected to a wire and AT&Tsaid, how many of these are we going to be able to sell by the year? Two thousand. So Mckinsey came up with a big study, $900,000 they said your 2000 came and sure enough they sold a 900,000 in the first three days of the year. And the overall, uh, sales that year were 120 times what we're projected. So they're now more than seven and a half billion mobile phones. Everybody in Africa has a mobile phone practically. I was in Africa this spring. I saw Masai warriors with their traditional garb and the spears and they're taking their cell phones out. I mean, literally this is a revolution that is spreading the world. They'll sell another one point 2 billion this year. So here. It's mostly in the developing world, although it's a pretty prominent here. These are the mobile phone subscriptions worldwide. So the question is why were the predictions not only wrong but way wrong? I've asked that question myself. Why? And I think the answer is really a four fold. The cost drops so quickly. Nobody expected it even as the quality went up and the individuals were making the decisions to buy, not monopolies or governments. And importantly these countries did not have landline telephone grids and so they leapfrog. Let me see a show of hands on this question. How

many of you no longer have a land line telephone contract and only rely on mobile phones?

Speaker 1: 00:51:09 Gee Whiz, probably 80 percent. If I'd asked that question 10 years ago, it would have been very few. It won't be too long before I'll be able to ask that question about electricity because guess what? The landline electricity grids are not that great in many parts of the world. That was Africa. This is India. So now we're already getting solar panels on the roofs of grass huts because they've never had electricity before and we're getting new business models pay as you go. I have a friend who sells these in India and he was negotiating with a woman householder and she said, no, 30 rupees a month is too, too high. He said, what about one rupee per day? She said, you have a deal, and so this is spreading very, very rapidly. The most rapid spread of rooftop solar panels is in Bangladesh to new systems per minute on average night and day, west Africa, South Africa, west Africa, east Africa, beginning in South Africa, South Asia, Pakistan, lots of places in Florida.

Speaker 1: 00:52:26 It is illegal as I said, but the in Orlando, they found electricity from solar cheaper than coal or gas in Australia. One in seven homes already have rooftop systems in Germany, a northern latitude industrial powerhouse with lots of clouds. One day last year they had 78 percent of their electricity from renewables. Hawaii has just voted to go 100 percent renewable by 2045 is a great example. President Bashar La came in where solar was nothing. Now it's increased dramatically in South America. There was a 370 percent increase in solar last year. We're going to see a comparable increase this year. Costa Rica got 100 percent, not just on one day, but for 100 straight days this year. This revolution is spreading and growing and the cost is still down. The Vatican has promised to be the first, a C02neutral country. They have two advantages. Of course, they're very small and God is on their side and on a global basis, we get enough raw energy from the sun in one hour to equal the entire world's energy use for a full year.

Speaker 1: 00:53:45 So as we improve the fraction that we can profitably harvest we're, we're really going to see dramatic progress. And energy storage is starting to follow the same cost down curve as the PV cells themselves. Tesla's just entered the market with its power wall. A battery energy storage is a predicted to be a very big business. It's already growing. This is the small scale distributed energy storage and the utility scale storage is projected to be an even larger business globally on a worldwide basis. This is the largest private business opportunity in history because almost two thirds of it is going to be financed in the private sector

already. We're seeing green bonds increased 15 fold just in the last three years. The investments in new electricity generating capacity around the world. As of two years ago, renewables took the lead over fossil fuels.

Speaker 1: 00:54:51 Last year the gap grew. This is from Bloomberg, new energy finance. This is this year you can see the solar in yellow and the wind and blew the projections for five years, 10 years and 15 years. This is where the world is going and it's extremely exciting, but we need to accelerate it. The age of renewables is beginning and there is a financial risk if we continue to invest in fossil fuels. Last week, this is actually from a year ago, but last week and London, the governor of the central bank, the, he's the equivalent of the chairman of the Federal Reserve. And the US, Mark Carney, he made an amazing speech. Those of you who are majoring in this field of study, it should get that speech online. It was incredible. The world has $21,000,000,000,000 of carbon assets on the books, 7 trillion and multinationals, 14 trillion owned by sovereigns. Their value is based on the assumption that all of those carbon fuels are going to be burned.

