- This is a carbon copy, first draft written by William L. Laurence several weeks before dropping of bomb on Japan.

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(Tentative draft of radio address by President Truman to be delivered at the time of use of the atomic bomb over Japan, ~~or, if Japan capitulates before such use, at a time to be determined shortly after announcement of capitulation.)~~

* * *

Today marks one of the most important days in the history of our country and of the world. Today, as the result of the greatest scientific and engineering development in the history of mankind, ~~our 20th Air Force~~ (Army) has released upon Japan the most destructive weapon ever developed by any nation, a weapon so powerful that one bomb has the equivalent effect of from 5,000 to 20,000 tons, or 10,000,000 to 40,000,000 pounds, of TNT. Ultimately, these bombs, ~~weighing~~ containing (& the rare material) only a few pounds, will carry a concentration of explosive power so tremendous that one of them is expected to reach the equivalent of 100,000 tons, or 200,000,000 pounds, of TNT.

This greatest of all weapons, developed exclusively by American genius, ingenuity, courage, initiative and farsightedness on a scale never ever remotely matched before, will, no doubt, shorten the war by months, or possibly even years. It will thus save many precious American lives and much treasure. But, while the work was undertaken primarily for the purpose of developing a weapon for the winning of the war against Japan in the quickest possible time and at the smallest possible cost in lives ~~and treasure~~, the tremendous concentrated power contained in the new weapon also has enormous possibilities as the greatest source of cosmic power ever to be tapped by man, utilizing the unbelievable quantities of energy locked up within the atoms of the material universe. This type of energy, known as atomic energy, is the inexhaustible source of power that enables our sun to supply us with the heat, light and other forms of radiant energy without which any life on this earth would not be possible. It is also the same atomic energy that keeps the stars, bodies much bigger

President Truman's Speech

and hotter than our sun, emanating their light and heat. The energy within the atoms, that is, the elements of which the physical universe is constituted, is so tremendous as compared, for example, with coal and gasoline, that one pound of any substance, if 100 percent of its atomic energy could be utilized, would be the equivalent in power content of more than five and three quarter billion pounds of coal, or nearly three million tons, Put in another way, one pound of matter contains atomic energy equivalent to 10,000,000,000 kilowatt hours, which means that about twenty-one and a half pounds of matter contain enough energy to supply all the electrical power requirements of the United States for an entire year. However, the atomic energy that we are now able to utilize constitutes less than one-tenth of one percent of the total.

This new development, which brings this "Cosmic Fire" down to earth for the first time, just as Prometheus, father of civilization, brought ordinary terrestrial fire down to earth from Olympus, marks the opening of a new era in our civilization. The discovery of the use of fire by man brought the transition from the Stone Age to the Iron Age and Bronze Age. Then, after the passage of thousands of years, came the Age of Steam and the Age of Electricity.

We are now entering the greatest age of all--the Age of Atomic Power, or Atomics. Just as the transition from one age to another always meant a vast increase of man's control over the forces of nature, resulting in the conquest of disease, the lengthening of the average lifespan and the raising of the standards of living to a degree never dreamed of by the generations that preceded it, so the ushering in of the age of atomic power will inevitably mean the increase of the wealth, health and happiness of mankind to a degree so vast in its dimensions as to challenge the most vivid imagination.

This prospect, of course, is entirely contingent upon the proper use of this new vast power in the services of peace. The obverse side of this picture of the

immediate future is the possibility of the destruction of civilization in a few weeks, or even days, should, Heaven forbid, such a weapon fall in the hands of warlike nations, large or small, intent on world domination.

The United States, along with other peaceloving nations, has already begun to take the necessary measures of control to make certain that never in the far foreseeable future will a weapon of such staggering potentialities for destruction be allowed to fall in the hands of those who may conceivably misuse it to the detriment of civilization. Steps to assure continued security are being taken.

One cannot fail to see the hand of Providence in the fact that it was our people that Almighty God saw fit to give this weapon to first. One shudders to think what might have happened had the Germans succeeded in developing this weapon in time for use in this war. That they did not succeed was not because they did not try hard enough. There were, in fact, many anxious moments both in this country and in Great Britain during 1943 and 1944 when we greatly feared that they might win the race against us--and it was very definitely a race. And it was not until the middle of April, 1945, when American forces in Germany captured a large stockpile of the material used in the release of atomic energy and destroyed one of Germany's vital plants used to purify this material, that we knew with a measurable degree of certainty that Germany no longer had the means to develop an atomic bomb in time for use in this war.

