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To: The Next President

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Re: America's Nuclear Waste and What to Do With It

Mr. President, it should be clear to you that one of the most pressing issues of our time is America's dependence on fossil fuels. Every time you looked out the window of your campaign bus, from Bangor to Bakersfield, you saw the ever-rising gas prices. But as painful as three or four bucks a gallon might be for the average American, you also noticed that the concern about fossil-fuel dependence cuts deeper still—to fundamental questions of national security, economic growth, and environmental preservation.

Whether we guzzle them as oil or mine them as coal, fossil fuels exact costs that we can no longer afford or ignore. We need real alternatives—and, while we all recognize that fossil fuels will have to play a role for years to come, that does not include trying to drill our way out of the problem.

Memos to the Next PRESIDENT

The years of your presidency, then, must include some serious reckoning with this nation's energy future—and with the vital question of how we shall wean ourselves off of fossil fuels.

In order to answer this question, you will need to push for a significant increase in energy research, particularly in the field of renewable sources like wind, solar, and biomass. Perhaps even more importantly, you will need to push programs that will make the United States more energy-efficient so that our homes, businesses, and vehicles can operate more cleanly and cost-effectively.

Yet while renewables will eventually increase our supply of clean energy, and efficiency programs will reduce demand, none of this will happen overnight. In some parts of the country, these measures may not even meet the needs of a growing population and economy. This means that, if we want to reduce our use of fossil fuels, we need to think about increasing the use of all non-fossil sources.

A candid discussion is needed—within your new administration and in the country as a whole—about nuclear energy, a non-climate-changing power source that is actually capable of generating significant amounts of energy in the near term. The key to making nuclear energy a more viable alternative is the adoption of advanced spent-fuel recycling techniques to deal with one of nuclear power's most vexing problems—the presence of radioactive waste material.

By accelerating research on advanced recycling, the United States could leapfrog other nations and produce an innovative response to the twin problems of curbing man-made climate change and alleviating the waste-storage problem.

More than three-quarters of America's clean energy already comes from its 104 nuclear-power plants. Nuclear energy produces about 20 percent of the nation's electrical power. Unlike coal (which generates just over one-half of America's electricity), nuclear power does its work without emitting greenhouse gases. In other words, expanding nuclear energy's share of electrical production is one potential means of combating climate change. Indeed, a growing roster of scientists believes that nuclear energy is an essential piece of any climate-protection strategy. In fact, as our energy needs grow over the coming decades, many experts assert that we will need to expand nuclear power just to keep the share of emissions-free electricity at 30 percent.

Nuclear power is controversial in many parts of the country, and much of the controversy revolves around a single fact: the United States still has not decided what to do with its nuclear waste, which can remain dangerously radioactive for thousands of years. In some states, the waste issue has placed a hard limit on the growth of nuclear power. For more than two decades, for example, Illinois has had a moratorium on new nuclear-plant construction until a safe storage method is developed. California and Wisconsin have similar measures on the books.

While concerns about greenhouse-gas emissions have caused the legislatures of all three states to consider a repeal of their reactor-construction bans, the very existence of such prohibitions demonstrates the political sensitivity of the waste issue. Even states such as South Carolina and Georgia—in which utilities have signed contracts to build new reactors—are very concerned about the waste issue and demand a solution.

Therefore, if nuclear power is to have any chance of meeting its full potential as a reli-

able, relatively clean source of energy, we must figure out what to do with the leftovers.

But this is not just a matter of meeting future needs; there is a very practical, immediate reason for us to focus on the nuclear-waste issue. Remember, there is already enough nuclear generation going on in this country to produce a full one-fifth of the electricity needs of the world's largest economy. That means there is already a fair amount of nuclear waste (about 60,000 tons) sitting around, with more (about 2,000 tons) being produced each year.

The U.S. government has a statutory responsibility to take this waste—which is in the form of ceramic pellets in metal tubes—and dispose of it. By law, this should have started in 1998. The government, however, has yet to take responsibility for a single pellet of spent fuel.

So where does it all go? Right now, it is staying where it is—at the power plants that produce it. The effort to create a deep geologic storage site at Yucca Mountain, Nev., while still moving forward, is under heavy fire from Congress and has had its budget slashed. Even if Yucca Mountain were entirely successful, it still might not be enough. If America expands its use of nuclear power, and we continue to produce nuclear waste at the present rate, using our present methods, we would need to build yet another Yucca Mountain facility to deal with the waste.

