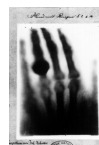


# The Development of Nuclear Energy

1895 Roentgen discovers X-rays



1896 Becquerel discovers rays emitted spontaneously from uranium salts



1898 The Curies identify 2 radioactive nuclides, coin term "radioactive"



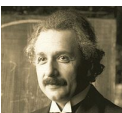
1899 Rutherford distinguishes alpha and beta radiation and discovers half-life



1909 Rutherford discovers that most mass is concentrated in a small nucleus

1920 Rutherford theorizes a "neutron"

1935 Chadwick identifies neutrons



1938 Hann and Strassman split uranium atoms with neutrons, Meitner and Frisch explain what's happening and name it "fission"

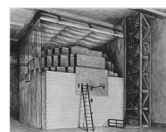
1939 Fermi and Szilard measure neutron multiplication, conclude that a nuclear chain reaction is possible

1939 Szilard, Wigner, and Teller convince Einstein to sign a letter warning Roosevelt of possibility of nuclear weapons

1939 Roosevelt authorizes creation of Advisory Committee on Uranium, begins US nuclear bomb effort (though not vigorously)



1942 Fermi achieves first nuclear chain reaction in a squash court at U. of Chicago. Manhattan project in full swing. Secret cities are built in Oak Ridge TN (to enrich uranium), Hanford WA (to produce plutonium), and Los Alamos NM (to design and assemble bomb)



July 1945 The world's first nuclear weapon test, the Trinity shot, is successful



Aug 6 & 9, 1945 Atomic bombs Little Boy and Fat Man dropped on Japanese cities, Hiroshima and Nagasaki. Up to 240,000 people died.



Aug 15, 1945 Japan surrenders unconditionally, ending WWII.



1951 EBR-1 reactor is the first to generate electricity in Arco, ID

1953 Eisenhower gives Atoms for Peace speech, launching civilian program



1954 USS Nautilus launches, the first nuclear-powered submarine



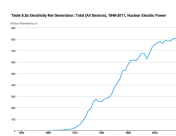
1954 Obninsk reactor in the Soviet Union becomes the first commercial nuclear power plant



1957 Shippingport reactor begins operation, first commercial nuclear power



1974 French Prime Minister Messmer launches huge nuclear power program in response to oil crisis. In 2004, 75% of France's electricity is nuclear

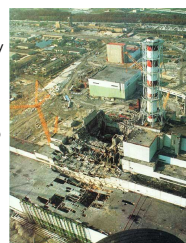


1979 Three Mile Island reactor suffers a partial meltdown. Radiation largely contained

1986 EBR-II reactor demonstrates that advanced, sodium cooled reactors can passively shut down without backup systems



1986 Chernobyl reactor suffers a large power excursion resulting in the release of large amounts of radiation. 50+ firefighters die, up to 4000 civilians estimated to die of early cancer



1994 Megatons to Megawatts program started, turns 20,000 nuclear weapons into electricity. By 2000, ~10% of US electricity comes from dismantled Russian warheads

2004 After decades of electricity generation with no deaths in the US, a Nuclear Renaissance discussed, with talks of more reactor builds to offset carbon emissions

2011 4 reactors at Fukushima Daiichi lose backup generators due to tsunami and suffer core meltdowns, hydrogen explosions. Radiation release estimated 10-30% of Chernobyl. Zero people's health affected by dose, but land is evacuated



2013 Climate guru James Hansen publishes paper claiming nuclear has saved 1.8 million lives total (including worst-case estimates for all accidents) by offsetting air-pollution related deaths

2013 Voyager I enters interstellar space after traveling the solar system for 36 years. It is powered by a Plutonium-238 radioisotopic thermal generator