Speaker 1: 00:56:02 They're not going to be burned less than a third could possibly a beat burned. And even if there is not legislation or there's not a treaty, Mother Nature's going to prevent that from happening. So at what point do investors realize, uh, could this be another sub prime mortgage fiasco? You remember the subprime mortgages, they gave mortgages to. People couldn't make a down payment, good, make the monthly payments. But they said, oh, that's okay, because there are a lot of them are. And if we lumped them all together and attach them to some phony, a financial instrument and sell them off into the global market and nobody will notice and it will be all fine. Well, it wasn't fine that the market collapsed. That was the credit crisis that was caused, the great recession. We now have all these subprime carbon assets. Anyway, more to say on that, but not time to say it all. So this is a great city. This is a great success story. I wanted a sound effect to call your attention to this slide. These are the new coal plants that were proposed over the last 10 years and have been defeated. These are the existing plants that have been retired. These are the plants where the retirement has been announced. The overall picture is quite amazing.

Speaker 8: 00:57:26 All these have been cancelled. This is a huge success story and you will hear people who are in the coal business or the oil business or the gas business say, well, solar and wind are just minor sources of energy. Historically that's been the case, but they need to catch up with reality. Look at the new sources of

generating capacity built in the United States last year. Solar, wind, coal is. Wait a minute, let's see. 0.6 percent. Natural gas still plays a significant role and that's a complicated story, but last year there was a big controversy in Minnesota on the Canadian border, like Vermont. They had to build new electricity generating capacity. They had a big bakeoff between all the people that wanted to sell it. Solar beat natural gas in an open transparent competition. Last month, the same thing happened in Colorado and by the way, the first six months of this year, 2015, looking at what the result has been this year, more than three quarters of all the new generating capacity is solar and wind renewables. Coal I can't even see the coal line, but it's point zero, zero, zero five percent. That's too much by the way. But in any case, these are the. Oh, Vermont, 2014, 100 percent of the new generating capacity was solar. Yeah.

New Speaker: 00:59:18 Here in Vermont. So one year ago, a really historic development with the US and China reaching this historic agreement to cooperate in reducing greenhouse gases for years. One of the deniers, the argument has been, well, we shouldn't do anything because China's not doing any. China's ahead of us. Now they have just announced a cap and trade program which is extremely exciting and one of the reasons that they're doing it is that the collateral pollution from a burning coal has made to the Forbidden City even more for bitten on many days. I don't show this slide in China. It's digital, a wall art the life expectancy in China's gone down five and a half years in northern China just from air pollution even before the lung cancer epidemic sets in the Shanghai Academy of Social Sciences. It's getting to be no longer livable. And on September 25th, China announced a national cap and trade initiative that will start in 2017.

Speaker 1: 01:00:35 They're capping emissions and they're launching a, a huge reductions program. Europe has been providing inspiration for a long time. They're going to cut by another 40 percent by 2030. Here are the global carbon policies,worldwide. The US is already implementing it's a regulatory mandate. We have several Canadian provinces joining Mexico. You can see how this plays out in India. Just this slide needs to be updated because just three days ago, India announced a goal of 40 percent of its energy from renewables by 20, 30. They did not cap their emissions, but that is a tremendous step forward by India. So now China, the US, the EU, and India, the big four are all on board, moving in the right direction. We had the climate march in New York City a year ago, a 400,000 people and tens of thousands elsewhere around the world.

Speaker 1:	01:01:46	So this is our home. This is our challenge. Don't let anybody tell you that we're going to get on rocket ships and go live in hermetically sealed buildings and Mars. On Mars, we can't, we couldn't even evacuate New Orleans when the hurricane was on the way. We have to take our stand right here. We are winning this. We are, we have the momentum. If it was a sporting event, be behind on the scoreboard, but the momentum shift would be so apparent and you look up and there's enough time to win before time runs out. The students at the University of Vermont, the business community here in Burlington and throughout this state, your state government, there is tremendous leadership here. Always remember we have the opportunity to change our circumstances and always remember that political will is a renewable resource. Thank you very much for hearing me. Thank you. Thank you. Appreciate it. Thank you. Thank you very much. Oh sure. Okay. Thank you. Thank you. We have time.
Speaker 9:	01:03:23	I believe we have time. Thank you very much. Let me grab this. That was fantastic. Thank you and thank goodness that wasn't a 30 minute presentation because a lot of us would have walked out of this place. Absolutely. In dire straits, the hope that you shared at the end is phenomenal. We're joined today by students, not only from ubm but down here is a great group of future leaders from the Sustainability Academy in Burlington. We're joined by fifth graders. Are you hear? I can't hear you. You're being so well behaved and we have a few questions. The fifth graders who I did some quick math, they'll be about 45 years old and the 2050 had a question about a campaign, so they'd like to start a campaign to help people learn about the importance of sustainability and taking responsibility for their actions everyday. Do you have any recommendations for how we could spread the word to the world, how they can start a campaign?
Speaker 1:	01:04:29	There's this thing called the Internet that allows kids to, to, to connect with, to create messages that are important to you and put them online. So I think that's one way to proceed. You might be able to connect with other fifth graders who feel the same way and I'm sure there are businesses right here in Burlington who would be willing to give you a little support in getting that going.
Speaker 9:	01:05:02	That's absolutely true. Thank you for that. Seventh generation has been a partner with the Sustainability Academy. We've installed solar panels on the roof. We've had done a community garden in all sorts of great work in the classroom. Oh Great. Good for you. They are being really well led and I'm inspired by