This would, of course, then beg the question of where to build the next big waste site. If the controversy over Yucca is any indication, it could be a very long time before any such repository gets its first shipments of waste.

So, Mr. President, you have a couple of very compelling reasons to make the unglamorous subject of nuclear waste a priority of your administration. First, the lack of a clear national policy on waste prevents us from looking squarely at the bigger question of whether to increase the role of nuclear power. Second, we owe it to ourselves and to future generations to figure out just what to do with the waste we have already generated.

Needless to say, the science of nuclear energy is extremely complex, and you do not have the time to bring yourself to full expertise in the subject (though such knowledge is not unheard of among individuals in your position; one of your predecessors, Jimmy Carter, did graduate work in nuclear physics and was an officer in the nuclear-submarine fleet). For now, though, there are some important technical developments on which you might want your Secretary of Energy to provide a briefing.

While looking to France for inspiration may or may not play well with domestic audiences, it is one of the first places to look for ideas on how to handle nuclear waste. Actually, the French (who get almost 80 percent of their electricity from nuclear energy) do not really think of it as waste, and therein lies an important difference between their approach and ours.

The United States uses what is called a "once-through fuel cycle," in which the nuclear material in the fuel is used just once, the used fuel is put in a geologic repository, and that's that.

But that leftover nuclear material still contains a lot of energy. In fact, some have likened the "once-through" method to pulling a log out of the fireplace just because the bark has burned off. Let's say you were to put a batch of nuclear fuel into a reactor. After a three-year cooling-down period, 96 percent or 97 percent of that material is

potentially reusable uranium or plutonium; only the remaining 3 percent or 4 percent is genuinely useless "waste."

France "reprocesses" that leftover uranium and plutonium into useable energy. The final wastes undergo a procedure called vitrification, in which they are compacted into a stable glass log and placed into temporary storage. The French do not have a permanent solution for their nuclear waste either, but, because of reprocessing, they have far less of it to deal with—about 10 grams per Frenchman per year. That is about three-tenths of one ounce, or slightly less than the weight of a U.S. half-dollar coin.

The bad news about this kind of reprocessing is that it is based on the same technology developed by the United States in the 1950s to make nuclear weapons. This makes that technology very controversial in the United States. In fact, nuclear-proliferation concerns played a major role in the Carter administration's decision to cease federal support for reprocessing in the United States. While our country may be a relative latecomer to reprocessing, however, new technology could enable this nation to vault past other nuclear nations. American scientists are well on the way toward developing new processes that are both more proliferation-resistant than the existing technology and more environmentally friendly.

For example, U.S. researchers are exploring ways to break waste down into stable, non-radioactive materials using "fast reactors." These reactors would be capable of using up more of the plutonium and other elements that today's reactors simply cannot process. Using these technologies would reduce waste, minimize the long-term hazard nuclear waste poses to the environment—and also result in greater electricity production as we use nuclear material more efficiently.

Another benefit of this work is that U.S. leadership can bring the world's nuclear energy nations together to meet this challenge—both to our domestic benefit and to benefit of the world as a whole.

Still, in the end, a major storage facility will be needed. Even the most advanced technology will leave small amounts of nuclear waste that must be stored for hundreds of years. In addition to waste from ongoing energy production, the United States is storing large quantities of nuclear material left over from the Cold War and from the continued operation of the nation's nuclear navy. But technology can also give us more time to make sure that if we do require a repository, we will design one that meets our present and future needs.

Nuclear energy is not a cure-all, and there will be many who raise objections to it. Some recent administrations have started out fully intending to reduce our use of nuclear energy, only to return to it at the end as part of the solution. While it has clear benefits, nuclear power has its costs and its hazards, as do all forms of large-scale energy generation. A pair of uranium leaks at French nuclear facilities in July caused public concern at precisely the moment when Nicolas Sarkozy's government was looking to build more reactors.

Yet the very reasons for France's continued commitment to nuclear power—namely, to free itself from foreign oil and climate-changing greenhouse gases—are reasons that we must take seriously as well. Whether we, too, should increase our use of nuclear energy is one of the many important decisions you will have to make in your new job. Figuring out what to do with nuclear power's waste product is central to that decision—and to our nation's energy future.

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