

Build 100 new nuclear power plants in 20 years
*For a rebirth of industrial America while we figure out
renewable electricity*

Address by U.S. Sen. Lamar Alexander (R. Tenn)
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One year ago I came to Oak Ridge to propose a new “Manhattan Project” to put America on the path to clean energy independence. The project would focus on seven “grand challenges”: plug in electric cars and trucks, carbon capture from coal plants, making solar power cost competitive, recycling used nuclear fuel, advanced biofuels from crops we *don't* eat, green buildings, and finally, fusion.

Today I am in Oak Ridge to propose that the United States build 100 new nuclear power plants during the next 20 years while scientists and engineers figure out these grand challenges. This would double America's nuclear plants which today produce 20 percent of *all* our electricity, and 70 percent of our *pollution-free, carbon-free* electricity.

It is an aggressive goal, but with Presidential leadership it could happen. And I am convinced it should happen because conservation and nuclear power are the only real alternatives we have today to produce enough low-cost, reliable, clean electricity to clean the air, deal with climate change, and keep good jobs from going overseas.

Climate change may be the inconvenient problem of the day, but nuclear power is for many skeptics the inconvenient answer.

These nuclear skeptics cite regulatory delays, bring up past problems with safety, and appoint commissions to slow-walk decisions about recycling used nuclear fuel. They point to the shortage of welders for new plants. They complain that Japan and France are building most of the essential equipment for new nuclear plants — no surprise since Japan is building one nuclear plant a year and France is producing 80% of its electricity from nuclear. The skeptics say that carbon from coal plants contributes to climate change, which is true, and so they offer their solution: operate our big complex country, which uses 25% of all the energy in the world, on electricity generated from the wind, the sun, and the earth.

One day, that might be possible. But today there is a huge energy gap between the renewable electricity we would like to have and the reliable, low-cost electricity we must have. My guess is it will be 30, 40, or 50 years before these new sources of electricity are cheap enough and reliable enough to supply most of the power to our electric grid.

The nuclear skeptics in Congress, urged along by the President, reported last week an energy and climate change bill that would require 20 percent of our electricity to be made from a narrow definition of renewable energy.

You are meeting in Oak Ridge to discuss how to attract and keep high tech jobs in this region. So let me try to paint a picture of how this legislation would affect you, and what we should do instead.

To put things in perspective, the Tennessee Valley Authority produces on average about 27,000 megawatts of electricity for industrial and household customers in its seven-state region. 60% comes from coal, 30% from nuclear, 8% from hydroelectric power and 1% from natural gas. Nationally, it is 50% coal, 20% nuclear, 20% natural gas and 6% hydro.

Nationally, only one and one-half percent of electricity comes from the sun, the wind and the earth and almost none of TVA's power does. But the 40 percent of TVA power that comes from nuclear and hydro is just as clean as these narrowly defined renewables – free of pollution that dirties the air and of carbon that contributes to global warming. In that sense, TVA is the 16th cleanest utility in the country.

Here is another yardstick: the new nuclear unit at Watts Bar can produce 1240 megawatts, the Bull Run coal plant 870 megawatts, the Fort Loudoun Dam 150 megawatts. All three operate almost all the time. That is called baseload power, which is important since large amounts of power

can't be stored. Some forget that solar power is only available when the sun shines and the wind is available only when the wind blows.

So how much renewable electricity is available in our region? The new solar plant Gov. Bredesen has proposed for Haywood County will produce five megawatts. The 18 big wind turbines atop Buffalo Mountain just a few miles away have the capacity to produce 29 megawatts, but actually produce only 6 megawatts. It may also be possible to squeeze a few hundred megawatts from turbines in the Mississippi River. The Southern Company's new biomass plant in Georgia — biomass is a sort of controlled bonfire of waste wood products — will produce 96 megawatts.