these future leaders and it's so great to have you here today. We have some questions as well, from some uvm students. So Gina, fear real. Did I get your name right or you hear Gina? Hi, there you are. Is a sophomore in environmental studies and a volunteer for the climate reality project. Oh, thank you. And she asks the question, what successful actions are students taking around the world to combat climate change? What do you see elsewhere?

Speaker 1: 01:05:49 Well, students are like you, Gina, really leading the way and the so called millennial generation of which you're a part is not just, I'm a little bit different and attitudes from my generation and others. It's a lot different and I think it's partly because you've grown up with a clear eyed view of what's happening in the world. My job, many in my generation, they see these developments in the news of the floods and the droughts and the storms and all of that. And you know what's going on. You and your generation rightly feel that your future is affected by this profoundly and so students are really leading the way all over the world. That March, I would say the percentage of students was extremely high. I remember when I was a very young and the civil rights movement was just beginning. I spent a lot of my childhood in the south and I remember watching on tv the use of fire hoses on a young African American kids who were demonstrating for freedom.

Speaker 1: 01:07:04 And I thought, Whoa, what, what is that? And I remember my generation asking their parents, you know, explain to me again why it's okay to discriminate on the basis of skin color in the law. And when they couldn't answer those questions, the changes started to occur. I remember a conversation when I was about 11 or 12, one of my friends on the farm made some racist comment. Another friend spoke up and said, shut up. We don't talk that way anymore. And I thought of that a couple of years ago. I saw this new story from California about two gay men waiting in a line for pizza and some homophobic jerk walked by and made some nasty comment, and according to the story, literally every other person in that line turned and said, shut up. We don't accept that anymore. Every great social movement has had an overrepresentation of young people who have this clear view of what's at stake and every great moral question that has ultimately been resolved into a choice between what's right and what's wrong has succeeded abolition women's suffrage, civil rights, anti-apartheid, Glbtq rights.

Speaker 1: 01:08:28 Whenever it's down to right and wrong, we went this question of whether or not we're going to save the future of human civilization is the same. Is that right? Or is it wrong to spew 100,

		10 million tons of pollution into the atmosphere as if it's a sewer every day? Well, that's obviously wrong. And clearing away the underbrush so we get a clear view of that is really important. And don't get discouraged by the fact that there are a lot of people resisting. Of course there are, because we've been doing going down the wrong path for quite a while. We didn't know is the wrong path for awhile. Now we do the great American poet, Wallace Stevens, and actually I used this quote a lot I used to reference where I first learned about it and I'll do it here in Vermont because Gus Beth, who I mentioned at the beginning of my speech, wrote a wonderful book, Red Sky that morning and in the front of that book he had this quote is from Wallace Stevens and he wrote after the last no comes a yes and on that yes, the future world depends will all of those movements I referred to encountered no after, no after no, but after the last snow they finally got to a yes, and so will we.
Speaker 1:	01:09:45	So young people are a source of energy and drive an often clearer vision as I've said. So keep it up. We're depending on you. Oh, one other. One other quick quick story from my youth. I remember being inspired by President John F Kennedy when he made that bold pledge to put a person on the moon and bring him back safely within 10 years and young people my age were just so psyched and but a lot of older people at that time, so it's going to cost a lot of money. We've never done it before might be a catastrophic failure. Probably a big mistake. Eight years and two months later, Neil Armstrong set foot on the surface of the moon and the moment he did so at NASA's a mission control in Houston, a great cheer went up and the average age of the systems engineers in the room that day was 26 years old. Which means among other things, their average age when they first heard that challenge was 18 and they, many of those in that room changed their lives. Most of them to acquire the skills and knowledge and experience they needed to be a part of meeting that challenge. And many of the young people here today have already made that kind of decision. We are counting on you.
New Speaker:	01:11:12	We are going win mark my words victory, going to be ours in this, partly because of you. Thank you.
Speaker 3:	01:11:22	Thank you.
Speaker 9:	01:11:25	On that inspirational final thought. Let's give a final thank you and welcome to Vermont.
Speaker 8:	01:11:32	We have leadership. Thank you very much. God bless you. Thank you.

Speaker 3: 01:11:39 Thanks.