The fact that Providence saw fit to entrust this great weapon in our hands ahead of any other nation places upon the American people the great moral responsibility to see to it that it is used to the benefit of mankind and not to its detriment. Under proper control, this new force now placed at our disposal--the equivalent of armies ~~of tens of millions of trained men~~--can become the greatest weapon for enforcing

peace that the world has ever known, insuring a period of peace lasting into the far distant future, and conceivably until such a time when every individual or nation on earth will have attained such a high moral sense that war will have become unthinkable.

We are now so far ahead that it would take any other nation from ten to twenty-five years to catch up with us. We must, and we will, see to it, that we maintain our lead. As long as we do not relax our efforts and make sure that no nation ever gets ahead of us, or even matches us, we can be certain that our defenses are in good order and that no would-be aggressor would dare act against our will to maintain peace.

The existence of atomic energy first became known to the scientific world through the theory of relativity, discovered by Dr. Albert Einstein, now an honored American citizen. Until 1939, however, it was just as far from practical realization on this earth as a flight to Mars or to the moon. While means had been found by scientists in our country and in other lands to produce such energy on a very small scale in the laboratory, no conceivable power on earth was then known to produce it on a scale that would make it useful.

Then, in 1939, came a most remarkable discovery which practically changed overnight the prospects of producing atomic power on a large scale. It was found that a twin sister of the element uranium, the heaviest of all the elements found in nature, can, under certain conditions, be split, and that when this splitting, or fission, takes place, the uranium releases spontaneously a tremendous amount of the atomic energy which has been locked up within the core, or nucleus, of its atoms since the beginning of time. This meant that one pound of this type of uranium, if it could be obtained in pure form, could release an amount of power equivalent to 5,000,000 (five million) pounds of high grade coal, or 3,000,000 (three million) gallons of high octane gasoline. In terms of explosivenews, our scientists found out, one pound of

the substance, was the equivalent of 15,000 tons of TNT, or three hundred carloads of fifty tons each.

There was, however, a catch to this. Uranium, as found in nature exists in three forms, known as isotopes. These isotopes are named according to their atomic weights, and are known, respectively, as uranium 238, uranium 235, and uranium 234, or U-238, U-235, and U-234, for short. Unfortunately, or fortunately for the world, as it turned out later, the element releasing the atomic energy was uranium 235, which constitutes only seven-tenths of one percent of the uranium found in nature.

The difficulty, however, was not in the smallness of the percentage of the U-235, as uranium is an element found in considerable abundance in many parts of the world, including the United States, and even seven-tenths of one percent constitutes a large quantity estimated in the thousands of tons. The real difficulty confronting our scientists lay in the fact that no chemical difference exists between the three types of uranium, and at that time it was not known whether it would be possible to develop physical methods for separating the seven-tenths of the atomic energy element, namely, U-235, from the ninety-nine and three-tenths percent of its more abundant sister element, Uranium 238.

The manner in which our top ranking scientists, engineers, chemists, our Army Corps of Engineers and many of our great industries accomplished this gigantic task constitutes by far the greatest achievement ever attained by man. That it was successfully accomplished in the course of less than three years will stand as an everlasting testimonial to American genius, initiative, enterprise, courage, and, above all, imagination and faith. No other nation on earth had the required combination of brain power, resourcefulness, energy, technological "know-how", andmaterial resources to accomplish what we have accomplished in so short a time.

Not only did we devise the methods, develop the raw materials, build the enormous plants, train the thousands of skilled personnel and accomplish the thousand

and one other tasks that made it possible for us to produce relatively enormous amounts of the atomic energy element, U-235, but we also produced an entirely new element not found in nature, which is similar to U-235 in that it produces an even larger amount of atomic energy. This element, which is heavier than any element found in nature, has been named plutonium after Pluto, the most distant planet in our solar system.

Even the existence of this element (in exceedingly minute amounts) has been known to but a few select scientists, and its production in relatively enormous quantities by a special method, out of ordinary Uranium 238, is being revealed to the American people and to the world for the first time tonight. Until tonight this, and other facts relating to our work on the use of atomic power, ~~has~~ have been ~~one of the~~ top secrets of the war, known to only a few key men.

In addition to the enormous work of producing U-235 and plutonium in the amounts required for shortening the duration of the war against Japan, there was also the equally gigantic task of devising ways and means for utilizing the power of these elements in suitable weapons against our enemy. Thanks again to our physicists, chemists and Army engineers, working in cooperation with the Navy, this task also has been successfully accomplished.