Each of these sources of renewable energy consumes a lot of space. For example, the big solar thermal plants in the Western desert where they line up mirrors to focus the sun's rays take more than 30 square miles — that's more than five miles on a side — to produce the same 1000 megawatts you can get from a single coal or nuclear plant that sits on one square mile.

Or take wind — to generate the same 1000 megawatts with wind you would need 270 square miles. An unbroken line of wind turbines 50 stories high from Chattanooga to Bristol would only give us one-fourth of the electricity we get from one unit at Watts Bar — which fits on less than one square mile — and we'd still need Watts Bar for when the wind doesn't blow. There is a good reason why there is only one wind farm in the entire southeast — here, the wind blows less than 20 percent of the time and much of the time is at night when TVA has thousands of megawatts of unused electricity.

Biomass, we are told, will be the renewable source we're going to emphasize in the South. That's a good idea. It might reduce forest fires and will conserve resources. The National Forest Service tells us there are two million tons of wood scraps and dead trees in Tennessee forests. And pulp and paper companies might produce another two million tons. But let's not expect too much. We'd need a forest the size of the entire 550,000 acre Great Smoky Mountains National Park to feed a 1000-megawatt biomass plant on a sustained basis. And think of the energy it's going to take to haul all this stuff around. Georgia Southern says it will take 160-180 trucks a day just to feed biomass into a 96-megawatt electrical plant.

Of course, conservation and efficiency are the places to start when looking at America's and Tennessee's electricity futures. Tennesseans use more electricity per person than residents of any other state. If we just reduced our use to the national average it would equal the electricity produced by four nuclear plants. We might still have to build some new power plants because our history and that of the country is that conservation only limits electricity growth. It usually doesn't reduce it. For example, twenty years ago we never would have guessed that computers would be using nearly 5 percent of our electricity.

So you can see we are going to need some breakthroughs, something like a new Manhattan project before we can rely very much on renewable electricity.

Of all these renewable forms of electricity, in my judgment, solar has the most promise. It takes up massive spaces, but we can use rooftops. It only works when the sun shines, but the sun shines during peak times of electricity use. I believe Governor Bredesen is exactly right to try to make Tennessee a hub for solar power. The first grand challenge of my proposed Manhattan project is to try to make solar power cost competitive. According to TVA, in our region, solar costs 4-5 times as much as the baseload electricity TVA now produces.

Wind power, on the other hand, can supplement electricity on the Great Plains or offshore, but for our region it would be a terrible mistake. Here, it is a waste of money and destroys the environment in the name of saving the environment. The turbines are three times as high as Neyland Stadium. In our region they only work on mountaintops where the winds are strongest, and they barely even work there. And I haven't even mentioned the new transmission lines necessary from the mountain tops through your back yard. Someone asked Boone Pickens if he would put any of these turbines on his 68,000 acre ranch in Texas. "Hell no," he said, "They're ugly." Well, if Boone doesn't want them on his ranch because they're ugly, why would we want them on the most beautiful mountaintops in America?

Some of the jobs you will be growing and attracting to this high technology area will be so-called "green jobs" created as scientists and engineers work on the grand challenges. Please remember that nuclear power is also green, that electric cars and trucks are green, and that one third of Tennessee's manufacturing jobs are auto-related.

And even “green jobs” need low-cost electricity. The two new polysilicon plants – locating in Cleveland and Clarksville to manufacture polysilicon for solar cells – together use 240 megawatts of electricity, about one-fifth of the production of the new nuclear unit at Watts Bar. And don’t forget about places like Alcoa, which has closed its smelter in Blount County until it can get a 20-year low-cost electricity contract from TVA. Or the steady stream of regional manufacturers who have been to my office saying that electric rates are already too high for them to keep jobs here.

The point is, if you care about jobs of any color, the cost of electricity matters. Which is why it is especially galling to see France—a country we usually don’t like to emulate—using the technology we invented to give themselves some of the lowest electric rates and lowest carbon emissions in the European Union.