We now have two types of highly complicated aerial bombs, using either U-235 or plutonium. One, using U-235, explodes with a force equivalent to that of from 8,000 to 20,000 tons of TNT. The second, using plutonium, explodes with a force equivalent to that of from 4,000 to 6,000 tons of TNT. The second type of bomb will, with further developments, probably be the better of the two and will be used for both U-235 and plutonium. It is with this type that we hope to develop an explosive force equivalent to that of 100,000 tons of TNT.

Each of the two types, when it hits the target, has in it enough explosive power to obliterate an entire city. Let this, then, be a warning to the Japanese

militarists. We have produced enough of these bombs to lay waste to every one of their cities and to cause such havoc in the rest of their country that it will be a wilderness for generations to come. We therefore put this choice squarely before them: "Either surrender unconditionally or be destroyed". If they persist in their madness ~~and continue to take a toll in American lives~~ in a senseless continuation of a war that they themselves have known for a long time they must inevitably lose, the burden of responsibility for their own destruction will rest squarely on their own shoulders. ~~The blood of American youth is too precious not to use every~~ means at our ~~disposal to save every drop of it.~~

The possibility of using atomic energy for military purposes was brought to the attention of President Roosevelt in late 1939 ~~and~~ he appointed a committee to look into the matter. This led to scientific research, first on a limited scale, and then on a full scale basis. Shortly after December, 1941, the research and development work was ~~given an all-out status and was~~ placed under a special group of outstanding scientists in the Office of Scientific Research and Development.

By the middle of 1942, the progress was such that it appeared feasible to initiate plans for the construction of production plants. In the meantime, President Roosevelt had appointed a general policy group to advise him on the matter. This group consisted of Secretary of Commerce Wallace, then Vice-President; Secretary of War Stimson; General Marshall; Dr. Vannevar Bush, Director of the OSRD; and President James Bryant Conant of Harvard. In June of 1942, this group recommended a great expansion and acceleration of the work and the assignment of the construction phases to the Corps of Engineers of the War Department. With President Roosevelt's approval, ~~the program and~~ an organization, ~~that became known as the~~ Manhattan Engineer District, was created to handle the program.

By September, 1942, it became evident that the project was of great magnitude and extremely difficult of accomplishment. The Secretary of War then selected

Major General Leslie R. Groves, one of the ablest members of the United States Corps of Engineers, to take direct executive charge of the program. Since that time General Groves has devoted his entire time to the work, and it is largely due to his energy, ability, drive, foresight and organizing skill that this tremendous project, greater than any ever undertaken, has overcome all its major obstacles and has succeeded beyond our most optimistic expectations. Brigadier General T. F. Farrell ably assisted General Groves in the later phases of the undertaking.

At the same time, the President's General Policy Group appointed a Military Policy Committee consisting of Dr. Bush or his alternate, Dr. Conant, as chairman; Lt. General W. D. Styer and Rear Admiral W. R. Purnell, to plan military policy relating to the project. General Groves sits with this Committee and acts as its Executive Officer in carrying out its policies.

At that time there were so many completely unknown phases of the possible methods for producing the explosive material that it was decided, in December 1942, to proceed towards the construction of three major plants, each for the development of a special method of production. It was thought at the time that at least one of the methods would develop insurmountable difficulties that would necessitate its abandonment. As it turned out, however, while great difficulties were encountered, they were all surmounted one by one, and no one method developed such a superiority that the others could be safely abandoned.

In the summer of 1944, progress along another line of research indicated the wisdom of constructing an additional comparatively small plant, in which a fourth method for producing the atomic energy element, U-235, was employed.

The nature of the work required both safety and great secrecy, so the various plants were scattered over wide areas of the United States in sparsely-settled

sections of Tennessee, New Mexico and the State of Washington.

One of these mammoth plants, known as the Clinton Engineer Works, is located on a Government Reservation of about 59,000 acres, ~~located~~ eighteen miles northwest of Knoxville, Tennessee, which was acquired in the autumn of 1942. Here are located two large plants and one small plant for the production of U-235, and one experimental plant for producing plutonium.

To construct and operate these plants, it was necessary to build a Government-owned and operated town within the reservation. This, given the name Oak Ridge, is now the fifth largest city in Tennessee topped only by Memphis, Nashville, Knoxville, and Chattanooga in that order. The people of Oak Ridge live under normal conditions in comfortable houses, dormitories, hutments and trailers, and have all the religious, recreational, educational, medical and other facilities of a modern medium-sized city. Construction workers now employed at Oak Ridge total about 32,000 and operating personnel about 47,000. The population of Oak Ridge proper and adjoining temporary construction camps within the reservation is

approximately 78,000, including the workers and their immediate families. The remainder live in the surrounding communities. The plants at Oak Ridge are in charge of Colonel K. D. Nichols, of the Army Corps of Engineers, a highly efficient and brilliant young officer of whom our country is very proud.

Of the two large plants at Oak Ridge, one covers 500 acres and has 270 permanent buildings. It has nine of the largest magnets in the world, innumerable vacuum pumps, more powerful than any ever built, that pump millions of gallons of oil a day, five special chemical laboratories, a training school for operators of the new complicated machines, repair shops, huge storage buildings, a cafeteria, a large administration building and numerous other auxiliary structures.

This plant required tremendous quantities of copper for winding-coils, and as copper was one of the scarcest and most vital strategic materials, the project borrowed twenty-seven and three-quarters million pounds of silver from the United States Treasury and put it to work as a copper substitute in producing the new atomic explosive. This silver treasure, worth $400,000,000 at current prices, is <u>not</u> harmed in the process and can be replaced at a later date by copper when that material again becomes plentiful.

The second plant in Oak Ridge, using a different process for producing U-235, covers a ground area of 1,856,000 square feet, or about 42.6 acres. It has a total floor space of more than five and half million square feet, or nearly 128 acres. The whole building is about a mile long, built in the shape of a giant letter "U". To make possible the process used in this plant, a special type of tubing had to be developed. These tubes, which have exceedingly fine pores about a millionth of an inch in diameter, would, if laid end to end, cover a total of 6,000 miles, enough to go twice across the North Atlantic Ocean.

While the electric power required to run the plants at Oak Ridge comes largely from TVA, an additional power house generating 238,000 kilowatts of electricity had to be constructed in a remarkably short time to assure an adequate supply of power. This power plant is the largest initial single power installation

ever built. It has three boilers, each producing 750,000 pounds of steam per hour at 935 degrees Fahrenheit and 1325 pounds pressure per square inch. In all, the plants at Oak Ridge use a total of 693,000 kilowatts, an amount that nearly equals the total power output on the American side of Niagara Falls.

At the third plant, at which plutonium is produced, several new types of chemical laboratories had to be designed, with special new type of apparatus, never seen or even dreamed of by any chemist, to purify and handle the new type of material. Because of the tremendous amounts of dangerous radiations emitted by this new substance, new methods for handling it and new types of precautions had to be devised, by a staff of leading medical experts, headed by Colonel Stafford L. Warren, formerly of the University of Rochester, New York.

No human hands ever touch this material and no one ever is allowed to come in its vicinity beyond a certain danger zone, until a certain stage is reached when the material has been "defanged" of its incidental radium-like emanations that are not necessary for its explosive action. Until that stage is reached, the substance is handled by remote control, through extremely ingenious new types of automatically controlled machines, after the material is made to pass under huge tanks of water twenty feet deep. Operations (in the laboratory) are watched through periscopes placed in lead walls several feet thick. Every operation in this remote control laboratory is as delicately adjusted as the finest watch.

There is another similar automatic laboratory at Oak Ridge at which many new precious products are being extracted as by-products. At least twenty new types of substances, not found in nature, all of which promise to be of great importance in science, industry and medicine, are being thus produced. ~~One of these substances is 700 times more powerful than radium and can be produced in relatively enormous amounts.~~

The large plant for the production of plutonium is situated at the Hanford Engineer Works, a Government Reservation comprising some 430,000 acres located at an isolated, semi-desert site fifteen miles northwest of Pasco, Washington. The site was acquired early in 1943. Isolation from existing populated communities of any size was a prime requisite in the selection of the site for this plant, to provide the necessary safety distances. This reservation area contains the Government-operated town of Richland. It is similar to Oak Ridge, but much smaller in size. The operating personnel and their immediate families at the Washington site number about 6,500. The present population of Richland is about 17,000.

A highly secret research and experimental laboratory for the development of the weapon is located at a site twenty-five miles northwest of Santa Fe, New Mexico. Persons employed at this site number approximately 6,100 and a small, temporary Government-owned and operated community has a population of about 5,800.

In addition to these three principal sites, there are scores of new plants and expansions to existing plants scattered throughout the United States from California to New York, to effect the rapid manufacture of specialized equipment, the refining of uranium ores, for which no satisfactory process was previously known, and the development and production of special new chemicals essential for the project. A number of our large industrial firms are participating in this work and they are doing a magnificent job. The nation is grateful to them.