So why is it that nuclear energy, perhaps the most important scientific advance of the 20th century, was invented in America yet we have stopped taking advantage of it just when we most need it?

Shortly after World War II, Glenn Seaborg, the great American Nobel Prize winner, said that nuclear energy had come along just in time because we were reaching the limits of the fossil fuels. And he was right. The succeeding decades proved that fossil fuels are not unlimited and their supplies can seriously compromise our energy independence. And that doesn’t even begin to address global warming.

Yes, I do believe global warming and climate change are problems we must address. We can't go on throwing three billion tons of carbon dioxide into the atmosphere every year without running into some kind of trouble. Every session I have been in Congress, I have introduced legislation to cap carbon emissions from coal plants.

The way both to deal with global warming and to keep our jobs is to encourage what is being called the "Nuclear Renaissance" and start making nuclear energy the backbone of a new industrial economy. Right now there are 17 proposals for 26 new reactors in licensing hearings before the Nuclear Regulatory Commission. That's a start. But I think we need to go well beyond that. I propose that from the years 2010 to 2030 we build 100 new nuclear reactors to match the ones we already have operating. That's what we did from 1970 to 1990. During that twenty-year interval we built almost every one of the 104 reactors that now provide us with 20 percent of our electricity. If we built another 100 by 2030, we'll be able to provide well over 40 percent. Clean hydropower provides 6 percent of our electricity and with the electrification of small dams around the country we may be able to expand this to 8 percent. With diligent conservation, and other renewable resources, we can add another 10 to 12 percent. Then, my friends, we'll be talking about a clean energy economy!

Still, that's only the beginning. The second largest source of carbon emissions – and the biggest source of our energy instability – is the 20 million barrels of oil we consume every day to run our cars and trucks. I believe we should make half our cars and trucks plug-in within 20 years. That would reduce by one-third the oil we import from foreign sources.

The Brookings Institution scholars estimate that we can power those cars and trucks by plugging them in at night without building one new power plant. As our fleet of electric vehicles grows, the most logical option for plugging in will be supplied by clean nuclear power. Until we make great advances in storage batteries, it can't be electricity that's sometimes there and sometimes not. We can't have Americans going to bed every night praying for a strong wind so they can start their cars in the morning.

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Still, when it comes to nuclear power, a lot of people worry about safety. They say, "Nuclear power sounds great to me, but I'm afraid one of those reactors is going to blow up and cause a nuclear holocaust."

Well, let's make a few things clear. As Oak Ridgers know better than almost anyone, a reactor is not a bomb. It can't blow up, that's impossible. There's not enough fissionable material there.

What a nuclear reactor can do is overheat if it loses its cooling water, just the way your car engine can overheat and break down if it loses its antifreeze. It's called a meltdown. Nuclear scientists have worried about this from the beginning and take many precautions so that it won't happen.

Nuclear skeptics like to bring up Three Mile Island. So let's talk about that. What happened at Three Mile Island was basically an operator error. A valve failed and when the automatic safety mechanism kicked in,

the operators overrode it because a mass of flashing lights and sirens on the control panel confused them about what was happening.

Three Mile Island completely changed the nuclear industry. The Kemeny Commission, appointed by President Jimmy Carter, analyzed the problems and made many recommendations, most of which were put into practice. The valve that started the whole thing had failed *nine times before* in other reactors and the manufacturer had tried to keep it a secret. People in the nuclear industry just weren't talking talk to each other.

Now all of that has changed. Nuclear operators train for five years before they can take over in the control room. They spend one week out of every five in a simulator honing their skills. The nuclear companies have special swat teams that can be dispatched anywhere in the country at a moment's notice in case anything goes wrong. A Nuclear Regulatory Commission inspector practically lives on the site. What's more, every reactor in the country is on the hook for \$100 million if something goes wrong at another reactor. As you can imagine, they watch each other closely.