The plutonium plant in the State of Washington is operated by the du Pont Company. One of the key plants at Oak Ridge is operated by the Tennessee Eastman Corporation and the second large plant is operated by the Carbide and Carbon Chemicals Corporation. Columbia, Chicago, and California Universities and a number of other institutions throughout the United States, as well as many

industrial firms, contributed materially in developing and supplying special equipment, materials and processes used by the project.

Because of its tremendous importance, President Roosevelt personally ordered extraordinary secrecy and security measures for all phases of the project. As a result this entire project was General Groves placed this responsibility in the hands of ~~Lieut~~. Colonel John Lansdale, Jr., and Lieut. Colonel W. A. Consodine, whose work in keeping the project the best-kept secret of the war and in frustrating attempts of foreign countries to obtain information on what we were doing, cannot be praised too highly. Colonel Lansdale was also assisted by Lieut. Colonel W. B. Parsons, who has headquarters at Oak Ridge.

The greatest credit is due the American Press and radio networks for their wholehearted cooperation in refraining from mentioning the nature of the projects, or even attempting to obtain information on this work. Special credit must be given the local newspapers and radio stations, large and small, in Tennesee, Washington, and New Mexico, the reporters and editors of which not only gave their wholehearted cooperation and understanding but aided the projects in every possible way. Much praise is also due the tens of thousands of workers on the various sites, none of whom had any idea of the ultimate nature of their work, but who patriotically refrained from even talking of their own particular job because they knew that secrecy was vital to the national security.

Never before in history have so many great scientific brains been concentrated on one single problem. Only a few of them can be mentioned now in addition to those already mentioned earlier. This project could hever have succeeded without the loyalty, devotion, knowledge, imagination, courage, and a sublime faith that refused to acknowledge defeat, of Dr. Ernest O. Lawrence of the University of California, Dr. Arthur H. Compton of the University of Chicago, Drs. Enrico

Fermi, John R. Dunning, and Harold C. Urey of Columbia University, and Dr. J. R. Oppenheimer of the University of California, and Dr. R. C. Tolman, of the California Institute of Technology.

While the project's primary mission has been the development of atomic bombs for use against Japan, the tremendous and far-reaching implications of the future cannot be and have not been overlooked. Atomic energy, if controlled by the major peace-loving nations, should insure the peace of the world for decades to come and possibly for many generations. If misused, it can lead to the wiping out of our civilization. The urgencies of war have prevented full consideration of the postwar developments of atomic energy, but it is evident that the United States must maintain the leadership in the field of atomics which it now holds.

There must be continuous, vigorous and extensive research and development of the possibilities of atomic energy, including the development and use of new radioactive substances many times more powerful than radium, which have far-reaching possibilities as new powerful tools in medicine. In this work, we expect to cooperate with the United Kingdom, whose scientists contributed their special knowledge to many of the problems that needed speedy solution.

The postwar program will entail the continued procurement and movement to American and British control of available world supplies of uranium and other elements, such as thorium, that promise to become rich sources for the production of atomic power; the improvement and operation of the most efficient manufacturing processes; the improvement of the bomb as the most potent weapon for the national defense and the best guarantee for the maintenance of peace; the development of military power applications, such as to engines of naval vessels; the development of commercial and industrial power, if that proves feasible; the development of biological, medical and industrial applications of the radioactive substances; and fundamental research to enable us to retain our present lead in the field. A policy may also have to be worked out for the control of uranium and thorium within the United States.

Consideration is also being given to a recommendation for the establishment of a select committee of particular qualifications to recommend action to the Executive and Legislative branches of our Government and to ~~when secrecy is no longer in full effect. The committee would also recommend the actions to be taken by~~ the War Department on matters involving ~~prior to that time in anticipation of the~~ postwar problems. This committee would be assisted by specially qualified scientists, Army and Navy personnel and other persons.

In the final analysis it is the American people that has opened up this great marvelous new continent of atomic power, which Sir Arthur Eddington once described as the "Cosmic Cupboard" of inexhaustible energy. Providence has placed its trust in the American people by providing us with the key that unlocks this "Cosmic Cupboard" of Atomic Power, and the American people will keep faith with this trust. We will do with this new continent what we did with this land of ours -- develop it and cultivate it until we reach a new Promised Land of wealth, health, and happiness for all mankind, ushering in a new era of prosperity such as the world has never seen. With God's help and guidance we will achieve this goal.

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Copy prepared by William L. Laurence, Consultant to General Groves.
May 16, 1945.