And it shows. Our entire nuclear fleet -- 104 reactors -- is now up and running *90 percent* of the time. There has been only one yearlong shutdown for safety problems in the last decade. We've added the equivalent of 29 new reactors since 1990 just by doing a better job of running the ones we already have. If the rest of America ran as well as the nuclear industry, we'd be sitting on top of the world!

“But what about Chernobyl?” someone will say. “Wasn’t that a nuclear catastrophe?” Well, the Soviets did things very differently at Chernobyl than how we do it this country. For instance, they didn’t put a containment structure around the reactor, which is like not putting a roof on your house and then acting surprised when it rains and you get wet. In addition, they did something no American power reactor has ever done – they surrounded the core with carbon in the form of graphite. That’s like building your reactor in the middle of a charcoal grill. When the graphite caught fire, it spewed radioactive smoke all over the world. That could never happen at an American reactor – and it won’t happen again in Russia since they’ve made a lot of changes over there and now they are building reactors the same way we build reactors.

So let’s build 100 new reactors in the next 20 years. Our new reactors have even better safety features– although it’s never good to be overconfident. We’ve learned how to run the current fleet at its full potential. Most reactors are making close to \$2 million a day. The attorney general of Connecticut proposed a windfall profits tax a few years ago when fossil fuel prices went through the roof. He said it wasn’t fair that reactors could run so cheaply. So why not expand on our winnings? Why not build another generation of reactors?

Well, a lot of people say it can’t be done. They say we don’t manufacture anything anymore in America. We have to import all our hard goods from China. They say we don’t have the nuclear engineers to design the new generation. They say we don’t have the specialty welders to put them together on-site. They say we can’t manufacture the steel vessel heads

anymore, and our steel forges aren't big enough. Right now, the only forge in the world big enough to make a reactor vessel is Japan Steel Works and they're backed up. People say our new plants will spend a decade standing in line behind the 34 other reactors that are already under construction in the world, mostly in Asia.

And you know something? They're right.

They're right because all the things they're saying here are true. We don't currently have a nuclear construction industry. But then they don't know America. America can respond to a challenge. Just as we rose to the occasion in 1943 when we built this complex here at Oak Ridge, so can we rise to the occasion today to build a new generation of nuclear reactors that will provide clean, reliable power for America for the rest of this century.

It's not going to be easy. What we're talking about here is essentially a rebirth of Industrial America, and it's already starting to happen. Westinghouse is opening a school for training welders who can knit together a containment structure strong enough to protect both the environment from the reactor and the reactor from outside threats. Alstom, a French company, is investing \$200 million in Chattanooga to manufacture heavy turbines for nuclear plants. We also have to train nuclear engineers to take the place of the great generation that embraced the technology in the 1960s and 1970s, only to see their dreams come to naught when the nation turned away from nuclear power. We have to find a steel manufacturer somewhere in this country that is willing to step up and say, "Here, we can do those forgings right here in Pennsylvania or Ohio or Michigan. We don't have to stand in

line in Japan.” And we have to find investors who are willing to put up their money and say, “Yes, I have faith in America. I have faith in technology. I’m ready to invest in building a cleaner, safer, more prosperous world.”

And with Presidential leadership we could add more loan guarantees to accelerate construction, and could streamline the permit system to ensure that new reactors don’t become ensnared in regulatory mazes or combative lawsuits. But we can’t just sit on our hands, because in America we don’t sit around waiting for the government to do things for us. We do things for ourselves.

So the task we face here today is no less formidable than the task the Oak Ridge pioneers faced when they first arrived here in 1943. They were trying to save the world from Japanese militarism and Nazi totalitarianism. Now, we are trying to save the world from the pending disaster of dwindling energy supplies, the uncertain dangers of a warming planet, and the stagnation and decay that can only follow if we do not revive American industry.

So I ask you here today to join in the task of bringing about this Nuclear Renaissance, in helping to generate the Rebirth of an Industrial America.